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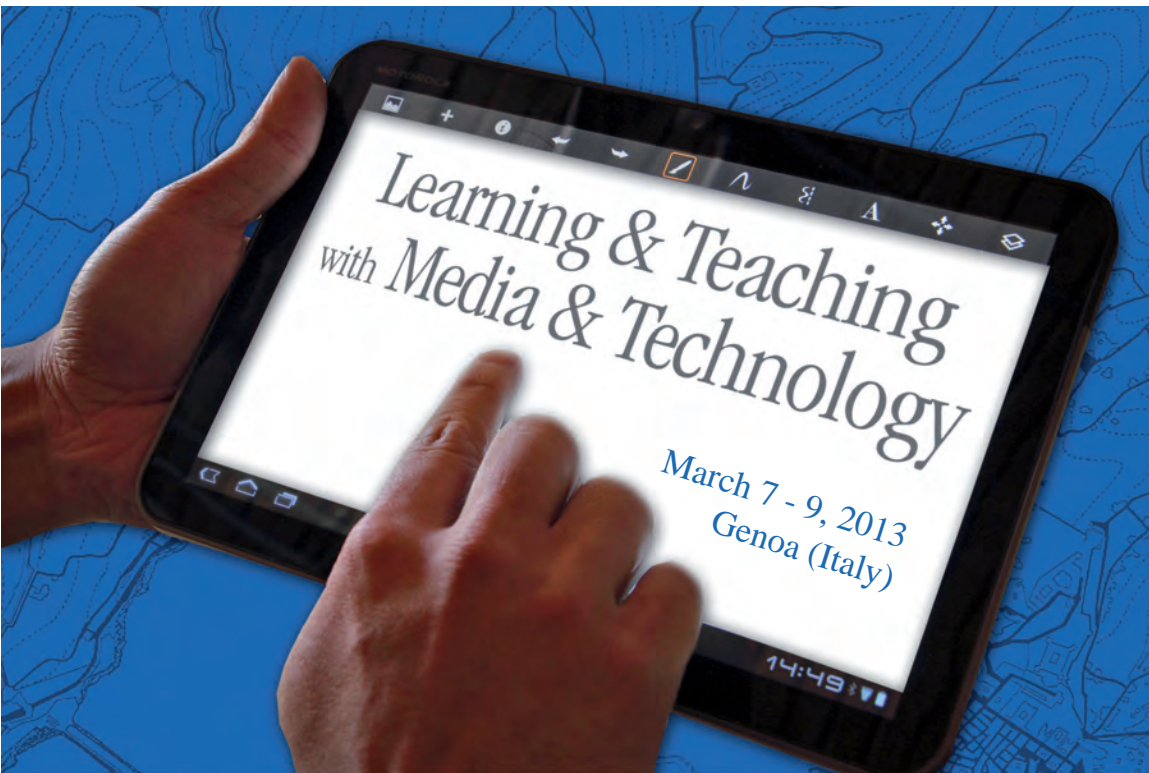
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Società Italiana di Ricerca sull'Educazione Mediale

Italian Society for Research
on Education and Media

Learning & Teaching
with Media & Technology

March 7 - 9, 2013
Genoa (Italy)

Edited by
Parmigiani Davide, Pennazio Valentina & Traverso Andrea

ATEE-SIREM
Winter Conference Proceedings

Learning & Teaching
with
Media & Technology

7-9 March 2013, Genoa, Italy

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Learning & Teaching with Media & Technology

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These proceedings arise from the ATEE winter conference 2013 that was held in Genoa (Italy) from 7 to 9 of March.

The themes and the aims of the conference were focused on the relationship between the quality of the learning/teaching processes at any educational level, from preschool to university, and the role of media and technology in improving such processes. The teachers use various instruments to implement and improve the quality of the learning/teaching processes. In this way, the old and new media and technologies represented and still represent ways to help teachers in creating meaningful instructional experiences. The conference gathered scholars, teachers and teacher educators to find and share ideas, studies, experiences and proposals aimed at imagining learning environments where teachers and pupils are able to create and develop competence.

The conference was the result of the collaboration between ATEE (Association for Teacher Education in Europe), SIREM (Italian Society for Research on Education and Media) and the Department of Education at University of Genoa.

In particular, the Association for Teacher Education in Europe (ATEE) is a non-profit European organisation, whose aim is enhancing the quality of Teacher Education in Europe and supporting the professional development of teachers and teacher educators at all levels. ATEE tries to reach its aim through active dialogue and international exchange of research and practice in initial and in-service teacher education. ATEE's members come from a wide variety of countries within Europe and beyond. As a result, ATEE is a multicultural association with a wide expertise on the various fields of teacher education and tries to increase the co-operation between individuals and institutions involved in Teacher Education both inside and outside Europe by promoting international networks (for futher information about ATEE and membership, you can visit the website: http://www.atee1.org/home).

The title of the conference *Learning & Teaching with Media & Technology* was intended to encourage submissions for papers addressing the various aspects of the use of ICT and

Media in the educational contexts. We received contributions focused on three different angles - policy, practice and research - as well as papers which were the result of collaboration of policymakers, researchers and practitioners.

During the conference, a variety of activities took place to ensure both the exchange of academic research as well as reflection on policy and practice, such as expert keynote presentations, paper presentations of research, and sessions which share the experience of academics, teachers and teacher educators.

The scientific committee of the conference was composed of international scholars and the keynote speakers presented the most current studies on educational media and technologies. In particular, we were delighted to meet:

- James Paul Gee, from Arizona State University, who talked about "Video Games, Digital Learning and New Literacies". He is author of "What Video Games Have to teach us about learning and literacy" (2008), "New Digital Media and Learning as an Emerging Area and Worked Examples as One Way Forward" (2009), "Language and learning in the digital age" (with Elisabeth R. Hayes, 2011);
- Mary Kalantzis and William Cope, from University of Illinois at Urbana-Champaign; their speech has underlined the theme "Ubiquitous Learning. Changes and Challenges for Educational Environments"; they are authors of "Literacies" (2012)", "Ubiquitous Learning" (2010), "Towards a Semantic Web: connecting knowledge in academic research" (2010) and "New learning: elements of a science education" (2008)
- Vitor Reia-Baptista from Universidade do Algarve, Portugal, who analysed the issue of "Media Pedagogy, Education and Media Literacy. Who Educates Whom?"

The conference was attended by 155 participants from 28 different countries of the five continents. We received 140 papers in all, but the scientific committee accepted 117.

During the three-day conference, the authors presented their studies split in 4 different parallel sessions:

- Teaching and assessing with ICT in the classroom
- Mobile, web 2.0 and social networking in education
- Games, videos and simulations for learning
- ICT in higher education contexts

Ultimately, we are satisfied for the high scientific level reached by the conference. All papers show several perspectives on the use of Media and Technology in the educational contexts but an only and mutual aim: improving the learning/teaching processes through an intelligent and aware use of educational technologies.

Section 1

ICT in Higher Education Contexts

Developing a Scale to Measure Attitudes of University Students towards E-learning

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Abstract
Despite the growing technology in higher education, several studies (e.g., Link & Marz, 2006) have advocated that universities have been slow to bring e-learning into the main stream and maximize the potential benefits of this kind of learning in the classroom. They found that failing to acknowledge the importance of e-learning was an important issue. Although many students may lack the necessary skills to use e-learning effectively, universities still invest large sums of money in automation and electronic communication facilities. Cereijo (2006) proposes that students attitude towards e-learning provides a beneficial construct to predict learning outcomes. Despite this fact there is, to the authors' best knowledge, no standardized instrument to measure university students' attitude towards e-learning. Consequently, this paper aims to develop a standardized scale to measure students' attitude towards e-learning. The authors undertook the following steps to develop the measure: Developing preliminary draft of the Scale; Try-out of the Scale; Item analysis; Final draft of the Scale; and defining Reliability and Validity of the Scale. The Scale was administered to 200 students enrolled in e-learning courses at the Universities of Bahrain and Kuwait. The results of the study demonstrated high levels of validity and reliability of the developed Scale.

Keywords
Scale, Attitude, University Students, Bahrain, Kuwait.

1. Introduction

Many private higher education institutions around the world are using e-learning in their education curriculum to compete with others and survive financially. Also, institutions are changing to new technology in education to enhance student learning experiences and to produce better learning outcomes and competencies (Khan, 2005).

To cope with recent technological innovations, universities should have a flexible organizational structure to incorporate technology such as e-learning approaches into their education curriculum to improve student learning experience (Al-doub, Goodwin, & Al-Hunaiyyan, 2008).

Some important prerequisites and factors for the success of e-learning during implementation in higher education institutions have been identified in recent studies (Marie-Louise, et al., 2009; Ostlund, 2008). Poor preparation can affect the use of e-learning facilities, and poor instructor training in using these facilities may lead to weak outcomes. The availability of connections to e-learning websites combined with slow downloads may discourage students from using e-learning.

Attitude is defined as an individual's positive or negative feelings about performing the target behavior (Palmer & Holt, 2009). This implies that learners' positive or negative feelings about their participation in e-learning activities through the use of computer would directly influence their behavior to use online learning for different purposes. Understanding students' attitudes towards e-learning can help to determine the extent to which students utilize the e-learning system in campus (Ong & Lai, 2006).

For this reason, Martinze (2004) suggests that the study of student's attitude towards e-learning can in many ways help managers better prepare in light of e-learning for the future. Usun, (2003), Asan and Koca (2006) revealed the relationship between students' attitude towards e-learning and positive learning outcomes.

Ellis, Ginns and Piggott (2009) have discovered significant strong positive correlations between the deep approaches to learning, the e-learning variables, and students' perceptions of the quality of e-learning.

A number of studies (e.g., Link & Marz, 2006; Smart & Cappel, 2006) have identified significant merits and demerits of e-learning as perceived by university students. Yet, except in the Mehra and Omidian's (2012) study, there is no standardized instrument to measure attitudes of University students towards e-learning, which motivated the authors to conduct this study in an Arab context.

2. The Context

The basic function of the University of Bahrain as an important institution of social control is to build students' personality and thought, and to establish a profound base and an active environment for student learning. In such an environment, teachers are encouraged to hold consistent and reasonable beliefs about e-learning and e-teaching, and to share these beliefs with their peers and students, thus promoting high standards of teaching and learning (University of Bahrain, 2010).

According to the last available statistics, the number of students involved in e-learning courses is 4800 students at University of Bahrain (2008), and 3990 students at University of Kuwait (2007). The e-learning courses at university are usually taught using WebCT, Blackboard, power point presentations, and e-mail. Some tertiary courses are Internet-based

courses because they are taught using the mixed-teaching approach that combines e-learning with traditional classroom lectures and seminars.

University Students in both Bahrain and Kuwait can study at either a private or a public higher education institutions. Teaching at the private institutions is in English while at the public institutions is it is mostly in Arabic. A study on e-learning in some Arab Gulf countries (Al-Ghannam, 2009) reported that there are significant cultural differences between the students at the two types of higher education institutions and also showed some significant differences in the availability of information technology between the public and private sectors. In particular, the students at the public institutions use stand alone personal computers in computing laboratories and do not have access to the Internet at their place of study.

The e-learning project at the University of Bahrain is run by ZAIN E-learning Center, which was opened in 2004. The Center organizes all kinds of activities and tasks associated with e-learning and supervises online teaching of more than 200 e-courses throughout the University. In Bahrain, male and female students attend the same e-learning class.

The Gulf University for Science and Technology (GUST), which is a pioneer private university in Kuwait, established an E-learning Center of Excellence and started using e-learning to support tertiary teaching in 2005. It was the first university to use e-learning in the region. Students at GUST are taught in English and predominantly come from English and American High Schools. English is the teaching language and computers are widely integrated in the curriculum. At the GUST, male and female students attend separate classes at the same locations.

The students in Universities of Bahrain and Kuwait are taught by both male and female instructors, and Internet access is available for all of the students in labs and through a wireless network at campus, e-learning, therefore, is accessed anywhere and anytime. Also, all students enjoy using internet at home, where they are able to access the Databases at University libraries, such as ERIC and Edusearch, for research and study purposes.

3. Method

3.1 Subjects

A total sample of 240 students participated in the study. The number of students who completed the instrument at university campus was 200, including 100 students enrolled in Kuwait University and 100 students - in Bahrain University. 65% of participants were female. The participants age ranged between 18 and 26, with 77% under 24 years. All participants used e-learning facilities in and outside the university.

3.2 Instrument

The series of steps that were taken to develop the scale to assess students' attitudes towards e-learning were as follows:
Step I: Developing a preliminary draft of the scale
An analysis of the current literature was undertaken to determine how "attitude" is perceived and evaluated in studies closely related to the study (U. S. Department of Education, 2008) and in standards to assess e-learning (Commission for Academic Accreditation, 2007). As a result, a need was identified for an instrument that assesses students' attitude towards e-learning in practical situations in higher education.

Items for the draft of the scale were developed after consulting with experts in e-learning. A total of fifty items were compiled using a five –point Likert scale. Half of the items were phrased negatively.

For positive items, score of 5 was given for strongly agree, 4 for agree, 3 for undecided, 2 for disagree and 1 for strongly disagree. Scores for the negative items of

Domain	No. of Items
Advantages and disadvantages of e-learning use	12
The student's experience in using e-learning at campus	24
Technical and Pedagogical Support at campus	14

Table 1. Initial domains of the Scale of Student Attitudes towards E-learning

were assigned in the opposite direction. The summated score of the individual items provided the total score of the measure. The items were developed in the following domains as shown in Table 1 below.

Step II: Try-out of the scale
The scale was administered to 200 students from two countries (Bahrain and Kuwait). Scoring was done in line with specifications given in step I.

Step III: Item Analysis
The total scores for the 100 students from Bahrain and 100 students from Kuwait were arranged in a descending order. 27% of the high scores and 27% of the low scores were identified. Then, for each of the 50 items, a t-ratio was computed for the higher and the lower groups to find out the discriminating power of each item. On the basis of the value of t-ratio, 6 items were rejected as they did not discriminate even at the .05 level of confidence. The t-ratios for the items have been placed in Table 2.

Step IV: Final draft of the Scale
The final draft of the Scale comprised of 44 items divided into three domains. Positive and negative items of the Scale are shown in Table 3.

Step V: Reliability and validity of the Scale
Cronbach's alpha coefficients for internal consistency reliability calculated in separate scale reliability tests conducted on the subsets of self-assessment responses for each subsection of the questionnaire, varied between .75 and .94. This was an indication of internal consistency. The alpha coefficients were encouraging and so no changes were made to the scale. Table 4 shows the reliability value of each subscale.

Reliability of the Scale was estimated by determination of inter-item and inter-total correlations, as well as alpha-if-deleted values. Average inter-item correlation coefficients of the three subscales ranged from 38 to .46, item-total correlation coefficients ranged from .55 to .70.

		t-values	
Domain 1: Advantages and disadvantages of e-learning use		Bahrain	Kuwait
1	E-learning can solve many of the educational problems	4.65	4.18
3	E-learning gives the chance to reinforce student's information and to sharpen his/her skills in the field of specialization	3.46	3.91
5	Online learning makes teaching and learning more flexible	4.64	4.87
15	Adopting e-learning as a learning style shall help students strike the balance between study and family requirements	2.98	3.26
18	My colleagues advice me to use the multiple benefits of e-learning	2.88	3.47
19	I think that e-learning made the learning process more enjoyable	3.67	4.11
30	I believe that e-learning has little contributed to the teacher-student interaction and communication	2.54	3.69

31	I think that the e-learning has a limited effectiveness in improving teaching and learning processes	3.44	2.67
33	E-learning saves time for both teachers and students	3.87	4.05
42	I think that e-learning had a little impact on my achievement	2.86	2.72
45	Access to education is increased through e-learning	3.62	1.82*
46	E-learning has created more problems than it solved	2.59	1.18*
Domain 2: The student's experience in using e-learning at campus			
2	Online learning increases my ability to understand subject matter	3.02	2.78
4	E-learning will improve my achievement in the online courses	4.16	4.68
6	E-learning allows me to deliver the course requirements in time	4.93	4.71
7	I find it difficult to use e-learning to express my ideas in writing	2.73	3.56
11	E-learning encourages me to conduct research in my field	3.57	2.66
12	I find it difficult to get significant information through e-learning	2.91	2.81
13	I feel depressed when I think of learning the subject matter online	3.66	3.28
14	I am not in favor of e-learning as it leads to social isolation	2.82	3.14
16	I find using e-learning both easy and possible	4.76	4.73
17	E-learning helps me compensate for the missed classroom lectures	3.54	3.79
20	I prefer face-to-face learning to learning by using Internet	3.22	3.44
22	I advice my friends to use the Internet for reading lecture notes online	3.77	2.94
23	I avoid using electronic sources for learning and research because I fail to use them effectively	2.77	4.18
24	I feel nervous and tense when I fail to use e-learning effectively	2.84	2.73

		t-values	
Domain 2- Cont.		Bahrain	Kuwait
25	E-learning consumes much of my time and effort	3.72	3.63
26	I hardly prefer e-learning over traditional learning because it lacks the direct interaction with the teacher	3.14	3.69
27	E-learning helps me acquire effective communication skills with other people	5.22	5.68
32	I feel comfortable with performing the e-learning activities and tasks related to the e-course	4.63	4.57
34	I have a strong desire to register in the e-learning courses	4.27	4.16
36	I find it difficult to learn the course using the Internet	2.82	2.70
38	I prefer reading from a printed source rather than to read from websites or e-books	3.94	3.12
44	I wish I could choose more online courses to study	4.30	4.11
47	I dislike using e-learning as it lacks appropriate content	2.09**	2.97
48	I think positively about e-learning	2.96	2.44**
Domain 3: Technical and pedagogical support at campus			
8	The slowness of network or its sudden stop are obstacles to my learning online	2.94	4.28
9	My University has got the technological base that is necessary to deliver e-learning	2.77	5.97
10	My University systematically updates the e-learning websites	3.86	3.19
21	In my University Faculty members prefer traditional ways of teaching and research	2.71	2.89
28	Faculty members at my university are very motivated to use e-learning on a wide scale	6.72	5.97
29	The faculty members at my University are inclined to use the internet for research more than for teaching purposes	5.89	4.13
35	I think that in the visible future my University should be a completely electronic facility	5.33	5.83
37	I think that the adoption of e-learning as a learning style at the University will help solve the students' problems effectively	4.92	3.87
39	The University's library really lacks electronic periodicals necessary to conduct research and to perform activities	8.27	7.55

40	In my University faculty members encourage me to use e-learning in doing educational research and activities	6.14	4.77
41	I assume that the slowness of the network decreases the level of effectiveness of e-learning at the campus	4.66	5.87
43	The e-learning system at the University lacks the technical support necessary for the management of e-courses	3.59	4.76
49	I find it easy to use the library of my University for e-learning	1.22*	3.01
50	More funding is required to purchase the updated technology	2.38**	2.95

* t-ratio is not significant at .05 level ** t-ratio is not significant at .01 level

Table 2. Values of t-ratios for items of the first draft of the Scale

Domain	Positive Items	Negative Items
Advantages and disadvantages of e-learning use	1-3-5 18-19-33	15-30 31-42
The student's experience in using e-learning at campus	2-4-6-11-16-17 22- 27-32-34-44	7-12-13-14-20-23-24 25-26-36-38
Technical and Pedagogical Support at campus	9-10-28 37-40	8-21-29-35 39-41-43

Table 3. Positive and negative items for each domain of the developed Scale

Domain	Cronbach's Alpha		Correlation Coefficient between Domain and Total Score	
	Bahrain	Kuwait	Bahrain	Kuwait
Advantages and disadvantages of e-learning use	.94	.91	.60	.56
The student's experience in using e-learning at campus	.86	.88	.69	.70
Technical and Pedagogical Support at campus	.79	.73	.55	.59
Total Scale	0.84		-	

Table 4. Cronbach's Alpha Reliability values for the domains of the Scale

The alpha-if-deleted values indicated that the scale would not be improved by the removal of any items and, therefore, the 44-item scale was accepted. Alpha for the Scale was equal .84 while Alpha values for the three subscales ranged from .73 to .93. The obtained figures clearly demonstrate the high internal consistency of the measure.

In this study, *content validity* was ensured through consultation with faculty members from different departments at Universities of Bahrain and Kuwait. Based on their opinions, few changes were made to the relevant statements and to the scale as a whole.

To assess the criterion-related validity of the Scale, the student's attitude towards e-learning was used as the predictor, and the student's end-of-semester score on the related e-learning course was used as the criterion. The high predictive validity of the Scale was demonstrated by the high correlation value (r = 0.82, p=.000) between the overall mean of the Scale and the mean of the total score on the e-learning course.

4. Discussion

As a whole, the obtained results of this study suggest a high level of reliability and validity of the Student Attitudes towards e-learning Scale. Furthermore, the findings of this study are

in line with the findings of previous studies that point to the need for the concerns of students to be given greater weight when e-learning courses are delivered, and suggest that if research is to influence classroom practice, then it is vital that teachers are given extended opportunities for further professional study to provide them with knowledge and expertise to engage in e-learning activities that would enhance their teaching online using the Internet.

5. Conclusion

This study has demonstrated that the developed Scale represents a valid and reliable measure of student attitudes towards e-learning. University teachers can easily use the Scale in typical educational settings in order to assess the attitudes of their students in the field of e-learning, and to pinpoint the basic problems encountered in teaching courses online. The developed scale in this study can also be used by individual students for self-assessment of attitudes. Faculty members are expected to be involved in e-learning in order to improve the rationality and justice of their own practices, to increase the quality of their teaching and to solve the problems that come up in their universities in a meaningful and constructivist manner. This is the key factor in achieving high standards and quality of education in the Kingdom of Bahrain, State of Kuwait and all countries worldwide.

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Future Teachers' Views on Using Digital Media in Teaching

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Abstract
There are several arising problems: teachers often complain that their learners read less and spend much time in the Web; they are more used to work with the Technologies than teachers are; digitizing of the routine learning skills and appropriate didactic provision moves slower than the increase of possibilities. The discrepancy rests on teachers' work-load, *skills*, and attitude towards replacing traditional tools by the digitalized ones.

Several publishing houses in Latvia produce digital text-books and a variety of other materials, and the learners welcome these possibilities. Another discrepancy – the digitalized text-books are a novelty by their format. Nevertheless they cannot be called completely learners' books which conduct the users' learning from surface to deep and further to strategic knowledge and understanding thus covering part of teaching and saving teachers' time for discussions and exchanging views. The reasons are two – the content of digital books is not always well prepared to conduct learning, and teachers often reduce their potential to the traditional usage.

The aim of this study is to investigate the discrepancy between future teachers' literacy of modern digital media and their preparedness for professional usage of these tools at school on the background of the 21st century educational paradigm.

Discussion deals with the barriers preventing the widespread use of the digital media and didactic skills to use these materials as learning tools (instead of teaching ones); students' attitude, preparedness and limited ability to teach constructively; the challenges of the new teachers' and learners' roles (unknown in their school learners' practices); possible improvements of the tertiary curricula.

Keywords
future teachers, literacy of digital media, didactic skills.

1. Introduction

The offered problem indicates that future teachers should be given knowledge not only about guiding the teaching/learning process, the regularities of the pedagogical process and children's sensory development in the study process as it has been so far but the future teachers should be taught to use different kinds of digital media, which children are already using, in order to be able to influence these processes thus promoting the children's cognitive development and taking into consideration the already known regularities of the learning process. It is clear that the pedagogical process changes in the 21st century and the university programs should incorporate study courses in which the prospective teachers are prepared for the pedagogical work using these media. In order to start guiding this process it is necessary to explore the students' preparedness to apply their knowledge and skills in the media usage in the pedagogical work. A survey targeted at the 1st year students of the teacher education programs was performed; the target group was selected purposefully so that it would be possible to take into account the survey results when planning the further study processor to organize the study process so as to use to the maximum students' current knowledge and skills in applying the digital media and would learn to use them in the teaching/learning process with pupils at school. Also Cheng (2004) indicates the necessity of this process stating that the emphasis on teachers' self-efficiency, effectiveness of mutual cooperation and effectiveness in the future work using the digital media is binding in the new learning paradigm when educating the future teachers. At the same time it should be taken into consideration that the change of paradigms in education using the digital media should be looked upon in connection with education reforms, changes in the education of future teachers and formulation of effective strategies for developing the professional competence, using digital media in this process (Cheng, 2004).It has to be taken into account that in order to balance the principles of the new paradigm in education, the teachers' digital competence and pupils' digital competence, it is not sufficient to use the digital media as supplements of the known tools in the teaching/learning process. Christopherson (Christopherson, 2011), too, acknowledges it and in his study proves that the use of different technologies does not, however, guarantee essential changes in the teaching/learning process only leading to the fact that pupils will participate with greater interest and their academic achievement will improve, despite that there are numerous studies about the positive benefits of using technologies both ensuring the development of pupils' comprehension and the willingness to be active participants of the teaching/learning process (Herreid,2006; Ribbens, 2007). This means that just including the use of digital media in the study and teaching/learning process does not change the results of the process, which has been also pointed out by Reich, Murnane and Willett (Reich, Murnane, Willett, 2012). The key outcome of using the digital media, which should be attained in the work with future teachers and encouraging them to use these media in their work with pupils, is to promote pupils' active participating in the teaching/learning process constructing their knowledge. These statements require changes on several levels as it is suggested by Sykes, Bird & Kennedy (2010):

1. To structure study courses including in them also courses on using digital media.
2. To reconsider study courses, which at present are envisaged for education of teachers in order to understand to what extent they anticipate the improvement of the competence of using digital media.

3. To evaluate to what extent the teaching/learning process can be improved using digital media.
4. To evaluate whether digital media help attaining the set aims.
5. To evaluate to what extent teachers are ready to work with the pupils of "digital generation".
6. To evaluate which resources are necessary for the future teachers to achieve such a level of digital competence that would correspond to the current situation in the change of paradigm in education (Sykes, Bird & Kennedy, 2010)

Unfortunately there are often limitations in the real situation in mastering these digital competences both due to insufficient use of IT resources and the insufficient digital competence of university teachers, and the limited time resources.

2. Research methodology

The research was conducted in University of Latvia with students who are studying in future teacher programs in 2012. There were handed out questionnaires to all 130 first year students and received 118 valid filled in questionnaires (table No 1). The questionnaire consisted of two parts. In the first part there were statements on the use of different digital media for entertainment, in the second part, the emphasis was on the use of these media in teaching/learning. Students could range the answers in 5 levels: from 0 – always to 5 – never. The questionnaire was anonymous. Discussions were organized with different groups and students had an opportunity to tell their ideas how they would use these digital media. All ideas were accepted and used for research conclusions. Students freely expressed their opinion about the useof media, which were mentioned in the questionnaire, and they could add other media, which they would use in teaching. Data processing was done implementing *SPSS 19.0 data processing software*. Data analysis was done implementing methods used for test reliability (Cronbach's Alpha test), descriptive statistics (analysis of frequencies, central tendency, variability, crosstabs, skewness).

3. Main findings

The future teachers were offered to evaluate only some of the possible digital tools or the use of media– computer, cell/smart phone, digital camera, and the use of internet and one media which is not very popular yet but can be used in special education – motion games with *kinect* element. Authors of the research did not ask about all possible digital tools and media because the purpose of the research was to find out how ready students were to think about all media as teaching devices, and in discussions find out what should be done to improve the study process of future teachers to prepare them for working with „digital natives" – pupils. The obtained findings are summarized in tables and figures, sometimes combining them when it was necessary to sum up the results received from the questionnaires and in the discussions on specific digital tools and media. This was performed purposefully in order to review these findings easily and compare them. Table No. 1 presents the summary of all data from questionnaires.

	Mean	Variance	Std. Deviation	Skewness	Std. Error of Skewness	N
entertainment_1 computer for entertainment	1,35	,776	,881	3,226	,223	118
teaching_learning_1 computer for teaching/learning	1,36	,439	,662	1,770	,223	118
entertainment_2 cell/smart phones for entertainment	1,45	1,258	1,122	2,514	,223	118
teaching_learning_2 cell/smart phones for teaching/learning	3,03	1,905	1,380	,370	,223	118
entertainment_3 digital cameras for entertainment	4,07	1,243	1,115	-,775	,223	118
teaching_learning_3 digital cameras for teaching/learning	4,53	,901	,949	-1,660	,223	118
entertainment_4 Internet portals for entertainment	1,45	1,224	1,106	3,001	,223	118
teaching_learning_4 Internet portals for teaching/learning	1,66	,944	,972	1,810	,223	118
entertainment_5 motion games (kinect) for entertainment	5,08	,420	,648	-1,998	,223	118
teaching_learning_5 motion games (kinect) for teaching/learning	5,14	,238	,488	-1,470	,223	118
entertainment_6 other for entertainment	3,20	3,029	1,740	-,165	,580	15
teaching_learning_6 other for teaching/learning	4,00	2,182	1,477	-1,219	,637	12

Table 1. Case summaires

The obtained results prove that the future teachers would be most ready to use computers and internet sites in the teaching/learning process. However, despite the fact that the survey findings show that computers are the most popular digital tools that students have considered as possible for using both for entertainment and the learning tool (graphs in table 2), their views expressed during the discussion prove that they are more envisaged to be used as tools for making their work easier not for constructing new knowledge (statements in table 2). Students have marked other offered digital tools and media as possible to be used in everyday life, for entertainment and very seldom as the teaching/learning tool which would help pupils construct their knowledge (see table 6). These same conclusions were confirmed during the discussions when students are asked to mention ways how they would use the mentioned tools and media for entertainment and how they could be used in the pedagogical process; the further summaries ow their answers certify it (see tables 3 – 5).

For entertainment:	For teaching/learning:
Playing games Using social portals Reading news Watching movies File storage Shopping	Writing papers Preparing presentations File storage

computer for entertainment

- Several times in a day
- Up to one time in a day
- Several times in a week
- Up to one time in a week
- Less than one time in a week
- Never

0,85%
1,69%
1,69%
3,39%
11,86%
80,51%

computer for teaching/learning

- Several times in a day
- Up to one time in a day
- Several times in a week
- Up to one time in a week

0,85%
7,63%
18,64%
72,88%

Table 2. use of computers (*students' expressions and the results of survey*)

For entertainment:	For teaching/learning:
File storage Talking Sending messages Taking photos Reading news Playing games Using social portals Watching movies Shopping	File storage Talking Taking photos

cell/smart phones for teaching/learning

- Several times in a day
- Up to one time in a day
- Several times in a week
- Up to one time in a week
- Less than one time in a week
- Never

4,24%
13,56%
14,41%
13,56%
25,42%
28,81%

Table 3. Use of cells/smart phones *(students' expressions and the results of survey)*

25

For entertainment:	For teaching/learning:
Taking photos/movies	Taking photos/movies
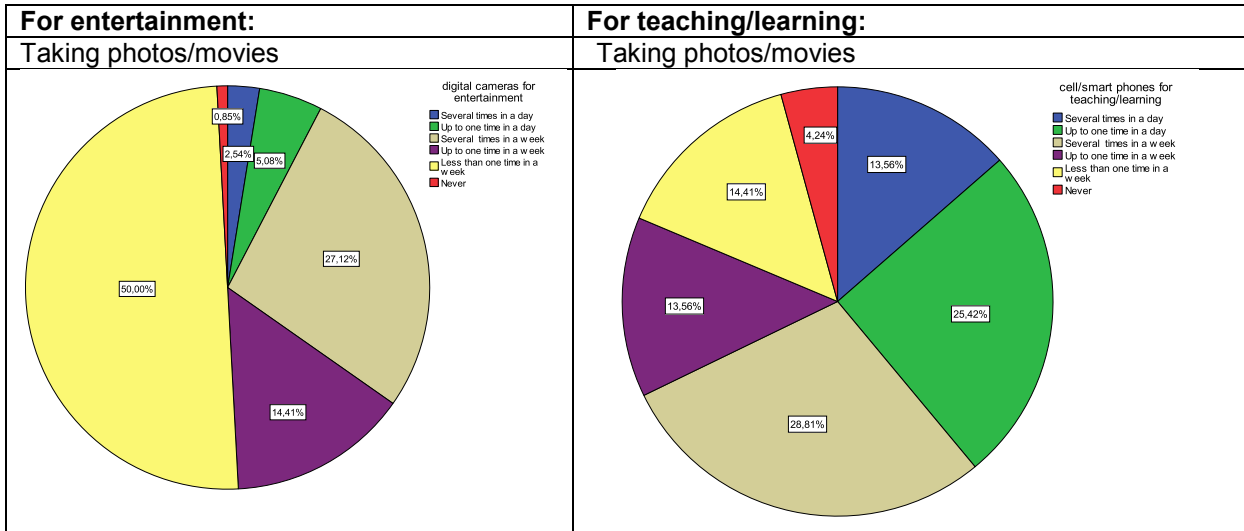
Table 4. Use of digital cameras*(students' expressions and results of the survey)*

For entertainment:	For teaching/learning:
Looking for information Share information Send messages File storage Play games Meet friends Make blogs Watch movies	Looking for information Share information Send messages File storage
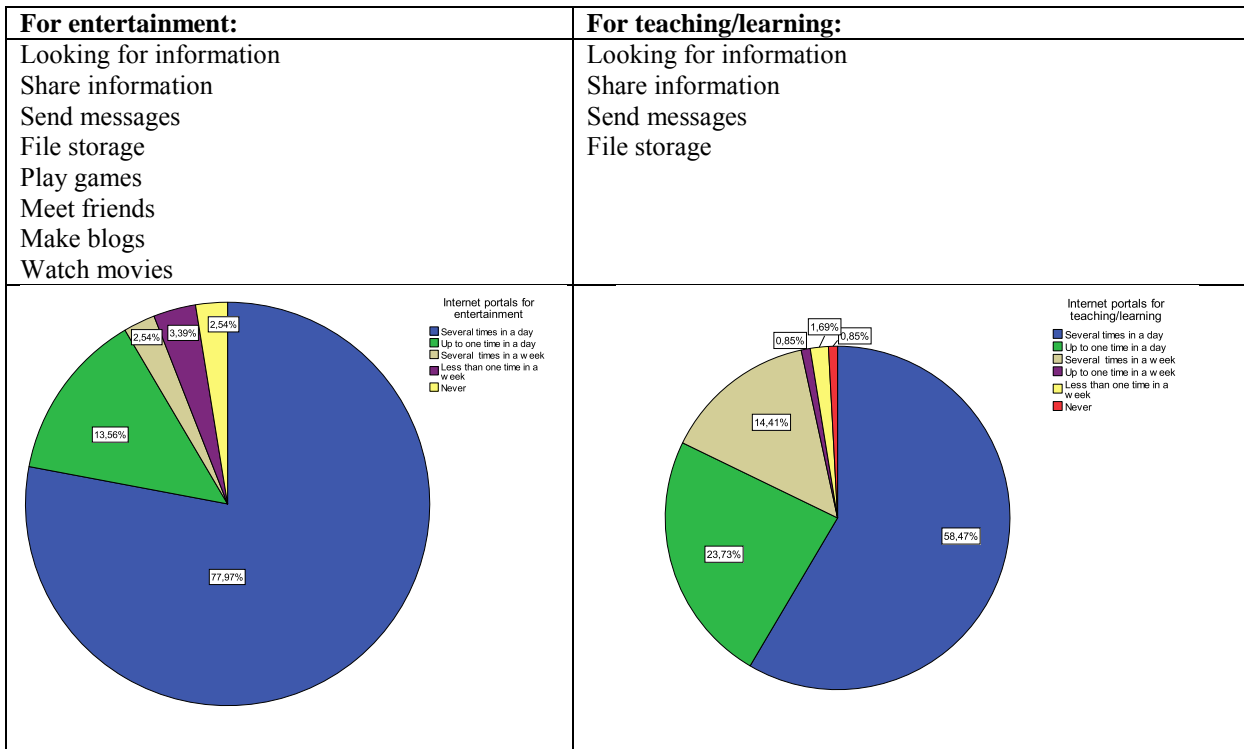
Table 5. Use of internet*(students' expressions and results of the survey)*

	Test Value = 0				95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
entertainment_1 computer for entertainment	16,619	117	,000	1,347	1,19	1,51
teaching_learning_1 computer for teaching/learning	22,376	117	,000	1,364	1,24	1,49
entertainment_2 cell/smart phones for entertainment	14,035	117	,000	1,449	1,24	1,65
teaching_learning_2 cell/smart phones for teaching/learning	23,809	117	,000	3,025	2,77	3,28
entertainment_3 digital cameras for entertainment	39,630	117	,000	4,068	3,86	4,27
teaching_learning_3 digital cameras for teaching/learning	51,787	117	,000	4,525	4,35	4,70
entertainment_4 Internet portals for entertainment	14,229	117	,000	1,449	1,25	1,65
teaching_learning_4 Internet portals for teaching/learning	18,571	117	,000	1,661	1,48	1,84
entertainment_5 motion games (kinect) for entertainment	85,218	117	,000	5,085	4,97	5,20
teaching_learning_5 motion games (kinect) for teaching/learning	114,384	117	,000	5,136	5,05	5,22
entertainment_6 other for entertainment	7,122	14	,000	3,200	2,24	4,16
teaching_learning_6 other for teaching/learning	9,381	11	,000	4,000	3,06	4,94

Table 6. One-Sample Test

4. Conclusion

Thus it leads to the conclusion that:

1.   Students do not know the possibilities of using digital media in organizing the teaching/learning process and the obtained research results prove that the only media, which is used both for entertainment and that could be used in organizing the teaching/learning process, is a computer.

2.   Specific study courses, in which students can master the use of digital media, should be included in the study process and changes should be envisaged in the courses that are already delivered so that the use of digital media would:

- Promote pupils' sensory development;
- Promote pupils' cognitive development;
- Promote the development of skills of constructing new knowledge;

- Be balanced with other processes significant in development.

For instance, to replace blackboard with the digital board; to replace hand-written works with works written on the computer; to replace reading printed books with reading e-books, etc. Using digital media on such a level teachers have reached only the level of media users and their competence often is lower than that of their pupils who use these media not only to ease their learning but also for other purposes and who have already for many years been the digital natives. This fully changes the balance in the pedagogical process (see Figure1) and the teachers' task is to renew this balance in order to facilitate that pupils' digital competences are used not only for entertainment, for using different digital tools to accelerate the acquisition of information, to prepare different tasks but also to use these competences in developing, evaluating the teaching/learning process as well as constructing new knowledge.
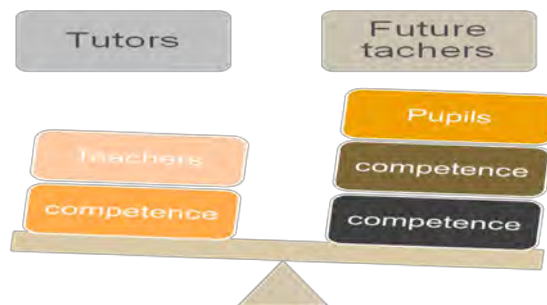
Figure 1. The competence scale of using digital media

This is a challenge for teachers because it requires that teachers not only taught and learnt themselves, modeled the pedagogical processes, communicated with pupils, colleagues and community, promoted pupils. Sensory development but also took risk in this process. Teachers cannot know everything and teach everything because information is everywhere, every day there emerge new digital media along with new possibilities of their use, which is also a reason for teachers to take upon themselves this new risk and master the competence of delegating the responsibility and were ready to use also the pupils' knowledge in organizing the teaching/learning process. However, the teacher's task still is to promote pupils' learning, to put forward the aims of the pedagogical processes and to know the possibilities of digital media. The model (see Figure 2) when the tutor in cooperation with the future teachers learns how to organize the pedagogical process in school using these media can be used in the university study process working with the future teachers.

Figure 2. Teachers' roles in the work with digital media

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Student Teachers' Views on Using and Reusing Online Discussions

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Abstract
The purpose of this study is to determine the students' views on using and reusing online discussions in teacher education. Participants were 50 pre-service ICT teachers from a large Turkish university in Ankara-Turkey. Of the participants, 37 (74%) were male, 13 (26%) were female. The mean age was 21. The participants enrolled in an undergraduate course entitled 'ICT Teaching Methods I" and participated in a 14-week blended course which consisted of face-to-face lectures with video-case presentations, and asynchronous online discussions. Participants were assigned to one of the following two groups: (1) online discussion and (2) online discussion and reading former online discussion postings (reuse of former online discussions). The Moodle is an open-source learning management system (LMS) used in the study to provide an online discussion environment to the students. After the implementation of a 14-week blended ICT teaching methods course, three open-ended questions were administered to the participants. These questions were related to the perceived usefulness of online discussions, perceived pitfalls of online discussions, and recommendations for future practices as well as the perceived usefulness and pitfalls of reusing former online discussions.

Keywords
Online discussions, reuse, student teachers, design of online discussions.

1. Introduction

The opportunity to discuss teaching issues with others is essential to teacher education (Romano, 2008). Online discussions are often used in teacher education to engage students in dialogue about certain teaching issues, as well as to analyze teaching-cases. An online discussion board is a place where people can post messages, read messages, and reply to other people's messages for the purpose of sharing and exchanging ideas and opinions (Yeh & Lahman, 2007). According to Harasim (1993), online discussion is considered to be a learning environment in which students can achieve higher conceptual knowledge through interaction of knowledge and experience among all students. Jonassen (1996, pp.176-177) asserts that «a tool such as an online discussion forum is a naturally collaborative technology that fosters collaborative meaning making by providing multiple perspectives on any problem or idea». Online discussion, whether it is used for online learning or as part of a blended learning experience, is an essential environment to encourage students to actively participate communication (Im & Lee, 2004). However, a key challenge for online discussions is to encourage participation and interaction. Moore (1989) has identified three types of interactivity that online participation may be supported: (1) learner-content interaction; (2) learner-instructor interaction; and (3) learner-learner interaction. Hillman, Willis and Gunawardena (1994), on the other hand, identified a fourth type of interaction as (4) learner-interface interaction which should be considered to be a critical component in technology-mediated learning environments. According to Dabbagh and Bannan-Ritland (2005) the use of online discussions can promote increased interconnectedness and scope of interactions and can be employed to supplement face-to-face instructional activities.

Morris, Finnegan and Wu (2005) examined student engagement in asynchronous online discussions. They found that the number of discussion posts viewed, the number of content pages viewed, and the seconds on viewing discussion pages were good predictors of final grades. Chen and Chiu (2008) examined how earlier messages affected later messages in an online discussion board. They found that disagreement, contribution, social cue, and past visits of an e-poster (a person who has posted a message on the online discussion board) in earlier messages can affect the properties of a subsequent message. Similarly, Ramos and Yudko (2008) investigated the factors that influenced online course outcomes. They found that the only significant predictor of success in an online course was page hits (not discussion posts or reads). In this study, "hits" were defined as the frequency in which each student viewed the content pages at the online site, "posts" were defined as the frequency in which each student posted messages to the online discussions, and "reads" were defined as the frequency in which each student viewed the discussion postings of other students or the instructor. Chang (2006) asserts that online discussion can maintain "spoken language" as archives, which makes it easy for students to retrieve useful information. Besides, Hull and Saxon (2009) asserts that communication online can be enhanced between speakers/listeners since the text of the conversation can be reviewed.

However, some studies showed that teacher candidates often do not actively participate and interact with others in online discussions (Khine, Yeap & Lok, 2003), most students tend to only post the minimum number of messages require, particularly if participation is voluntary (Fung, 2004), and limited student contribution in asynchronous online discussions appears to be a persistent and widespread problem (Hewitt, 2005). According to Mazzolini and Maddison (2003), a necessary, if not sufficient condition for a discussion to aid learning is for it to contain a sizable number of postings contributed by students. Winn (1992) suggests that computer-based communication tools are shells waiting to be filled by learners, and that our design processes for these shells should not focus on content design but rather activity and message design. Moreover, successful instructional design is a matter of selectively choosing

resources and features that will provide the most effective interactions for the learners (Simonson et al., 2003). While participants in online discussion forums generate knowledge, instructors and/or instructional designers may not often reuse this knowledge effectively. However, a study by Soon, Sarrafzadeh and Williamson (2010) showed that reusing knowledge in online forums has advantages such as subject improvement, time saving, and subject revision. Thus, the main idea behind the present study is to reuse former online discussion postings to be a rich content resource. More specifically, the purpose of this study is to explore student teachers' views on using and reusing asynchronous online discussions in teacher education.

2. Method

2.1 Participants, Procedure, and Data Analysis

Participants were 50 pre-service ICT teachers from a large Turkish university in Ankara. Of the participants, 37 (74%) were male, 13 (26%) were female. The mean age was 21. The participants enrolled in an undergraduate course entitled 'ICT Teaching Methods I" and participated in a 14-week blended course which consisted of face-to-face lectures with video-case presentations, and asynchronous online discussions. However, it should be noted that although the online discussions were carried out during the period of 14-week, only the 4-week period were included analyzing and discussing presented 12 distinct video-cases. All video-cases were taken from real ICT lessons either from an elementary school or a high school. Participants were assigned to one of the following two groups: (1) online discussion and (2) online discussion and reading former online discussion postings (reuse of former online discussions related to the same 12 video-cases which were produced by another student groups one year before the present study). We made the online discussions mandatory and gave incentive (extra grade) for student contribution. In group 2, however, students were encouraged, but not required, to read former online discussion postings. The Moodle is an open-source learning management system (LMS) used in the study to provide an online discussion environment to the students. In this blended class, in which both face-to-face and online discussions were used, the instructor (first author) used online discussion board as an after-class discussion activity and after-class communication channel among students. As for after-class activity, the instructor posted questions regarding the video-cases for students to think about and share their ideas, feelings, and views on these questions. After the implementation of a 14-week blended ICT teaching methods course, three open-ended questions were administered to the participants. These questions were related to the perceived usefulness of online discussions, perceived pitfalls of online discussions, and recommendations for future practices. This paper is a report of initial content analysis of student responses regarding above mentioned open-ended questions. Figure 1 shows a screenshot from the Moodle LMS including the former online discussion postings which are embedded into the online discussion environment as a MS Word document file.
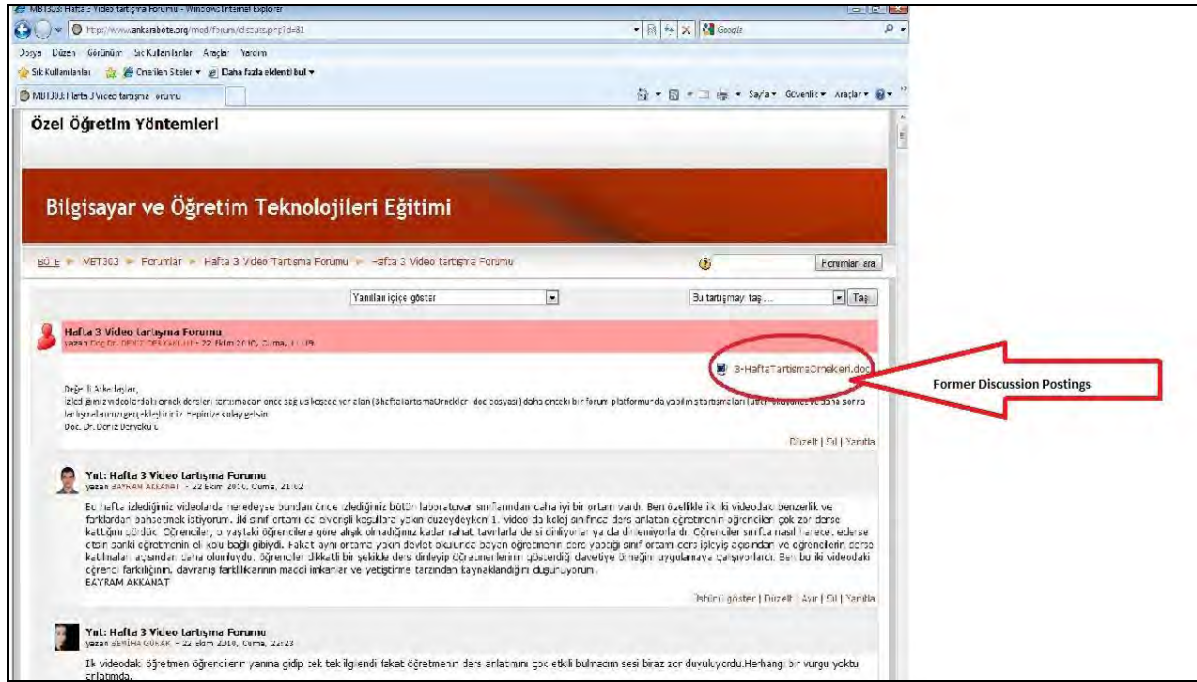
Figure 1. A Screenshot from the Moodle LMS Discussion Forum Environment

3. Findings and Discussion

First of all, we examined the student contribution in asynchronous online discussions. We refer student contribution to students posting messages such as making comments, asking questions, answering questions and sharing their thoughts or ideas. According to the results, the participants of Group B (online discussion + reading former online discussion postings (reuse) group) were gradually contributed much more than the participants of Group A (online discussion only group). Table 1 shows the study groups and the number of online discussion postings per week.

Groups / Postings per week	Online Discussion Only Group Group A (Control) N=25	Reading Former Online Discussion Postings + Online Discussion Group Group B (Reuse) N=25
Week 1	50	26
Week 2	162	155
Week 3	63	150
Week 4	123	190
Total	**398**	**521**

Table 1. Study groups and the number of online discussion postings per week

4. Perceived Usefulness of Online Discussions

Table 2 shows the perceived usefulness of online discussions. The first most frequently cited perceived usefulness of online discussions was its benefit for the participants "in understanding the other's point of views". The second and third most frequently mentioned perceived usefulness of online discussions were "to gain detailed information about what

should the candidate teacher do in his/her future career" and "to feel free in expressing himself/herself in online discussions" respectively.

Online Discussion Only Group Group A (Control)	f	Reading Former Online Discussion Postings + Online Discussion Group Group B (Reuse)	f
The online discussions helped me to understand the others' point of views	16	The online discussions helped me to understand the others' point of views	12
I gained detailed information about what should I do in my future career	4	I gained detailed information about what should I do in my future career	9
I felt free to express myself in online discussions	4	I felt free to express myself in online discussions	5
The asynchronous online discussions provided me access flexibility (time & place)	2	The asynchronous online discussions provided me access flexibility (time & place)	5
I learnt how to discuss	2	I learnt how to discuss	2
I learnt how can I construct a shared point of view from the others' ideas	1	I learnt how can I construct a shared point of view from the others' ideas	1
The participants provided constructive feedbacks for the others	1	The participants provided constructive feedbacks for the others	1
The online discussions encouraged us to discuss related theories and concepts	1	The online discussions improved my writing skills	1

Table 2. Perceived Usefulness of Online Discussions

These results are similar to those obtained in another study. Ellis, Goodyear, Prosser and O'Hara (2006) investigated university (undergraduate) students' experiences of learning through discussion both online and face-to-face. They found that the students conceptualized learning through discussions in four distinct ways: (1) discussions as a way of challenging ideas and beliefs in order to arrive at a more complete understanding; (2) discussions as a way of challenging and improving your ideas; (3) discussions as a way of collecting ideas; and (4) discussions as a way of checking your ideas are right (p. 249). Besides, Ellis et al. (2006) also found that some students felt shy in class thus can expresses themselves better in writing than talking. These results are consistent with our findings. For instance, majority of the students reflected that the online discussions helped them in understanding the others' point of views, and some students felt free in expressing himself/herself in online discussions.

5. Perceived Pitfalls of Online Discussions

Table 3 shows the perceived pitfalls of online discussions. The first most frequently cited perceived pitfall of online discussions was the interruptions caused by weak internet connection. Besides, according to the participants, the online discussion forum system did not provide a very well organized environment for following the online discussion messages easily thus they recommended us the following idea; "the discussions should be threaded" because threaded discussions can be easily handled by students. Indeed, the technical aspects of the asynchronous online discussion software have been identified as a factor that can limit student contribution (Hew, Cheung & Ng, 2010). Similarly, the related literature suggests "use of online forum environments that represent thread links visually to the user rather than representing messages as a list of message headers" (see Hew, Cheung & Ng, 2010). The other perceived pitfalls were mainly related to the quality of the discussions; some

participants regarded the online discussions as superficial and repetition of in class (face-to-face) discussions.

Online Discussion Only Group Group A (Control)	f	Reading Former Online Discussion Postings + Online Discussion Group Group B (Reuse)	f
Internet connection problems	6	Internet connection problems	4
The discussions should be threaded	3	The discussions should be threaded	4
Some discussions were the repetition of the face-to-face discussions	2	The instructor should be more visible in the discussions	2
Some solutions were insufficient	1	Some solutions were insufficient	1
	1	Some participants were provoked the other participants	1
		I could not express myself easily in the online environment	1

Table 3. Perceived Pitfalls of Online Discussions

6. Recommendations for Future Practices

Table 4 shows the recommendations for future practices. The most frequently mentioned recommendation was related to embedding the video-cases into the Moodle LMS environment, because the participants want to re-view the video-cases being analyzed and discussed.

Online Discussion Only Group Group A (Control)	f	Reading Former Online Discussion Postings + Online Discussion Group Group B (Reuse)	f
The video-cases should be embedded into the Moodle LMS	10	The video-cases should be embedded into the Moodle LMS	4
The instructor should be more visible to motivate the students	6	The instructor should be more visible to motivate the students	6
Participation to the online discussions should be optional	1	Participation to the online discussions should be optional	1
Invited experts should be included	1	Tests and quizzes should be included	1
Synchronous discussions should be provided	1	File exchange capacity should be expanded	2

Table 4. Recommendations for Future Practices

Another recommendation was related to the instructor's visibility. The participants want the instructor's more active participation and strict control in the online discussion environment. Tagg and Dickinson (1995) found that instructor involvement such as giving encouragement and feedback to be helpful in increasing contribution among students.

7. Perceived Usefulness and Pitfalls of Reusing Former Online Discussions

Table 5 shows the perceived usefulness and pitfalls of reusing former online discussions. According to the participants of reuse group (Group B), reuse of former online discussion postings help them in constructing their own point of views by learning the others' point of views and learning how to discuss.

Perceived Usefulness of Reusing Former Online Discussions	f
Former online discussions showed me the others' point of views and this helped me to construct my own point of view	11
Reuse of former online discussions showed me a way concerning how to discuss	11
Perceived Pitfalls of Reusing Former Online Discussions	f
Reading former online discussions was boring because of information overload	5
To me, using the others' point of views in a discussion is equal to cheating	3
Former online discussions should not be presented in such online environments because it may hinder the participants' desire of active participation to the discussion	2

Table 5. Perceived Usefulness and Pitfalls of Reusing Former Online Discussions

According to some participants of reuse group (Group B), however, reading former online discussions was boring because of information overload. Similarly, some researchers found that individuals are more likely to end contribution if information overload occurs (Jones et al., 2004, as cited in Hew, Cheung and Ng, 2010). Information overload occur when there is a high frequency of postings, so that individuals are unable to process them and respond adequately (Whittaker et al. 1998, as cited in Hew, Cheung and Ng, 2010).

Interestingly, some participants of reuse group regarded reusing former online discussions (e.g., using the others' point of views) in a discussion as equal to cheating and recommended that former online discussions should not be presented in an online discussion environment because it may hinder some participants' desire of active participation to the discussions.

This research examined the students' views on using and reusing online discussions in teacher education. In order to improve asynchronous online discussions, instructional designers should take into consideration such user views when designing instructional applications and/or environments.

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Digital storytelling as an educational and training methodology: a case study with social educators

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Abstract
This paper presents the data that we obtained from a teaching laboratory workshop that was included in the content offered during a methodologies and group work techniques and animation course (Tuning Project; Villa, Poblete, 2008). The study was carried out with 70 second year students majoring in Social Education and Cultural Entertainment enrolled in the Science of Education and Training Degree program at the University of Padua. This particular paper highlights the third stage of a long action research study on the use of digital storytelling (DST) that was conducted at a national level in collaboration with the CNCA (National Committee of Community Service), under the ministerial project "Sculpting Stories", 2010 (L.383/00, Ministry of Labor and Social Policy).

Keywords
digital storytelling, evaluation, higher education, competence, social educator

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[1] This article has been developed jointly by the two authors. Marina De Rossi wrote paragraphs 1, 2, 5.1 and Emilia Restiglian wrote paragraphs 3, 4, 5.2.

1. Theoretical framework

The most recent studies give great credence to narrative methodologies in being able to develop learning and in implementing educational empowerment (McDrury & Alterio, 2003). Under this perspective, Storytelling, takes on the characteristics of a real active method, that aims to promote the development of meaning about experience, an analysis of this meaning and the educational implications that result.

In particular, the reflective characteristic of activated processes is gaining widespread attention and discussion in the world of scientific research; current studies are developing two main areas of interest in the use of storytelling as a methodology: the socio-cultural component and customization.

The first concerns exploring the potential of sharing knowledge and experiences that have a high emotional connotation. Emphasis is placed on the involvement that narrative practices produce, representing a form of communicative mediation that is instrumental in teaching, and through which one can work on negotiation as a process of construction of knowledge and value systems (Bateson, 1976).

The second component concerns the autobiographical narrative as a tool to develop awareness of one's own identity, orientation, analytical skills and reflective problem-solving. Bruner, 2002; Demetrio 1996, 1999; Formenti, 2000; Poggio & Jedlowski, 2004; Ricoeur, 1983, 1997).

The autobiographical narrative provides a key support in the organization of thought as it is: a) an external representation of knowledge and an instrument to express a series of events connected in a temporal and causal manner (Turner & Turner, 2003); b) an organizing principle in the perception of action and memory (McEvan, 1997); a process that is able to work at integrating numerous cognitive mechanisms, such as the mechanism of cause and effect, reasoning, language and visual thought (Scalise Sugiyama, 2001).

In recent times the development of information and communication technologies and their increasing popularity have created a wide range of educational tools (academic and extra-curricular) to enhance the educational use of the narrative, giving rise to narrative learning environments that have different objectives and are applicable to various contexts (Dettori, Giannetti, 2006). Certain researchers assert that the narrative form could be used as a teaching methodology for an entire curriculum and in relation to each discipline, as it turns out to be both crucial in the process of constructing meaning, and in the construction of knowledge through the development of interpretive experiences (Mott et al., 1999; Schank, 2011). A learning environment focused on narrative methodologies offers multiple opportunities by making a delineable configuration beginning from a simple sequence of elements, which leads to a real cognitive integration between the task assigned or the objective considered and the process of enjoying and or producing the narrative (Timchenko, 2006).

Today, thanks to the low cost of digital devices and the availability of new media tools, the possibilities and methods of production and communication of stories are increasing. Therefore there is a complexification of the narrative process. The text (as a translation of narrative thinking in a narrative discourse) can assume different forms which correspond to different ways of using it. In addition to the monomedia tradition (oral and written form) (Bruner 1993; Ong, 1993; Rivoltella 2007) we now also have the multimedia world. This powerful influence arose from the transition between Web 1.0 and 2.0, which caused a change in paradigm: today people have both the means to tell their stories and the channels to spread and share them with extreme ease and immediacy. The individual stories and the personal views of the world open up to enable comparisons that generate an interactive feedback process that changes in-depth the nature and the direction of the communication flow (Buckingham, 2002; Jenkins & Deuze, 2008; Burgess, 2006; Petrucco & De Rossi, 2009).

The person takes on an active role in the process of co-construction of knowledge and thus leaves behind the role of "simple user" (Jenkins et al. 2006; Jenkins & Deuze, 2008; Beer & Burrows, 2010). Typical examples included wiki and online blogs, but this need to share and tell through digital means has also generated the practice of "digital storytelling".

Digital Storytelling is defined as «the modern expression of the ancient art of storytelling using digital media to create media-rich stories to tell, to share, and to preserve» (Digital Storytelling Association, 2008[2]). The possibility of mixing two different worlds (the storytelling world with its processes of objectification and subjectification, and the "digital" world with its ability to integrate various languages and appeal to younger generations) (Prensky, 2001; Bennett et al., 2008; Palfrey & Gasser, 2008) makes it a powerful tool in an educational context.

Amplifying the power of the traditional narrative method, the technique of Digital Storytelling offers a methodological and in depth reflection for teaching practitioners (McDrury & Alterio, 2003), especially in relation to new horizons and contexts of communication (Snelson & Sheffield, 2009; Ohler, 2007; Bull & Kajder, 2004; Robin, 2008; Okada et al., 2012) and particularly for those who work with young people.

In our project, the technique of Digital Storytelling has become a narrative autobiographical methodology aimed at facilitating and improving the development of reflective processes for strengthening an individuals professional identity and creating an awareness of the choices taken.

2. Introduction: the beginning of the experience

What is presented below refers only to the third stage of a complex action research called "Sculpting stories" which involved establishing a heterogeneous working group composed of managers and service coordinators, CNCA social educators (National Committee of the host communities) and experienced researchers of the University of Padua that worked with narrative methodologies, (autobiographical and orientative) through the use of technology, specifically Web 2.0. The project ran Nationally and was funded through Law number 383, pronounced on December 7, 2000.

We will briefly address the four stages of the project to better contextualize the stage we will discuss in this paper:
1. Training the CNCA social educators in order to make them experience in the first person the DST working methodology. The objective was to make them competent in this area so that they can play the role of producers and lead laboratories about autobiographical DST with groups of youths in the communities;
2. Methodological and scientific supervision of the regional working groups involved in the national project. This stage was concluded with an evaluation and self-assessment of the DST's produced by the students.
3. Adapting the workshop about autobiographical DST in the initial training of a group of 70 students enrolled in the degree program of Education and Training, specifically in Social Education at the University of Padua. The main objective was the introduction of the narrative method, through DST and provide a university educational methodology for developing technological skills, methodology, design, evaluation and professional training. The steps were monitored through specific quantitative instruments (evaluation form and self-evaluation form) and qualitative (open ended questionnaire in order to detect possible changes in student's perceptions with respect

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[2] http://www.storycenter.org/

to both the use of Web 2.0 technologies and narrative methodologies and the DST). The latter was carried out in a six-month follow-up;

4. The overall assessment of the effects of the training-workshop for educators was conducted by recording the opinions and perceptions through in-depth interviews with those involved.

2.1 Experience report (stage 3)

The cross-disciplinary workshop was aimed at developing areas of expertise in methods, technology, design and evaluation. (Perucca, 2005; Paparella & Perucca, 2006). This was carried out in a blended modality with second year students enrolled in the social educators and cultural entertainment program during the months of January and February 2012. The workshop took a total of 16 hours, and followed the methods and techniques of group work and entertainment that had introduced useful topics for participation in the intervention. The workshop had the following objectives:

- encourage reflection among students about integrating narrative methodologies in educational programs;
- promote the reflective process for career guidance;
- promote the use of narrative methodologies by constructing a DST;
- design and assess the DST as an authentic and more complex form of evidence (integrated assessment with exam);
- develop a tool for evaluation and self-evaluation of the DST taking into account the research conducted in this sense by Barrett (2007), the 7 key features of Digital Storytelling (Lambert, 2010) and the indicators of multimedia products for children (Lesser & Schneider, 2000).

The workshop enabled the production of 70 autobiographical digital stories about career guidance. Particular attention was paid at the conclusion of debriefing, both individually and as a group. Students that were given the role of producers, in fact, were asked to fill in a quantitative assessment form on the construction of the DST and it's evaluation from various points of view: narrative structure, content and technology. Later each DST was evaluated from a fellow colleague acting as an interested party (observer).

The workshop was divided up in the following manner:

Step 1 (in person): *warm up.* Individual and group autobiographical games were proposed to induce reminiscent, reflective and analytical processes with respect to events that have characterized the life of participants. In this manner we were able to outline a series of "timelines" with particular emphasis on some special "years" in which something significant happened. Everything was carried out via oral storytelling.

Step 2 (blended): *autobiographical narration.* From an oral narration we switched to the creation of an iconic storyboard to better convey the narrative metaphors. In this manner the narrative thought is transformed into a narrative discourse (Bruner, 1993). Individuals were given the freedom to choose a narrative tool: those that had difficulties in drawing could describe the image, insert photos taken personally or create a collage with existing images. In each case the storyboard had to be created in a paper format.

Step 3 (on line): *multimedia writing of story* (DST construction). Final selection of images, words (for example, key words, parts of the speech, metaphors), music and overall assembly of the different parts.

Step 4 (blended): *web writing.* The DSTs were posted on the network using an open space limited to the group of participants and closed to others. Later a self-assessment assignment was carried out followed by an exchange of the finished products and ended with an

evaluation conducted in small groups (debriefing) that was supported by filling out the quantitative forms.

Before and after the workshop (follow up at 6 months) we measured the students perceptions via an open ended questionnaire with respect to:

- technology and on the Web 2.0 tools used in the educational context;
- the use of narrative methodologies in formal and informal contexts;
- the use of DST in educational work with children and youths.

3. Observations

The inclusion of the DST workshop was made in view of professionally preparing individuals enrolled in a degree course (as per Decree 240/2004) and was built on competences and learning results that came from a previous experience of best practices presented in a Tuning[3] project and from a workshop carried out during a specialization course for pre-school teachers enrolled in the same degree program (De Rossi, Restiglian, Tabone, 2011).

In addition to developing technological expertise, planning and orientational-professional evaluation, we worked on building methodological skills through the creation of a digital artefact (the DST) as an authentic and complex task whose implementation includes a multitude of knowledge and abilities. The DST was evaluated "triangulating" different viewpoints, in this case making reference to the instructor, the producer and the DST user. This is a review of the subjective, objective and intersubjective levels, proposed by Pellerey (2004) and more recently by Castoldi (2009), that thanks to the multiple analytical perspectives is able to restore a holistic dimension to skills. The "objective" view of the instructor combined with the "subjective" view of the producer and the "intersubjective" view of the user, seeks to ensure the proper evaluation of a factor so complex and detailed as expertise, where taking on a single perspective would impede to grasp it's polymorphic nature (Castoldi, 2009, p. 68).

The production of a digital artefact is characterized as an authentic job in that it enables the student to be evaluated not only for what they know, but especially for "what they can do with what they know" as an actual performance that is appropriate to learning (Wiggins, 1998).

4. Methodology of data analysis

The assessment tool was made up of five closed ended questions about the technological dimension of their own digital artifact (software used for mounting, special effects, & soundtrack…), four open ended questions about the narrative dimension (focus, objectives and target), data not reported in this present paper, followed by a self-assessment of their own digital product with respect to several elements like content, form, function and target. The self assessment was scored from 1 to 6 (1= not at all and 6=very much) or with a nominal scale. The same questions were asked from the two perspectives of both producer and user. Following we will analyze only the manufacture's perspective. The answers to the evaluation forms were analyzed with SPSS 19 software detecting the averages, the standard deviations and the internal consistency of the clusters of items into dimensions (content, form, target) by means of a reliability test called "Cronbach's Alpha". It was not possible to detect a

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[3] Restiglian E., Tuning Russia, Short Term Missions at the University of Padua, SAG Education, March 27th 2012.

significant difference between the averages obtained. The percentage of the nominal scale of the DST functions was recorded.

The open ended answers were instead analyzed with the "paper and pencil" method (Losito, 2007; Tuzzi, 2003) enabling the ex-post detection of several categories that focus on the position of students before and after the workshop experience. For each topic (technology and Web 2.0 instruments in educational context, use of narrative methodologies in formal and informal context, use of DST in educational work with children and youths) we identified four dimensions (people, group work, community, educator) and around these we "gathered" the student's answers, highlighting in bold those that were mentioned by several individuals.

5. Findings and discussion

5.1 Questionnaire survey of students' perceptions

Regarding the perception of technologies and Web 2.0 tools in education (Figure 1), at the beginning we detected a common misconception about the difficulty of use by some individuals or groups of individuals in difficult situations, particularly on the possibility of unethical use and on the increase of cyberbullying phenomena. Web 2.0 technologies are not considered useful for use in view of socializing in the deepest sense of the term, obliging instructors to lead individuals by force on their possible use leaving little margin of autonomy for individuals. If educators really needed to resort to the technologies in question, they should then check the process.

On the back end instead we evidenced a change of perspective towards these instruments that are deemed useful for implementing learning and experiences that are integrated between formal and informal contexts in which individuals find themselves in everyday life. These are now referred to as easily accessible and provide "strong communicative innovation" when used in educational programs. The world of Web 2.0 provides opportunities to work collaboratively and proves very useful as a working tool for educators as it helps to achieve the set objectives of the projects, becoming a facilitating working method especially for the younger generations. This also helps to develop community processes (a community of practice) that is reflective and analytical.
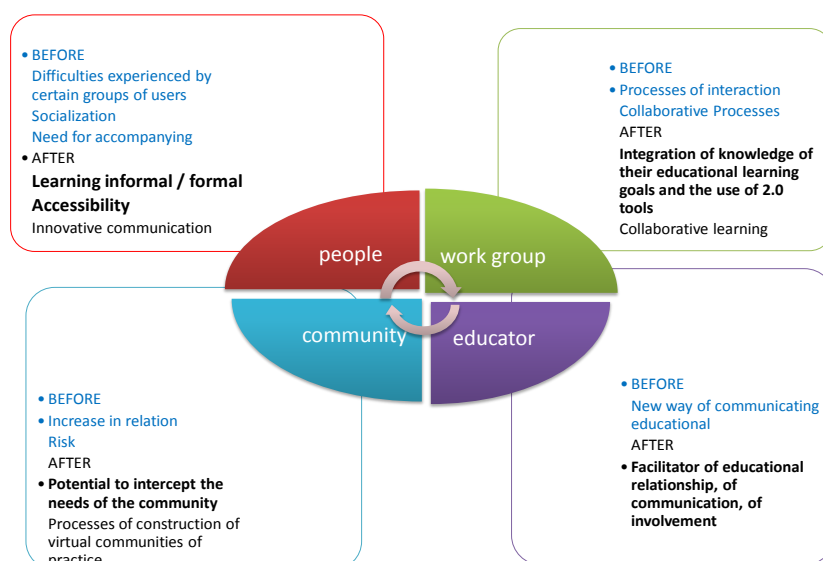
Figure 1. Perceptions of technologies and Web 2.0 tools in Education

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As for the perception of the use of narrative methodologies in formal and informal contexts (Figure 2), the aspect that certainly predominates at the start is to think that they can only be used in writing and oral work. Their usage seems to be limited to an informal context almost to accompany or support other working methods. The perception is that narration can only be useful in training adults that have mastered verbal language. Using them with youths that have difficulties, and that often have problems with verbal expression would be problematic.

At the end, the opinions change radically. The narrative method in formal and informal contexts are considered useful tools to reflect on and give meaning to the students own experiences and life stories, also in relation to the life stories of others (collective stories) in regards to values, experiences and points of view. All this would help to integrate the informal experiences of everyday with formally designed educational programs or even school courses.

- BEFORE
Emergence personal stories
Writing, oral
AFTER
Multimedia storytelling
Reflective processes
Attribution of meaning to experience
Active methodology
Effective tools

- BEFORE
Tell, listen
AFTER
Developing active listening skills
Problem solving
Narrative methodology of integration between formal and informal

people   workgroup

community   educator

- BEFORE
Collective narratives
Content
AFTER
Sharing of experiences
Processes of community
Collective histories (values, existential categories)
Emergence of Educational Work

- BEFORE
methodology informal
AFTER
Reflective processes
Personal empowerment and development group
Methodological training
Educational methodology
Customizing

Figure 2. Perceptions use of methodologies narrative between formal and informal

With respect to the perception on the use of DST in educational settings with children and young people (Figure 3), the greatest resistance concerns the identification of DST with Youtube (videos) and the difficulty of sharing something that is posted because I do not know in what manner it will be diffused, something that I posted just for fun without wanting to stimulate any reflection whatsoever. Prospective educators seem to be scared by the fact that the introduction of DST with end users could end up satisfying actions that are considered unsafe, giving prevalence to dimensions such as aesthetics and appeal, giving rise to narratives based on sensations rather than factors that last over time.

At the end, it emerges instead that the DST can be a tool for personal empowerment, a real educational methodology that develops responsibility, ethics education for citizens and that facilitates the processes of inclusion through the simplification of writing and telling stories . The DST also stimulates creativity and the use of metaphors even in verbal language, thus enriching the linguistic expression of the individual.
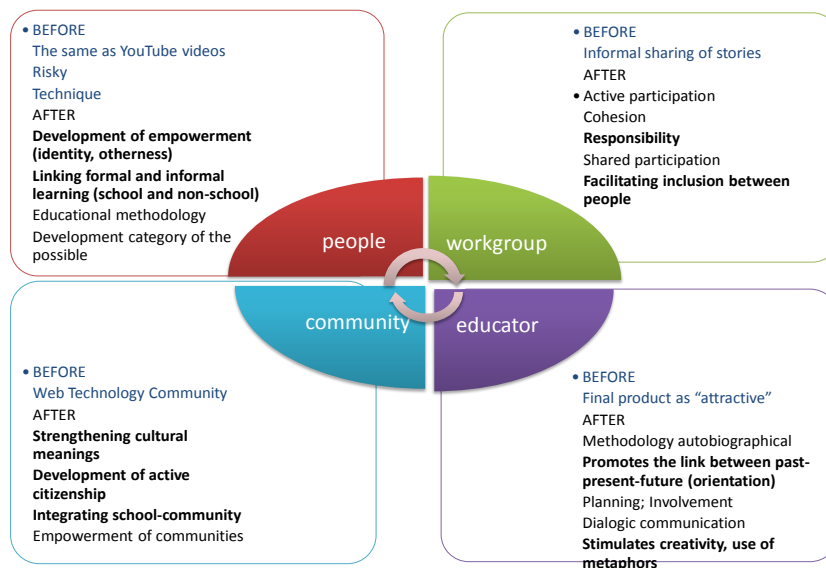
Figure 3. Perceptions use of DST in educational work with children and young people

5.2 Self Evaluation form (producer)

With regards to the main function given to each DST, almost all of the students (97.33%) assigned it an emotional and affective function (Table 1), while few assigned it a playful-recreational-function and motivational one. There are no more functions attributed to it (the questionnaire also proposed other options like "cognitive-intellectual" and "educational-documenting", but this is understandable considering the autobiographical nature of the DST proposed.
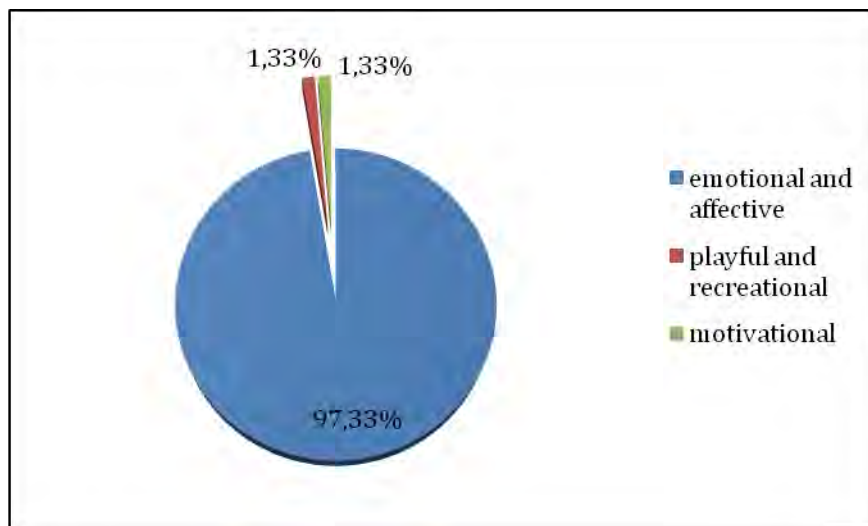
Table 1. Main functions of the DST

However, with regards, to the adequacy of some elements of content with respect to the communicative intent of their own artifact (Table 2: story originality, the significance of the content, characterization of characters, identification with the characters, and characterization of the environment), these all scored high (with the average ranging from 4.99 to 5.35)

The standard deviation is consistently good (between .533 and .694) as is the internal consistency (Cronbach's Alpha = ,745). As mentioned earlier, there were no significant differences between the averages that were always high. All values were over 5, except for identifying the characters (4.99)
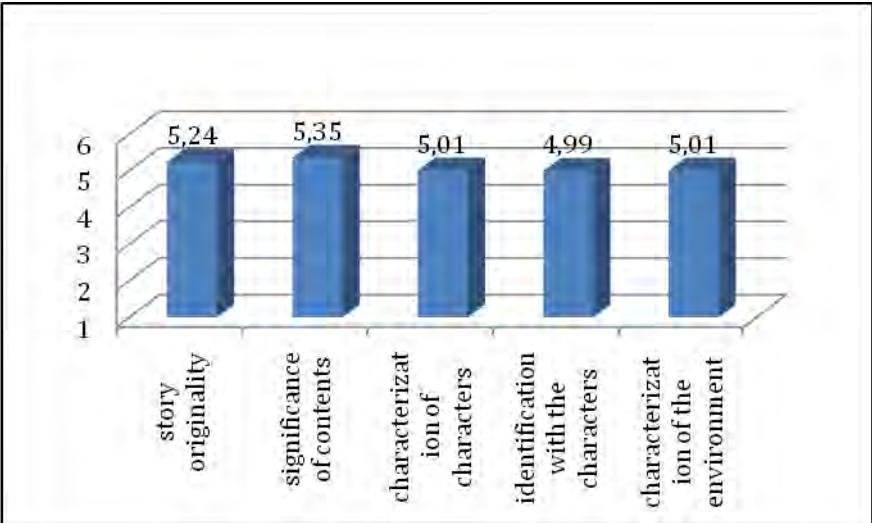
Table 2. Adequacy of elements of "content" compared to the communicative intent

Below instead we have some indication of the perception of the participants own DST from a technical point of view (Table 3). The students were asked to assess the appropriateness of the following elements: length, audio (in particular the relationship between voice/music), shots, narrative pace, synergy/coherence between audio and video, graphical elements such as written captions and background colour, originality and functionality of the narrative development in particular flashback, previews, insights and hypertext. Among the main factors considered were the pace of the narrative (average = 5.39) and length (average = 5.36) (Figure 3). The standard deviation ranged between ,651 and ,741 while Cronbach's Alpha reached ,800. All the values exceeded 5, except for narrative originality (4.97; range from 4.97 to 5.39)
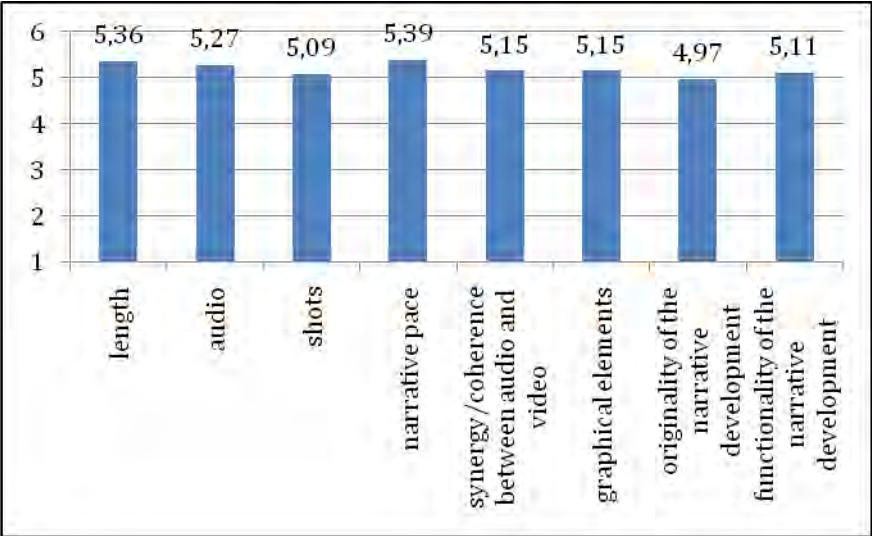
Table 3. Adequacy of the "shape" elements with respect to the communicative intent

In regards to the communication objective, in terms of emotional involvement, increase of knowledge, development of thought processes and effective communication, the factors of emotional involvement and the development of reflective processes obtained the highest averages (Table 4). These results are interesting in that they are closely related to what was stated before about the importance of DST production in the way described so far in the development of motivational orientative skills-for social educators and cultural animators. The standard deviation recorded was between ,569 and ,758 and Cronbach's Alpha was ,609. Even in this case the average values exceed 5 with the exception of an increase in knowledge (4.56), which is the lowest value of all the one's recorded on the form in question.
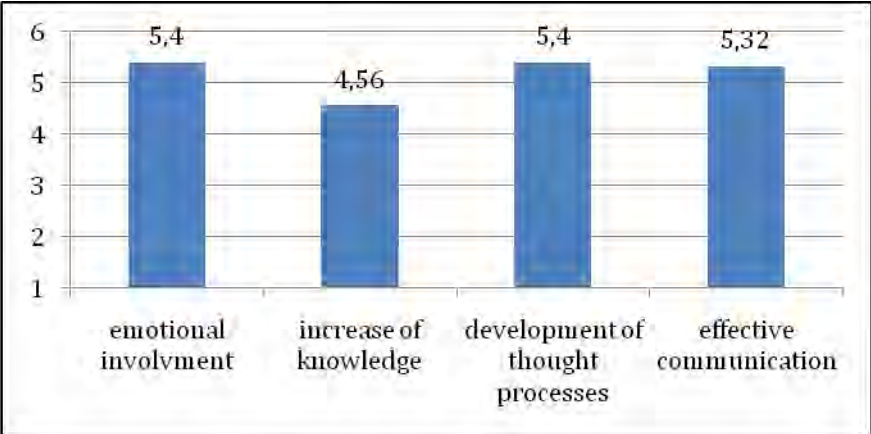
Table 4. Adequacy of certain elements with respect to communication objectives

Finally, regarding the appropriateness of certain elements in relation to the target audience (content, shape, purpose, appeal, level of understanding and attention) the values obtained were quite high (Table 5). In this case, the standard deviation in also rather reduced (from .487 to .610), and is therefore very significant and so too is Cronbach's Alpha (.824). All the averages recorded were above 5.
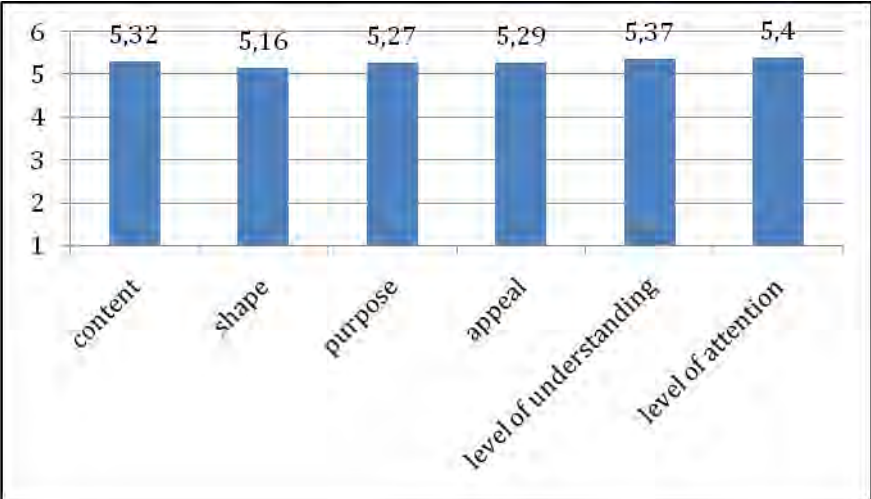
Table 5. Appropriateness of some elements compared to the reference target

6. Conclusions

The objective of this contribution was to demonstrate the educational value of a workshop that used narrative methodologies integrated with the use of 2.0 technologies. All the data that was obtained from the instruments that were administered supported our initial idea that consisted in the development of a variety of communication and experiential contexts that are useful in developing meaningful learning (Brown, Collins, Douguid, 1989). Emphasis was placed on the integration between communication environments in their various forms, direct and mediated, in person and on-line. The objective was to construct learning experiences in a mesh pattern, by connecting three key actions: knowledge (articulation) reflection, and exploration (Resnick, 1989). In particular, the DST technique became a narrative methodology because it enabled the development of reflective learning, consisting of cognitive and emotional activities through which the subjects committed themselves to exploring their own experiences in order to gain new knowledge, awareness and interpretations. Another important aspect was the production of artifacts, as authentic proof, through which students competed and brought into the playing field the development of skills from which they extracted goals and learning objectives foreseen from the teaching.

The workshop experience overall had an important autobiographical- professional value for students The narration of their personal stories led them to the realization that the goal was not only to produce a video, but to reflect on one or more significant events, re-analyzing them from their own point of view and reprocessing them in light of the knowledge acquired during the communication training (Petrucco& De Rossi, 2009). It is important to note that it was always a representation of the self in which the subject maintained an active role throughout all the production stages.

The teaching experience enabled us to integrate theoretical and practical knowledge from the perspective of the quality of learning and the curriculum at the university level (Restiglian, 2008). The methodology used in the workshop enabled the development of multiple skills, relating to the emotional, relational, methodological, evaluational and planning dimensions, an aspect that makes its presence in university curricula more necessary than ever. As we are aware of the difficulties that many universities face at this time, we cannot fail to state that an investment in the quality of education, and in our opinion the workshop, falls within the methodologies that contribute to overcome this moment of difficulty.

Apart from the above mentioned skills, an aspect that was not covered in the national project "Sculpting stories", but that emerges strongly from the replies to the open ended questions administered ex ante and ex post during the workshop, is the possibility to develop language skills through the DST. Identifying metaphors and concepts that can represent life's experiences means to seek new words and make them our own, thus enriching our vocabulary and enabling us to gain knowledge on it's use in new contexts.

Also the open ended questionnaire administered before and after the workshop, highlighted the importance of training in the use of narrative methodologies integrated to the 2.0 technologies for instructors and coordinators that work with children. These findings were also supported by the doctoral thesis students that monitored and supported from a scientific viewpoint the entire national project.

The opportunities offered by this method, in particular by the DST, emerge clearly in situations of rehabilitation and in working with children in situations of distress.

To conclude, we would like to highlight that the videos made by the students hold great persuasive value, and as an expression of young members of the community, should be made available online at institutional sites and disseminated through social software and Web 2.0 tools in various problematic discussion contexts. This is a pragmatic approach that supports the concept of "community as curriculum" (Anderson, 2008; Cormier, 2008) in order to

integrate formal and informal contexts. The video narratives may, in fact, help to "socialize" the motivation, which in our case was made by choosing a vocational degree, illustrating the capacity to unite and project the community towards concrete action, to ensure that individuals and actors in the institutions, by sharing the meaning, finally decide to move from the narrative towards action.

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Moodle in the Middle: VLE as a Medium for Teacher Professional Development

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Abstract

This paper describes the use of Moodle, a virtual learning environment, to enhance a programme of teacher professional development. The core aim of the International Fund for Ireland funded Classrooms Re-imagined: Education in Diversity and Inclusion for Teachers programme is to provide courses for teachers to assist them in developing awareness and practical skills in dealing with division, diversity, inclusion and community relations/reconciliation in the classroom and on a whole-school basis. Moodle's main purpose was to host discussion forums, initiated each week by the course team, to enable teachers to reflect on their learning and to support the embedding of good practice in their own schools. A questionnaire was distributed after the course asking teachers to evaluate the virtual learning environment and its impact on their learning. Results of the paper-based questionnaires were analysed using a grounded-theory approach and common emergent themes identified. A focus group was held with a number of participant teachers to further explore these emergent themes. The majority of teachers surveyed found the connection with other teachers beneficial and greatly appreciated the learning that took place in rich discussions.

1. Introduction

This paper describes the use of Moodle, a virtual learning environment (VLE), to enhance a programme of teacher professional development. The core aim of the International Fund for Ireland (IFI) funded Classrooms Re-imagined: Education in Diversity and Inclusion for Teachers (CREDIT) programme is to provide courses for teachers to assist them in developing awareness and practical skills in dealing with division, diversity, inclusion and community relations/reconciliation in the classroom and on a whole-school basis. The programme is organised as a number of contact days interspersed with periods back in school, and a VLE was chosen for use during the periods in school to encourage promotion of a community of learners (Wenger, 1998), engaging in continuing dialogue and reflection.

Moodle's main purpose was to host discussion forums, initiated each week by the course team, to enable teachers to reflect on their learning and to support the embedding of good practice in their own schools. Online discussions have been shown to be effective arenas for critical learning (Riley, 2006) and because of their asynchronous nature, to give participants time to reflect before posting a comment (Beeghly, 2005). They have also proved useful among beginning teachers for sharing ideas for practice beyond the school wall (Romano, 2008) and this aspect resonates with the aims of this particular programme.

A questionnaire was distributed asking teachers to evaluate the VLE and its impact on their learning. Results of the paper-based questionnaires were analysed using a grounded-theory approach (Glaser, 1992; Strauss, 1990) and common emergent themes identified.

The paper commences with a review of current literature on the use of VLEs and the outcomes of this particular study are then situated in this wider context. The findings are then presented and the paper concludes with recommendations.

2. Background

"Northern Ireland is a society emerging out of a sustained period of armed conflict" (Connolly, et al., 2013, p. ix). For a period of nearly 30 years from 1969, ethno-political conflict resulted in terror, fear and heartbreak for many families across the country. Increased segregation of the two main communities, one mainly Roman Catholic and nationalist, the other mainly Protestant and unionist, has been the result of this period of time often referred to as 'The Troubles'. More recently, the ceasefires in the 1990s and the Good Friday Agreement (1998) have indicated a clear movement towards peace, and "there is a sense that Northern Ireland is now emerging out of conflict as devolved government has been restored and politicians from across the political divide begin to work together." (Connolly, et al., 2013, p. ix). Despite these changes in political structure there is some evidence that, particularly in more deprived urban areas, aspects of segregation and division have deteriorated in the decade following the signing of this agreement (Shirlow & Murtagh, 2006).

It is recognised that Northern Ireland has made steady progress in terms of greater political stability, and the economy has benefitted from a number of significant tourism opportunities in recent years. However the legacy of the conflict is still evident particularly in terms of segregated housing and schooling. Over 90% of pupils in Northern Ireland attend a school which is either explicitly or de fact associated with one community or the other and only approximately 5% attend schools designated as integrated (Department of Education, 2013). In addition to the two predominant religious beliefs, the arrival of an additional 122,000 internal migrants between 2000 and 2010 (Russell, 2012) to Northern Ireland has emerged as a much more diverse and multi-cultural region.

3. The CREDIT Course

Having received funding from the International Fund for Ireland, the CREDIT project was established jointly by the two largest teacher education institutions in Northern Ireland, Stranmillis University College and St. Mary's University College, to assist teachers to develop the skills and confidence to deal with key issues of diversity, inclusion and community cohesion which have risen to greater prominence in recent years, within the classroom and on a whole-school basis. The project also supports the development of specific curriculum areas such as Personal Development and Mutual Understanding and Local and Global Citizenship. Where previously community relations work would have dealt predominantly with the unionist and nationalist communities, as a result of the changing demographics of the region, the work completed in the CREDIT project now takes cognisance of the wider relations in the area.

The Good Relations Forum (2010) reinforced the importance of the role of education, schools and teachers, in helping to shape the lives and attitudes of children in a positive way and to encourage them to participate fully and responsibly in society. The CREDIT project acknowledges the pivotal role that teachers play in helping to prepare young people for all the challenges of life today and in the future and helping them to embrace diversity without fear or adversity, and with tolerance and respect, and recognises the support needed to help teachers deal with these controversial issues prevalent in Northern Ireland.

The CREDIT project offers two course types. As indicated in Figure 1, Exploring Skills in CREDIT is a three-day course specifically designed to suit teachers who feel they would like to develop basic skills in this area of community relations and reconciliation, while Extending skills in CREDIT is a more in-depth five-day course designed to embed good practice in different educational phases and sectors within Northern Ireland. Throughout both courses, contact days are interspersed with interim periods of time where teachers go back to their school setting to start the process of embedding new practices, before coming back together again to reflect with the rest of the participants. A key element of the course structure is providing teachers with the opportunity to engage with other like-minded professionals to share good practice and ideas.
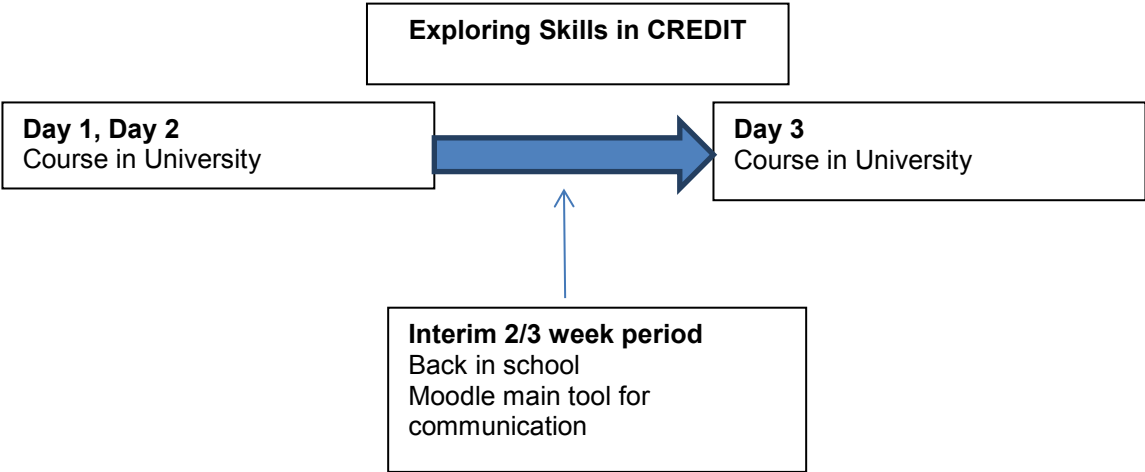
Figure 1: Structure of the Exploring Skills in CREDIT course

4. Digital technologies in professional development

Digital technologies can play a role as tools which afford learners the potential to engage with activities. Fisher et al. (2006) describe teacher learning with digital technologies as a complex but exciting area and suggest there is a need to change with the times. Digital technologies provide opportunities to enable and support the processes of teacher learning and in this instance, it was decided to use Moodle as the main digital tool to create a supportive online community during the interim periods of the course. The Moodle system is open source and was specifically designed to meet the needs of educators. It provided an easily accessible tool to manage and augment the learning in the CREDIT courses, helping to build a richly collaborative community of learning to support the participants.

4.1 Professional development: Critical reflection

Critical and analytical reflection is considered to be central to teachers' professional learning, development and practice (Fisher, et al., 2006; Schon, 1991; Shulman and Shulman, 2004). As cited in Aubusson, et al., (2008), Fieman-Nemser (2001) assert that professional development takes place through serious, on-going conversation. In Northern Ireland the recently formed General Teaching Council entitled their document listing teacher competences as *Teaching: The Reflective Profession* (2007) in order to reinforce the centrality of reflection to effective teaching.

Other writers reinforce the need for teachers to have the opportunity to engage in professional discourse with like-minded individuals and gain support from critical colleagues. Shulman & Shulman (2004, p. 264) suggest that "Through discussing their work … and engaging in regular discussions of practice, we aim to enhance teachers' capacities to learn from their own and one another's experience." whilst Chubbuck, et al. (2001) reiterate the need for informal and supportive conversations, advice on sensitive situations and reflection on experience followed by discussion with others. Teacher reflection is the key to professional development and digital technologies can play a valuable role supporting teachers in sustaining a communal orientation in their professional learning.

In their research, Ofsted (2009) identified that the best virtual learning environments required good quality induction and early use of the system was essential in ensuring positive attitudes. Evident encouragement from leaders and enthusiasm of individual trainer were also important factors identified by (Ofsted, 2009). Taking cognisance of such evidence, an induction session outlining the purpose of the VLE and helping teachers to develop the necessary skills to engage with it was incorporated into the programme design to support teachers.

4.2 The use of discussion forums

"A socially constructive learning tool, discussion forums remain central to online education." (Shaul, 2007, p. 39). Discussion forums are the most widely used e-learning tools to support online groups in Higher Education (MacDonald, 2008) and online asynchronous discussion forums are becoming a common feature in on-campus and online courses (Nandi et al., 2012). Ball (1996) suggests that the most effective professional development model involves follow-up, usually in the form of long-term support or on-going interactions with colleagues.

Forums have continued to evolve in functionality, acquiring ever-increasingly usability features (Shaul, 2007). They enable participants to share what they think, feel and learn and their use can result in thought-provoking and relevant conversation.

"Asynchronous online discussion is one of the most widely used instructional activities for online and blended learning environments, however there is still a question of what students learn from discussion boards" (Cook, et al., 2011, p. 74). The asynchronous nature ensured that there were no time boundaries for discussion and engagement to take place and it gave teachers time to reflect before responding: this was particularly important considering the sensitive and controversial nature of topics being discussed. As cited in (Robinson, 2010), Salmon (2000) reinforces the value of the asynchronicity, emphasising that students can reflect on forum messages before responding, questions can be asked without students having to wait in turn to ask them, and notes that the ability to engage participants is 'remarkable'.

Shaul (2007) identifies three types of forum. Firstly, the social forum furnishes students with an informal area to discuss class- or non class-related matters. This is a space where students are free to speak openly since they are often not viewed by instructors creating. Secondly, the general discussion forum tend to be more free flowing, adopting a less structured style than social forums, however they do pertain to the course material. Instructors can select broad topics or simply ask students to post course related questions or material. Thirdly, topic driven forums are the most structured in terms of comment and correspond to classroom assignments in which the instructor picks the topics and expects students to come prepared to debate and defend. The forum adopted by CREDIT was that of general discussion to provide teachers with structure and relevant information but also provide them with a secure place to raise issues which they may deem important and relevant.

4.3 Tutor role

Despite the history and wide, though not full, acceptance of the importance and use of forums, lack of awareness on how best to use them persists (Shaul, 2007). (Mazzolini & Maddison, 2007) suggest that a particular challenge for online instructors lies in working out how much and in what way to intervene in students' discussions in order to aid learning, without actually taking over in the process. Taking cognisance of this, CREDIT staff ensured active participation on the forum formally once a week to engage teachers and encourage dialogue (included as one of the criteria for successful completion of the course) and informally on an on-going basis, in response to queries, teacher comments, postings and thoughts.

There is much debate about the expectation and role of the tutor in relation to guiding and supporting the focus and direction of engagement on the discussion forum. The role of the tutor is fundamental (Robinson, 2011) in helping to set up the direction for discussion and define its boundaries (Nandi et al., 2012) and without tutor support and intervention, a VLE will not be successful (Salmon, 2005). Finegold and Cooke (2006) further suggest that it is a useful platform for student interaction and that the presence of lecturers is important for students and useful when a group could not meet face-to-face to discuss and share ideas.

Mazzolini & Maddison (2003) offer an interesting insight into the range of approaches that may be adopted by a tutor from 'sage on the stage' to the 'guide on the side' to the 'ghost in the wings'. More recent research carried out by Mazzolini and Maddison (2007) into the role of the online instructor highlights the differences in this role from the perspective of the student and the instructor. Students felt that instructors needed to introduce new concepts, answer questions promptly, provide feedback and discuss student solutions from different angles and when answering questions, to ask follow-up questions. On the other hand,

instructors believed they should play a much more limited role by simply answering students' questions, asking leading questions and asking subsidiary questions in order to continue the discussion thread.

5. Methodology and Results

Research instruments were developed that drew on existing research literature. Because of the nature of the CREDIT project, participants were already subject to a number of questionnaires and focus groups regarding the effectiveness of the programme as a whole and it was agreed to use this existing methodology but to include questions specifically about the VLE. A mixed method approach was employed using both open ended (qualitative) and closed ended (quantitative) questions. The section in the overall questionnaire, showing a sample response, regarding the VLE is given in Figure 2.

3. Moodle (the VLE)
Please rate each of the following on a scale of 1-5 (strongly disagree to strongly agree) by circling the appropriate number.

	Strongly Disagree				Strongly Agree
The VLE was easy to use	1	2	3	4	(5)
The discussion forum encouraged me to think about the course	1	2	(3)	4	5
The VLE allowed easy access to help & advice	1	2	(3)	4	5
I did not find the VLE useful	(1)	2	3	4	5

Please provide any other comments about the VLE aspect of the course in the box below.

A good way to keep in contact with other participants.

Figure 2: Sample response to VLE questionnaire

The first 4 questions required responses on a 5 point Likert scale from strongly disagree to strongly agree. The final question was an open response box for any other comments. The questionnaire was distributed at the end of each course and collected immediately, thus ensuring a high return rate. Data was collected from 4 cohorts of 20 Exploring Skills in CREDIT course participants, during the period October 2011 to February 2013. From the 80 participants who completed the course, 76 returned the questionnaire and 37 of these included comments in the open response box.

	Strongly Disagree				Strongly Agree
The VLE was easy to use	1	2	21	24	28
The discussion forum encouraged me to think about the course	2	7	16	25	26
The VLE allowed easy access to help &advice	1	4	21	26	21
I did not find the VLE useful	34	16	15	3	5

Figure 3: Results from questionnaire quantitative questions

Responses to the first four questions are given in Figure 3. Answers were grouped into the 3 categories; agree or strongly agree; neutral; and disagree or strongly disagree and this analysis is shown in Figure 4.

	Disagree or strongly disagree	Neutral	Agree or strongly agree
The VLE was easy to use	3.95	27.63	68.42
The discussion forum encouraged me to think about the course	11.84	21.05	67.11
The VLE allowed easy access to help &advice	6.58	28.95	64.47
I did not find the VLE useful	68.49	20.55	10.96

Figure 4: Grouped results from questionnaire quantitative questions, shown as percentages

It is clear that the majority of respondents (68%) agreed or strongly agreed that the VLE was easy to use with only 4% disagreeing or strongly disagreeing. Likewise 67% agreed or strongly agreed that the VLE encouraged them to think about the course with 12% disagreeing or strongly disagreeing. Further 64% agreed or strongly agreed that the VLE allowed easy access to help and advice, with 7% disagreeing or strongly disagreeing. When asked about the usefulness of the VLE, 68% disagreed or strongly disagreed with the statement that they did not find the VLE useful while 11% agreed or strongly agreed.

The comments obtained from the questionnaire were subjected to a grounded theory style analysis. At the initial stage of analysis the comments were coded to highlight patterns and the following five emerging themes identified: General issues; Technical issues; Communication; Resources; Discussion topic details. We now focus on each of these in turn.

General Issues

There were 10 comments that fell into this category with 7 identified as generally positive and 3 overall negative. Examples of positive comments included "Really enjoyed using VLE" and "Very informative and useful" while examples of negative comments were "Didn't find it useful" and "Didn't add to my development".

Technical Issues

There were 20 comments that fell into this category with 5 identified as generally positive and 15 overall negative. Some comments were repeated by more than one participant and incidences of the same or very similar statements are given after each statement. Where no number is indicated it is understood that this is a comment made by one individual. Examples of positive comments included "Very easy to use, straightforward and clear" (3) and " Problems quickly sorted" while examples of negative comments were "Difficult to navigate" (12), "Had to login twice" and "My IT skills need improving" (2). Numbers in brackets indicate how many statements of this particular type were made. It is worthwhile to compare responses in this theme with the quantitative results using the Likert scales. Only 4 individuals answered disagree or strongly disagree in response to the statement *The VLE was easy to use* yet 15 people expressed perceived negative comments regarding the technical aspects of the site including 12 who specifically mentioned difficulty navigating the VLE.

Communication

There were 9 comments classified in this category all of which were generally positive. Examples of comments included "Good to see how others were approaching things" and "Useful to talk to others on the course".

Resources

There were 3 comments in this category again, all of which were generally positive. Examples of comments included "It has been very useful to have access to course materials through this VLE" and "Resources on the VLE were useful".

Discussion Topic Details

There were 10 comments identified in this category with 2 generally positive and 8 overall negative. Examples of positive comments included "Discussion amongst participants through VLE very useful" (2) while examples of negative comments were "There were no or limited discussions" (3), "I didn't find the discussion forum useful", "I wasn't sure what we were meant to be discussing" (4) and "Discussion could be more contentious to get people's views out about aspects of education and benefits to pupils". It is interesting to note that all 8 negative comments came from 1 particular cohort of participants. With this particular group, due to a number of staffing issues, tutors did not post discussion questions or respond to queries as frequently as they had with other groups and it is evident from the feedback of this particular group that tutor involvement is key to ensuring effective use of the VLE.

6. Analysis of Use of VLE

In addition to analysing the written feedback an analysis was made of the actual use of the VLE itself during each course. This was considered from 2 aspects, firstly looking at how the course tutors engaged with the VLE and secondly, an analysis of the use made by participants. Since it was a requirement of the course that participants engaged with Moodle at least once each week it was decided not to report usage statistics as these were virtually 100%. Rather the type of engagement and the sort of comments posted were analysed to ascertain how the VLE was being used in practice.

When the tutor's role was examined it emerged that use was being made of the VLE in the following ways:

- Post questions each week (a requirement of the course)
- Respond to teachers' comments
- Dealing with technical issues
- Information exchange
- Relationship Building

Posting questions was a requirement of the course and there were 2 distinct types of questions used, those that attempted to inspire participants and those that were more encouraging in nature.

Likewise when a similar analysis was carried out on participants' use it was clear that there were 3 main types of engagement, listed below:

- Direct response to questions
- Technical/Information
- Engagement with each other

The first two of these are not unexpected as it was a requirement that participants respond to the stimuli and the VLE quickly became a useful forum for technical questions about how to use the VLE itself and for specific queries about the course such as starting times of meetings or documents to be submitted. However a real strength of the participant use of the VLE arose when it began genuinely to be used beyond the expectations of the programme to facilitate rich peer discussion regarding issues that had arisen during the course or indeed outside of the programme. In at least one instance a new discussion thread was started by participants when an incident that happened locally caused participants to reflect on how their learning from the course could be directly applied to relevant real-life situations.

7. Conclusion

The need to have a safe forum to continue discussions and enable teachers to keep in contact during the interim period of the course with others and the course team was deemed to be an important element at the planning stages of the project. Having implemented its use with a number of courses, Moodle has proven to be a useful and meaningful method to maintain and extend peer conversations, and promote rich professional dialogue (Shaul, 2007). With appropriate tutor support the VLE proved an extremely beneficial tool for reflection on the complex issues addressed during the programme and extended the reach of the course to beyond the specific contact sessions. Participants used it as a repository for information, a way to contact the course team and a space for reflection on their own learning in response to stimuli. In the best cases it also became a vehicle for participant initiated discussions, addressing issues of concern and allowing for immediate implementation of core ideas of the programme. However with at least one cohort, where tutor engagement was necessarily limited due to staffing issues, the feedback on effectiveness was much more negative thus underlining the importance of regular, targeted tutor support (Robinson, 2011, Salmon, 2005).

Moodle has been used effectively in the middle of the course programme in order to maintain contact with the participants but also as a method of communication between participants and tutor and with each other. It plays a key role in promoting effective teacher development in this programme. Use of the VLE is ongoing in the project and focus group data is being gathered giving more qualitative insights to the effectiveness of Moodle as a tool in this project. The final comment comes from a participant and highlights the sense of community engendered by remaining in touch with teachers when they were back in schools:

"Moodle was good. It is nice to have that connection with people on the course. I have come back from other courses and thought 'I am on my own again' but (with Moodle) you can send up a flare if you need to. That's quite comforting and encouraging. You can see what other people are doing and think 'I can do that'.

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Planning tools as an aid for multimedia didactics for university students with visual impairments: the communicative aspects.

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Abstract
This text offers an analysis of the communicative aspects used in the processes of transmitting visual information to blind and partially sighted people through the use of media. The intention is to reflect on *what* and *how* to describe the significant information, conveyed through images, in order to improve accessibility to university lectures that make use of multimedia supports (videos, PowerPoint etc.) for minority groups. The work is part of a research project at the University of Ferrara, carried out in partnership between the *Department of rights to study and disability services for students* (S.M.S. Service) and the *Department of Humanities* (CARIDlab, Workshop in Science and Technology of cognitive processes and learning), which envisages the implementation of two video lectures, one in the humanistic field, and the other in the medical field[1]. The final aim of this text is therefore to provide describers with a series of guidelines, identified through the study of reference literature, functional to the application of (visual) content adaptation processes to university lectures for blind and partially sighted students.

Keywords
e-inclusive, accessibility, audio description, describer, visual impairments.

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[1] The scientific project managers are Daniela Mari (Delegate of the Rector for disabilities) and Paolo Frignani (Delegate of the Rector for orientation and distance learning).

1. Introduction

Have you ever thought about what the world of thought and study would be without the alphabet? And yet we blind were so until 1826 when Louis Braille, a prisoner like us, invented his system.

Paolo Bentivoglio

Through the *Braille* system, people with visual impairments have learnt to read and write and therefore to discover their social identity and express their potential from a cognitive and emotional and creative point of view (Quatraro & Ventura, 1992, in Bonfiglioli & Pinelli, 2010, p. 119). When it was first created the Braille system met with various resistances from the institutions for the blind, but it spread, if slowly, first in France and then in the rest of Europe. After this it became the only reading and writing system for the blind used throughout the world, suited to any language (Bonfiglioli & Pinelli, 2010, p. 119-120).

Braille in the digital era must be accompanied by other tools, which are equally effective. Since the 1990s our society has been transformed into the society of information, marked by an increase in the value of knowledge, considered as a factor of economic, social and cultural development. A fully inclusive society must ensure that all citizens have access to *Information and Communication Technology* (ICT) through the removal of *virtual barriers*. In 2006 the European Commission introduced the concept of "e-inclusion" as a tool for creating a fully inclusive, fair and developed information society (Zirone, 2008-09). Nowadays, the most advanced accessibility standards demand that goods or services should be guaranteed to all individuals, including those belonging to the minority groups.

In an e-inclusive university environment this means allowing those with visual impairments to gain access to the digital documents used to convey knowledge and information within the didactic contexts in person or through distance learning. In this sector the role of images is considered to have increased remarkably. The use of software with high graphical content such as PowerPoint, used as a lesson aid, has become common practice at all teaching levels, in person and in distance learning. Sometimes the images are used without any communicative function, i.e. they have the purpose of filling space or are used as decoration, whereas in other cases, they take on a central role in the communication (and didactic) process and must, therefore, be *read* and understood, in order for the message to be conveyed.

In practice, *e-inclusive* means accessibility to the two levels that determine the possibility to make use of digital documents: the program interface (navigation elements) and the contents (texts, sounds, images). This can be simplified by splitting the problem into technological aspects and communicative aspects. Regarding the first of these aspects, there is a series of guidelines and the relative success criteria, WCAG 2.0. (Web Content Accessibility Guidelines 2.0), published on 11 December 2008 by the WAI (Web Accessibility Initiative), which in turn is part of the (W3C) World Wide Web Consortium (AA.VV., 2008). The guidelines revolve around four main principles: perceivable, operable, understandable and robust (Diodati, 2007). Each of these principles corresponds to twelve *guidelines* which must be complied with in order to make the multimedia contents accessible. The technological issues – studying the state of the art and analysing the applications to be used for university didactics – are tackled as part of the project by a team that reports to the engineering department; hence, they are not taken into consideration in this article. The subject of this article is the analysis of the state of the art relative to the editorial and communication aspects; more specifically, the study focuses on the principles of the audio description of digital documents used in teaching/learning situations on a university level (in e-learning contexts, "Didattica 2.0", or simply in the event of classroom lessons that envisage the use of multimedia supports, from PowerPoint to videos).

2. Accessibility and Audio description

The techniques of audio description originated in the USA during the 1960s and 1970s and were applied to various fields, including theatre, cinema, television, museum exhibitions, fun parks, digital products and websites. Naturally, the methods of audio description depend on the application context, with differences caused by distribution methods (synchrony or asynchrony), reference sector (entertainment, information, didactics) and forms of communication used (still or moving images). Finally, the spread of audio description, in terms of quantity, depends on legislative obligations. It appears appropriate to cite the case of the UK where 10% of TV programmes are described and 80% of films for cinema and where 170 cinema auditoriums are equipped to allow blind and partially sighted people to make use of the audio description services (Cook, 2006, in Zirone, 2008-09).

2.1 Definition of Audio Description

There is no standard audio description method or a universally recognised definition of audio description. In the paragraph *Visual Information and Motion,* on the basic techniques for WCAG 1.0 it states: "Auditory descriptions of the visual track provide narration of the key visual elements without interfering with the audio or dialogue of a movie. Key visual elements include actions, settings, body language, graphics, and displayed text." (Web Content Accessibility Guidelines 1.0).

This definition focuses on the audio description of images for entertainment, referring to film and television, making explicit reference to the audio and dialogues of a film. The definition of Bernt Benecke goes in the same direction (2004, in Zirone, 2008-09): «It provides a narration of what is seen and describes the action, body language, facial expressions, scenery and costumes. The description must fit in between the dialogues and must not interfere with important sound and music effects».

The definition found in the doctorate thesis, *The Language of Audio Description from a Corpus-Based Prospective,* by Saveria Arma (2007) seems to be wider: «A recent technique that allows primarily blind and low-sighted people to gain adequate access to audiovisual products such as movies, theatre performances, sport matches and museums. A pre-recorded or live audio track transmitted through appropriate technology describes costumes, settings, particular moods, movements and all the elements that normally sighted people perceive through sight».

The merit of such a definition lies in the extension of the action radius of audio description. But it is still not enough. A more appropriate definition, despite its simplicity, seems to be the following: «Intersemiotic translation of a visual code into a verbal code» (Hernàndez Bartolomé and Mendiluce Cabrera 2004).

Nowadays, in whatever form of communication mediated by technologies, still or moving, real or reconstructed, images, with or without sound accompaniment, are of central importance. Sometimes they are used without any communicative function (as decoration), whereas other times they have a decisive role in the knowledge transmission process (informative role). Images conveying meaning must therefore be *read*, otherwise the message will not be understood. The technical definition is simpler: An audio description consists of one or more audio tracks, integrated and synchronised with the audio and video tracks of the audiovisual product. For the audio description of still images, made of up graphs, mathematical formulae and paintings, the alternative text is normally made up of an audio file or a text read by a digital reader (screen reader, voice over, etc.). Audio descriptions can be recorded in advance, as for films or videos, or live, for a live show, a university lecture, etc.

2.2 What to describe and how: relevant studies

Images convey many meanings, therefore for them to be read by blind and partially sighted people it is important to identify *what* must be described and *how*. Below is a series of indications taken from relevant studies whose common intention is to undertake a path that can guarantee, in the long-term, a scientific charter for audio description and a solid reference basis for the industry.

Mention is made first of all to that of the Canadian accessibility professor Joe Clark (2001), who proposes some terminology and guidelines to be used. His intention is to create descriptive techniques that are functional to different contexts and as general as possible, standardised throughout the world: «Agreeing on basic techniques is where we would need to start». Naturally Clark, aware of the impossibility to mechanically adopt such principles, talks about «nominal and non-binding adoption». Only after identifying a series of basic techniques is it possible, according to the Canadian professor, to develop training programs and certifications, as well as testing schemes recognised by international organisms.

A British study in 2000 (*Guidance on Standards for Audio Descriptions*) conducted by the ITC (Independent Television Commission), now OFCOM (Independent regulator and competition authority for the UK communications industries), enabled guidelines to be drawn up for the audio description of television programmes, based on a research project coordinated by Veronica Hyks lasting about 4 years, from 1992 to 1995. The following procedures were used: Questionnaires given out to a sample of British fully blind and partially sighted people; trial viewing sessions for a sample of blind and sighted people (split up by age and social rank) and then a focus group; the analysis of the audio-described programmes by a group of appropriately trained experts; a national sample which, for a period of time, consulted 7/10 hours of audio-described programmes a week, and regularly subjected to interview. The USA research program *Described and Captioned Media Program* carried out in association with the *National Association of the Deaf* was conducted with the aim of improving the learning processes of students who are blind, partially sighted, deaf, deaf and blind or have hearing impairments. The guidelines identified, which focus on *what to describe* and *how to describe* (AA.VV, 2009), provide indications functional to the audio description of visual material used in a mainly didactic context: *Guidelines for describing STEM images (science, technology, engineering, mathematics)*. The program highlights how the world of images belonging to the fields of science, technology, engineering and mathematics (graphs, tables, diagrams, mathematical equations) requires a specialist descriptive approach.

The research centre on accessibility to the media, *The Carl and Ruth Shapiro Family National Center for Accessible Media* (NCAM), founded in 1993 as the research arm of the American public television, drew up a series of guidelines, the result of 4 years' work, functional to the audio description of both television programmes and didactic materials.

The *Art Education for the Blind* (AEB) foundation, which was founded in the USA in 1987 by Elisabeth Axel, promotes accessibility to art for blind and partially sighted people and has developed a specific descriptive methodology. The description of images, objects, items and videos that belong to the world of the arts implies a completely different approach from that relative to STEM images. In that case the main aim is to communicate the scientific data, the logistic path or the nature of the process being examined, eliminating all aesthetic references; on the contrary, in the description of works of art the aim is to transmit the sensation and aesthetics of the work, naturally as well as its physical characteristics. The foundation, as Nina Levent (p. 154) points out, works with scientists, researchers and blind people to draw up methodologies that are functional to the accessibility not only of the images, but also the styles and the *Zeitgeist* (spirit of time). A museum is naturally the main location where this form of description is most useful.

2.3 Operative Procedures of Audio Description

Before investigating the methods identified, relative to what and how to describe, below are some indications on procedures to be developed and professional roles necessary for the audio description process. This process necessarily implies a work group and some roles, which Clark identifies as the *describer,* the *narrator* and the *production.* Let's start from his indications, which will be integrated with definitions from other studies and our considerations.

The *describer* is the person who writes the description of the event or the information that can be given through formulae or symbols. He has a very important role because he must put into practice the principles of the audio description guidelines, keep the atmosphere of the audiovisual product intact (Gerzymisch-Arbogast, 2007, in Zirone 2008-09), promote the enjoyment of the documents through the knowledge of the addressees (Law 138 of 2001 envisages a distinction between completely blind, partially blind, medium-severe partially sighted, slightly partially sighted), be objective and describe without personal interpretations. At the German television station Bayrischer Rundfunk the audio description work is performed by a team of three people, two sighted and one blind. This promotes discussion on what is to be described, the degree of detail and the duration. The presence of a blind person is already a first *testing ground* with respect to the effectiveness of the work (Benecke, 2004, in Zirone 2008-09). A problem to be faced concerns the question of *who is the describer*? In didactic situations can it be the expert of the contents/the qualified lecturer or a professional describer who specialises in the various fields (scientific, artistic, etc.)?

The *narrator* is the speaker who reads the text of the description. The narrator may be replaced by a speech synthesizer, which naturally implies different dynamics. Think, for example, about the importance to be given to the right intonation of the voice, which can "blend" with the original soundtrack. The narrator must speak clearly, at a suitable speed for the comprehension of the text, and use the right pauses or moments of silence. In special cases, the narrator could be the same person as the describer.

By *production*, Clark means the product being described: a play, a television programme, a dance performance, a film, a photograph. Describing a complete television series involves different productions.

Below are the guidelines, which are fundamental for the work of the describer and are not to be interpreted as a sterile list to be respected at all times, but are useful in order to understand the point of view to be adopted based on the context. Let's try to split the list into three parts: *the general principles*, which are valid at all times; *describing images for entertainment*, which come from film, television and theatre and are therefore functional, above all, to the description of actions with characters, settings and narrative situations; *describing images for didactics and scientific popularisation,* functional to describing, above all, technical images such as formulae or symbols, illustrative, scientific and informative images.

A - General Principles

Knowing how to observe. Considered by Clark to be the most important requirement of audio description, this principle envisages going beyond a mechanical view in favour of observation for the purpose of identifying what is most significant and less obvious. When an image is well constructed it is rich in detail, therefore the describer must be able to select the fundamental elements for understanding the story or the information to be transmitted.

Thinking about the production and the audience. The description has a functional and descriptive role; it is intended for the users. Therefore, it is necessary to avoid *showing off*

with rich, elevated or rhetoric language. The focus must be the audience and its needs.

Being objective. The describer is by nature inclined to describe what he prefers to see - just think about the political views or cultural and social values we all have. We must maintain an objective point of view and describe coherently with what is happening.

Time management. What is happening at that particular time on the screen is normally described; the tense of the description is the present. Passages of time (ellipses, flashbacks, flashforwards) must be described when there is clear visual evidence thereof, such as a calendar, the hands of a clock or the message "one month later"; when the passage of time is inherent to the sequence of actions there is no need to explain it.

The descriptions are provided during the sound pauses. When this is not possible, the principle of the understanding of the product for the user is to be followed, i.e. if it is not possible to preserve every detail of the original soundtrack it is acceptable to describe over dialogues and other elements of the soundtrack. Consider how, in the event of on-demand use, it is possible through the extended description technique, to overcome this limit. Digital documents allow the insertion of files that can be consulted in parallel or asynchronously to the flow of images and sounds.

Specifying the type of media. It is important in the multimedia era to indicate the object of the description - video, photographs, library films, scene of a film, graph – considering the fact that each element contains its own communication features.

Concision. Considering that people with visual impairments need longer to read information, the cognitive process should not be slowed down further by needlessly long descriptions. Once the describer has identified the thing to describe, he must do so using the smallest number of words and concepts possible.

B - Entertainment Images: describing situations and actions

Describing all the obvious emotional states. There are two views on the description of emotional states: the first trend is to describe the physical configuration (frown, smile, smirk), whereas the second also includes the description of the emotions, if they are clearly visible (impatient frown, cold smile, frustrated/dissatisfied smirk). Both approaches can be defended. They both agree on the need to describe only what is visible.

The context and changes of scene. The first part of the description must refer to the context (place, period, style) in order to create a setting in the mind of the spectator; only after this can the details be described. This naturally highlights changes of scene and therefore of environments.

Characters and/or people. The people or characters must be identified by name and by their physical characteristics.

Music, noise, sound effects. The elements of the soundtrack must be described when it is important to indicate their origin, diegetic or extradiegetic.

Headlining, credits, lettering. The headlining and credits must be read fully. Lettering means the captions supporting the images or used independently. In both cases it is important for it to be understood that written texts are being read.

C - Images for Didactics and Scientific Popularisation

Colours. Is it useful to describe colours to people who have never seen them? According to the Independent Television Commission the percentage of people who have never had the chance to see is minimal, therefore most blind people remember the colours, thus it is important to include them in the description. Many people who have lost their sight in their early years are also able to understand the meaning of a colour by association: green with

grass, red with heat.

Drill-Down organisation. The descriptions should follow a drill-down type organisation, a short introductory summary followed by the extended description. This enables the reader to continue reading to obtain further information or stop when they think they have read enough.

Tables and data. When the communication of data is significant, it is better to neglect the connected visual elements; tables and relative graphs (pie or bar charts) do not need narrative description. The description must therefore concern the analysis of the data.

Processes. Processes that are presented visually in flow charts, illustrated diagrams and chemical reactions, for example, can be successfully converted into nested lists. Often narrative descriptions of flow charts and other processes could be massively long and, despite the efforts made, may not provide access to the information.

Mathematics. Some images concern the reproduction of mathematical or chemical formulae, complex graphs, programming listings, etc. There are languages for the preparation of texts functional to the translation of the aforementioned formulae; in the academic context, the most widely used one is LaTeX. LaTeX is the language used by Wikipedia to allow scientific formulae to be displayed: for sighted users in terms of mathematical symbols and through the possibility to read the LaTeX source code (description of the formula) for people with visual impairments. Non-sighted students must obviously know the commands and meanings of the key words of LaTeX. A functional alternative to reading the mathematical formulae (thanks to their translation into text format) is offered by the mark-up language MathML (Carella, 2009).

Art objects. A coherent description must provide visual information in a sequence so as to allow the visual construction of a complex art object *to be assembled*, piece by piece. Below is the basic information to be provided:

- For a museum exhibition, the verbal description starts with the data found on the label of a work: the artist's name, nationality, qualification, data, etc.;
- Functional information to the overall representation of the work, as a whole, the atmosphere and general setting, the composition, the use of colours;
- The description must eventually be in-depth and detailed, concentrating on the individual appropriate details;
- Regarding the indication of the position of items or figures in a painting, it is useful to refer to the positions of the numbers of a clock, rather than using the concepts of right and left. Sometimes, it may be useful to provide instructions that enable blind people to imitate the position of the figure represented.

4. Conclusions

It is clear that nowadays evolved societies cannot neglect the issue of e-accessibility, which would be gross negligence against minority groups. Something is being done about this; various studies have examined the issue of accessibility to information and communication technologies; the concept of usability is the subject of recommendations by international organisations and shared standards are being studied. Despite this, there still remains much to do; the approach defined *design for all,* which can guarantee an inclusive and universal design is still a long way off. Naturally the situation is different in different countries. In Italy, it is unfortunately a long way from the standards of more advanced countries such as the UK, the USA and Canada. There are various problems, which are not easy to solve: costs, definition of standards and technical specifications, above all. It now appears clear that the impetus needs to come from more binding legislative measures and increased investments to support research and development.

The University of Ferrara project is progressing in that direction and this article is the starting point for looking in greater depth at the issues concerning accessibility to university lectures, in the presence of digital supports and remotely. There are two aims. The first is to increase the presence in the classroom of blind and partially sighted people and the second is to give them the chance to access study courses based on the methodologies of e-learning and the use of web platforms. Learning environments, such as that provided by Moodle (*Modular Object-Oriented Dynamic Learning Environment*), already allow a series of activities to be managed by blind people (forums, online exercises, sending text messages, etc.); however, the use of didactic materials based on the use of images, such as tutorials or video lessons appears to be more problematic. The improvement of these processes would promote access to knowledge for minority groups, both in formal environments and in informal training contexts.

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Reconsidering learners' attention in video conferencing from the teacher's perspective

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Abstract

Videoconferencing (VC) has been used to support teaching in Universities for several years. Exploring the literature about VC's educational use, one finds that there are still some negative impacts on students. Our previous research indicated that learners located on the remote site report having more difficulty to remain attentive than when taking a courses on the local site. Issues related to learners' attention are important because it is recognized as necessary for learning. The proposed paper will review our previous two studies and exploit six teachers interviews using and interpretative perspective in order to reinterpret our previous observations, adapt our preliminary model and propose further research so it is closer to reality.

Keyword

Videoconference, learner's caracteristics, attention, instructional method.

1. Introduction

Videoconferencing (VC) has been used to support teaching in Universities for several years. Its many advantages have long been documented (Abbot et al., 2004; Demers et al., 1996). Exploring the literature about VC's educational use, one finds that there are still some negative impacts on students. According to several researchers, learners located on the remote site report having more difficulty to remain attentive (Beaulieu & Jackson, 1996; Harvey et al., 1998; Tiene, 1997a; 1997b). Issues related to learners' attention are important because it is recognized as necessary for learning (Gagné et al., 1992; Lemaire, 1999; Simon, 1986).

We previously studied learners' attention in VC (Giroux, 2007; 2010) using a correlational descriptive research plan (Pelletier *et al.*, 2000) and an Experience Sampling Method (ESM) (Csikszentmihalyi & Larson, 1987). Our goal was to test an hypothetical model developed from many writings. We observed a significant relationship between attention and several factors, including the teaching method, the site from which learners participates and the time. A second study using a similar approach was conducted in order to confirm these observations (Giroux & Lessard, 2012). We found, once again, that there is a difference between the levels of attention reported by local learners (LL) and remote learners (RL) and that time is important, but we could not confirm the effect of the teaching method. In light of the first two studies we felt we still could not propose a good explanatory model of learners' attention in VC on which teacher could rely to develop better formation in VC. Consequently, a new research cycle was initiated. Six university teachers who had experiences teaching in VC were interviewed to see if they had observed similar relationships to those described in our prior studies and question them about the importance of the teaching method and other factors. We also wanted to document their perceptions and practices. This paper will review our previous two studies and exploit the interviews using an interpretative perspective in order to reinterpret our previous observations, adapt our preliminary model and propose further research so it is closer to reality.

2. Theoretical framework

2.1 Learner's attention

The central concept of this research is learners' attention. While attention has been studied for several years (Plude, Enns, & Brodeur, 1994), this concept is often poorly defined. The definitions vary depending on the angle adopted or the process studied (Laberge, 1999; Lemaire, 1999; van Zomeren & Brouwer, 1994). In the past, these variations were significant enough that some authors have found it necessary to issue warnings and recommend more precision (Donchin, 1984).

Like earlier studies that observed the attention problem of RL in VC (Beaulieu & Jackson, 1996; Harvey et al., 1998; Tiene, 1997a; 1997b), our two previous studies and the one presented in this article focuses on the selective aspect of attention. It is to this aspect that Simon (1986 : 107) refers when defining attention as a "system that enables us to select among competing data and to bias our recall from memory and our ongoing stream of thought toward some context rather than others". The importance of this system is due to the fact that the sensory organs and the central nervous system are unable to collect, process and interpret all available information in the environment due to their limited capacity. Attention allows the individual to select relevant information that can access higher cognitive functions (van Zomeren & Brouwer, 1994). Without a system to eliminate irrelevant stimuli, the learner would not be able to function properly, perceiving and dealing with too much unnecessary

information. The attention is not directly observable, so a learner is considered attentive if he meets the expectations set by the teacher. In our research, the student is considered attentive if he focuses his thoughts and actions on the right object given the inputs of the system such has the goal of the activity and the context.

2.2 Factors related to attention in videoconference

Giroux (2010) reported the results of an ESM study in which he observed several factors related to attention in VC. This research aimed to compare a hypothetical model of attention to reality. Giroux (2007) provides details of the hypothetical model. The observations reported by Giroux (2010) cover the first forty minutes of class and showed that attention does not always decrease over time. Attention however vary differently depending on the site. According to Giroux's observations, there was no significant difference between the LL and RL after 20 minutes but he noted a significant difference between LL and RL in the 40th minute. During Giroux's research, the level of attention of LL increased between the 20th and 40th minute and remained relatively stable at remote sites. He reported that the "site" variable is the most significant since he found that the site, in addition to having a direct statistical effect on attention, also has an indirect effect and acts as a moderating variable (on moderating variable : Alain, 2004). Overall, these observations are consistent with those of Beaulieu & Jackson (1996) and Tiene (1997a, 1997b) who reported that RL have more difficulty maintaining attention that LL. According to Giroux's observations, several characteristics of the learners also have a direct or indirect effect on attention in VC. Having a positive perception of videoconferencing is positively related to attention, but the link only show at the 40th minute. Giroux suggests that this variable is gaining importance over time. In addition, the sense of self-efficacy in relation to learning in VC also has an indirect positive effect on attention at the fortieth minute. Experience is the last learners' caracteristics which Giroux found to be related to attention. It has an indirect negative effect on the total VC attention. The moderating effect "Site X Experience", however, has an indirect positive effect, which means that the experience would be particularly important on the remote site. Overall, these observations are consistent with several previous writings. Motamedi (2001) proposed that the attitude of learners in part determines the success of a training. Salomon (1984) explains that learning actually depends on the perception that the student maintains of the source. With respect to experience, Dahlgren and Karp (1998) found that the lack of experience and knowledge related to the development of a course in VC create insecurity for the learners. Also according to Giroux (2010), an interactive and learner-centered teaching methods is associated with a higher level of attention on the local site and a lower level of attention at the remote site after 40 minutes. Again, this variable would have a different impact depending on the site. Previously, many researchers pointed the finger at the teaching method in connection with the attention. More often, it was identified as an important success factor for training in VC (Badenhorst & Axmann, 2002; Beaulieu & Jackson, 1996; Furst-Bowe, 1997; Motamedi, 2001; Yair, 2000a, 2000b). Several other authors have also noted the importance of an interactive method, but they did not speak of a difference depending on the site.

Giroux and Lessard (2012) also reported the results of a study conducted using an ESM method in VC. The latter, however, studied a longer period, up to 40 minutes after the break. They first observed a significant effect of time, but even if attention was always lower at the remote site, this difference was not significant statistically. At one point (fortieth minute), however, they observed that the teaching method seemed to have a different impact depending on the site, contributing positively to the remote and not having any effect on the

remote site. However, they did not find a statistically significant difference. They suggest that the effect of the method is probably medium or small. The lack of power in their study due to a small sample would explain they were not able to reject the null hypothesis. Giroux and Lessard also studied the effect of break on learners' attention but did not find any significant impact. Twenty minutes after the break, the level of attention of students was well below what it was 20 to 30 minutes before the break. If breaks have an effect, it is small and therefore does not last very long.

3. Methodology

3.1 Objective and research approach

Our main objective for this study was to address the situation from a new perspective in order to reinterpret our previous observations, adapt our preliminary model so it is closer to reality and propose further research. Thus, rather than adopting a quantitative and descriptive approach, we chose an approach that can be described as qualitative (Fortin: 2010) and interpretative (Anadón & Savoie-Zajc: 2009).

3.2 Context

This research was conducted in a regional university (6000 students). It has a main campus and two distant learning center which are up to 550 km away.

3.3 Participants

Potential participants were contacted by email in order to create a diverse sample in terms of teaching experience. It was necessary to contact 11 teachers to complete the sample. Six teachers were interviewed, five professors and a lecturer. The participants were volunteers. Among the professor, one was a new professor (one year of experience) and the four other had at least 7 years of teaching experience. One of the professor was only a few months from retirement. Together, they give an average of ten courses in VC each year. The lecturer taught two courses/year in VC since 2008.

3.4 Data collection strategy

Data were collected using semi-directed individual interviews (Demazière & Dubar, 2004: 7). The topics of the interview focused on the teaching experience of the teacher, the organization of courses by videoconference, the teaching method preferred in that context, the difficulties encountered by the teacher and videoconferencing support. The interview lasted approximately one hour.

3.5 Procedure for data analysis

The analysis of the transcripts was done following an inductive logic. This approach helped construct meaning from the raw data (Paille, 2006). We first developed a thematic tree

(Paille & Mucchielli, 2003). That is to say that we have identified the mains topics as they appeared in our interview outline to which we added emerging sub-topics. Once our thematic tree was developed, our analysis was conducted in two stages. At first, we opted for a restitutive posture (Demazière & Dubar: 2004). Once this first step has been completed, we tried to make sense of the raw data as they appear in the first movement analysis. For this second step, we adopted an analytical posture and we seek to interpret the subjective meaning that the phenomenon took for participants.

4. Results

The participants in our study are in agreement on one thing: the RL have more difficulties to remain attentive. They compare it to watching television at home and explain you don't have to stay always focus :

> *« C'est comme si tu étais devant une télévision. Pour les étudiants, tu as un écran, tu es à distance, alors qu'est-ce que tu fais quand tu es devant la télévision? Ben écoute si tu as le temps de te lever, puis tu te lèves, tu vas chercher quelque chose à manger ou, si ça te tente de jaser avec le voisin, tu le fais même si quelque chose se passe à la télé. » (Participant 4)*

4.1 Teacher' experience

Many factors could impact learners attention. The first is the experience of the teacher. The participants in this study varied experience as a teacher, whether in a regular classroom or in videoconferencing. It appears that a teacher who has more experience is more confident about how to approach its course and when and how to make adjustments. In contrast, a teacher who has little experience of teaching seems to seek his marks and often do not know how to adapt and adjust.

4.2 Group size and number of sites

The participants in this study reported never having control over the place where students are connecting. Some participants have never had more than two sites simultaneously, while others have taught a group spread across seven sites. Regarding the number of students, the experiences of the participants accounted from two to fifty RL. According to participants, the group size is particularly important and could be a contributing factor to the problem of attention among learners.

> *« Oui, les gros groupes changent la dynamique au niveau de l'attention, j'en suis convaincue. » (Participant 4)*

According to most participants, there would be fewer distractions on sites where there are only a few students. However, teachers make some nuances. Indeed, if the size of the group may affect learners' attention, it must still be specify that it can also be a source of motivation in the sense that the energy and commitment of a portion of the group may have an impact on the dynamics of the group, even in other sites.

> *« S'il y a huit personnes dans la classe qui participent beaucoup, les gens à l'extérieur vont avoir tendance à participer beaucoup, à poser les questions, à être attentifs. » (Participant 1)*

4.3 Schedule

The schedule seems to be another factor to consider when it comes to attention in VC. Participants did not emphasized directly the impact the schedule can have on learners' attention, but we noticed they all tried to adapt the schedule by modifying it or adding breaks to maximize the concentration/participation or to reduce fatigue that prevented learners to profit from the course. The participants tested several schedules. Some participants divided their three-hour sessions in three 45-50 minutes parts separated by breaks. Others have tried to do two 90-minutes sessions rather than a three-hour session. It seems they always tried to adjust course schedule in relation to the students. For example, a participant explained that he chose to divide his course in two 90 minutes session per week rather than a single 3-hours course because the content was too complex. He felt it was too much for students considering they were already forced to use VC. Overall, it would be better to opt for shorter sessions with students less familiar with university and longer sessions with graduate students or those who have more experience of VC. Breaks seems important for participants. However, they emphasize not knowing what is best and believe it would be useful to have a guide to choose the optimal number and length of breaks.

4.4 Strategies specific to VC

Furthermore, the study revealed that participants were unanimous on the fact that VC rhymes with extra work. The major difficulty the participants have to face is the lack of contact with students. Also, to compensate, they seek other avenues to facilitate "life" of RL, to capture their attention and help them learn as much as LL. Participants in this study used several strategies they do not use face-to-face. They first use online survey tools or SMS polls that allow each student to participate no matter where he is. They say it help learners to engage.

> *« J'ai vu le changement, des groupes qui ne participaient pas commençaient à poser plus de question. » (Participant 1)*

They then use forums that require students to participate, to get involved, to communicate with each other outside of class. For the forums to work, however, teachers need to reward students for their participation.

> *« Il faut donner des points au forum parce que s'il n'y a pas de points, oublie ça! Ils ne participent pas. Tu es évalué dans ta participation aux forums comme tu es évalué dans tes travaux parce que c'est un travail, une réflexion. » (Participant 4)*

Participants then explained that they use a lot more e-mail, Skype and phone calls. They provide specific times to answer queries of RL and provide them with assistance. This requires much more time than when teaching face-to-face. Teachers interviewed also provide more complementary exercises when teaching in VC. In some context, they also adopt strategies to maximize their own attention. For example, during oral presentations by RL, a teacher required to receive a presentation outline or a copy of the visual support that will be used by students during the VC in order to familiarize himself with the content and thus be able to concentrate more easily on their presentation.

> *« Vraiment, j'ai un cours l'après-midi il y a quatre étudiants qui vont faire les présentations. Je leur ai demandé de m'envoyer leur PowerPoint avant pour que je les regarde l'après-midi ce qui fait que je vais pouvoir me concentrer davantage sur ce qu'ils disent. » (Participant 5)*

4.5 Teaching Method

Participants were invited to comment on the ideal teaching method in VC. It appears that they are divided. The first half of the participants stated clearly that the lecture method is essential. The fact that the group is geographically distributed and the presence of a technical mediator push these teachers to lecture. They use this teaching method to avoid creating an inequity between the different sites. Those participants explain that more interactive teaching formulas are difficult to manage. With the lecture method, all learners have access to the same course. However, they stress the importance of having a visual aid or support document.

The other half of the participants prefer more interactive, open and dynamic approaches. They organize debates, systematically and regularly question students or study cases in a group, etc. Teachers should challenge students, call them by name, ask them to react to the actions and comments of each other to keep them involved. They explain that the communicative style of the teacher is also important. It would impact learners' attention.

4.6 The main difficulties encountered

Participants noted several difficulties in VC that can affect learners' attention. Among these, there are the image quality. Sometimes the image is constantly moving or it is unclear. For them, the poor quality of the image can make it hard to focus. There is also the fact that there is a response delay. This delay can make online learners very impatient and get them to do something else.

Participants also explained that it is difficult to manage a geographically dispersed group. Online students can't easily meet the teacher or other students. When these online learners are grouped to form teams, they often do so based on proximity rather than based on interests or personalities. So there are often conflicts within teams of remote learners who are difficult to manage as they do not really know each other and do not often have the chance to meet in person. Also, teachers often are more likely to watch people on their own site during VC. They believe that it can play on motivation.

> *« Quand tu le regardes le prof en vidéo et qu'il ne te regarde pas une fois pendant un cours (qu'il ne regarde pas la caméra), ça peut jouer sur la motivation. C'est comme si les autres apprenants n'étaient pas là ou n'étaient pas importants. » (Participant 1)*

Another element with which teachers must deal is the culture of learners. This refers to their experience related to VC and education. Some participants observed that there are students who are not comfortable with VC and they are struggling to interact and keep their motivation. Despite the efforts that teachers can provide to get students to interact, some do not react and drop out. In addition, with regard to the education of learners, the participants noted that students in the second and third cycle (master and doctoral student) seem to have an advantage. They argue that this may be related to greater discipline, better working strategies or greater intellectual maturity.

4.7 Support

The research also looked at the support offered to teachers in videoconferencing. Participants complained that they have no educational support.

> *« Quand je suis rentré ici il y a 8 ans, il n'y a personne qui nous a accueilli.*
> *Il n'y a personne qui nous a présenté ce qui était l'essentiel de nos tâches*
> *(...) »* (Participant 3).

It seems that the main support offered is technical. In most cases, a technician would be present only at startup to make the connection and provide basic support (eg, explain how to open/close the mic, show how to adjust the camera, ensure that bandwidth works well and the image is of good quality). The technician would rarely be present or available throughout the duration of the session, even if the situation deteriorates or changes.

The participants explained that they were often given more or less informal support from the people responsible for remote sites or administrative assistants. They often probe the remote students and provide feedback to the teachers. Sometimes they help teachers to distribute additional material or organize additional activities outside of normal class hours. This support greatly facilitate the work of teachers who appreciate it even more since, according to them, teaching in VC is much more demanding.

5. Interpretation of results

The data collected from teachers in this study often overlap with previous studies. This section highlights the similarities and differences.

5.1 Attention and personal characteristics of learners

Giroux (2007, 2010) studied the variation of attention depending on the time and location. He noted that the remote learners have difficulties remain attentive and that attention tends to decrease over time. Teachers interviewed observed the same thing, and it does not matter if they teach maths or nursing or how much experience they have.

According to Giroux (2007, 2010), it seems possible that the observed difference between the sites in terms of attention can be partly explained by a difference in the profile of LL and RL Some teachers interviewed in this study seem to agree with Giroux. Participants, for example, noted significant differences between a professional who already has academic foundation and an inexperienced student who just finished college.

> *« Au 2ième cycle, tout le monde a un diplôme. ... À mon avis si le cours*
> *s'adresse à des gens qui ont déjà une formation de base universitaire, au*
> *niveau de l'attention, il y a déjà une base à mon avis qui est plus solide que*
> *si vous les prenez qui sortent du CEGEP et arrivent à l'université. »*
> *(Participant 3)*

This study also highlights the importance of a sense of self-efficacy of learners. Participants in this study indicate that there are students who are not comfortable with VC and they often find it difficult to interact. Despite the efforts of teachers, these students would be less likely to respond and engage and many would quit. Several researchers have already affirm the importance of establishing a interactive teaching method (Andrews & Klease, 1998; Kaufman & Brock, 1998; Kunz, 2000; Marchand et al, 1999; Mazur, 2000; Motamedi, 2001; Shresta & Sutphin, 1999). The feeling of self-efficacy appears to be a requirement to permit that interactive teaching methods are effective.

5.2 Attention, schedule and breaks

Participants seem to have experienced several schedules,but none seems to be perfect. Giroux and Lessard (2012) concluded that breaks probably have a very low impact and Giroux (2017, 2010) concluded that attention decreases rapidly with time. Considering our participants experiences and our previous research, the best solution appears to be to divide the course into smaller sessions although this sometimes cause organizational difficulties to learners. If this is not possible, increasing the number of breaks seems necessary. Then again, the impact of breaks must be really small because the study participants were unanimous in saying they are still looking guidelines in that matter.

5.3 Attention and teaching method

If breaks do not seem to have much impact on attention, the teaching method appears to be an important factor. However, it is impossible to know what teaching method maximizes attention as teachers interviewed in this study seem to echo the comments of Giroux (2007, 2010), which found that the effect of the teaching method on attention vary by site. Giroux (2007) suggests that although most researchers seem to conclude that it must focus on interactive teaching methods, others rather promote lecturing method and the results of this study suggest that it should still be debated. Among our participants, half favors a lecture method while the other half of the teachers prefer an interactive method. It seems likely that the preferences of teachers in educational method is strongly influenced by their beliefs about teaching and learning. For some, the teacher should be at the center of the process, while for others it must be the learners. As mentioned previously, the choice of teaching method and its effectiveness seems to also be influenced by certain learner's characteristics. In interviews, teachers also suggested that the group dynamics could affect attention, the number of sites and the number of people at each site was related to attention. These factors limit or constrain pedagogical choices. Unfortunately, teachers have very little control over these variables.

Despite the apparent disagreement about the method, all the teachers think they do well and they all explained using several additional teaching strategies outside of class hours. Thus, all participants in this study believe that the time they teach in VC is not enough or that learners can't learn as much in VC (compare to face-to-face). To them, the time spent in VC is clearly not the sole or primary learning time as they use many alternate strategies.

6. Conclusion

The present study confirms several observations made in previous studies concerned with learners attention in VC. Interpretation of the results presented here was mainly focused on three aspects which confirm and sometimes help clarify the hypothetical model explaining the attention presented by Giroux (2007, 2010).

First, learners' characteristics would be particularly important. Participants in this study identified mainly experience. But in their speeches, it is also the age, academic level and cognitive strategies that are discussed. Teachers interviewed suggested that graduate students would be better equipped for learning in VC. It would be interesting to see if this is the case. This could inform the training of university undergraduate students who must take courses in VC. Teachers also explain the feeling of self-efficacy of learners is important in VC. We understand that it could compromise the effectiveness of certain teaching methods.

The teacher then explains the schedule and breaks seem to have little influence. Fittingly, the participants in this study are asking for help or guides. Similarly, research undertaken by Giroux and Lessard (2012) did not allow to conclude on the importance of breaks. Further studies are probably needed.

Finally, the interviews show that there is no consensus about the teaching method for VC. On the other hand, all teachers described many strategies outside the classroom they use to complete their teaching in VC. They also argue that these strategies are generally not required in their traditional courses face-to-face. Thus, VC would not be as complete. VC is more demanding for the teachers than face-to-face. It would be interesting to know how exactly to teach in VC is more demanding.

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Rethinking e-learning accessibility: toward didactic guidelines to design inclusive activities

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Abstract
The international debate on e-learning accessibility has been limited for a long time to the technical standards and parameters; in the recent years a new concept of accessibility is developing, focused on pedagogical, relational and participative aspects for integration and inclusion. The proposal of this paper is to integrate the existing technological standards for accessibility with new flexible guidelines, to ensure the methodological-didactic accessibility, developing a first conceptual framework aimed to build a prototype to be implemented for the different types of disabilities. The paper presents the synthesis of the results of a research work carried out in the Doctoral School of Pedagogy and Social Science of University Roma Tre. The research, started in 2009 and ended in 2012, was based on the assumption that e-learning represents a strategic resource, allowing students with disabilities to overcome the obstacles related to the traditional classroom activities and effectively addressing their special needs. This highlights the necessity to plan and deliver courses that are universally accessible both at a technological and at a methodological-didactic level, to guarantee all students an inclusive learning experience despite their disabilities.

1. E-learning and disability

Elizabeth is 21 years old and is enrolled in the first level degree course at university. This semester she began to attend a course with online activities: debates on thematic resources, written exercises and collaborative work. But there's a problem: since the early access in the e-learning platform, she encountered difficulties in reading and understanding the content, and in interacting with the other students on the asynchronous web forum. Elizabeth, in fact, suffers from dyslexia, and has difficulty making tasks that for other students are simple: reading, writing, understanding the syntax and the meaning of a text (Stella, 2010). In attending lessons and studying she is aided by the student support staff, but now the tasks she has to face are more complex, involving activities to be carried out autonomously such as to communicate, interact and collaborate in writing. Elizabeth explains her problem to the teacher, and the teacher cannot find other solutions that exempt her from the online activity.

Elizabeth is just one of thousands of students with disabilities enrolled each year in a university course. When they try to perform online activities, they face a series of obstacles linked to their motor, sensorial, multiple or learning disabilities. Elizabeth was not able to work with her classmates because, despite she could log in the course e-learning platform, she found inaccessible learning activities and resources. In Italy there are 2,600,000 disabled people, equal to 4.8% of the population more than six years living in a family; 12,403 of them are enrolled in a university course (Banca Dati MIUR-CINECA, 2007). If we consider the dramatic growth of e-learning courses offered by the universities, we can predict that the number of students with disabilities who have to study and collaborate online is intended to augment. The problem of accessibility can no longer be ignored depriving students of a so much important social learning experience (UNESCO, 1994).

This paper presents a synthesis of the results of my doctoral research realized in 2009-2012 in the Doctoral School of Pedagogy and Social Science of University Roma Tre. My work, based on the paradigms of Universal Design and qualitative interpretive research, consisted in the analysis of literature, desk studies and surveys, interviews to experts, data analysis, definition of a framework for the design of e-learning courses, elaboration of methodological guidelines for the design of inclusive and accessible online activities (Guglielman, 2011).

2. The challenge of accessibility

Accessibility can be defined as the degree to which an environment, service, or product allows access by as many people as possible, in particular people with disabilities (UNESCO, 2011); this concept is closely related to the right of access ratified by the Convention of Human Rights of Persons with Disabilities (2006). Referred to the technological dimension, it consists in ensuring that a web site, an interface, a software or a hardware are easily accessible by any user, including people with sensory, motor or psychic disabilities. The most well known accessibility parameters are the WCAG 2.0 guidelines, developed under the Web Accessibility Initiative (WAI) in 1997 and updated in later years, and rapidly imposed at international level as the most widely used standard for web accessibility. (W3C, 2008). In addition other standards and metrics have been developed to ensure digital inclusion of people with disabilities.

At educational level many institutions and governments have enacted norms to make e-learning platforms accessible. But digital inclusion is very often identified exclusively with the technological dimension of accessibility, with the result that disabled students can access to hardware, software and the web, but they not necessarily will access to learning resources and activities (Seale, 2006). If we analyse the components of an e-learning course we can

identify three levels of accessibility: access to the e-learning platform; access to content; access to the activities (Guglielman, 2011).

In terms of access to the e-learning platform, the user must be able to log in, enter in the home page, surf the main sections, edit his own profile, read the information about the course and the notices published on the bulletin board. At this level the focus is on the technological accessibility, ensured by various technical standards and specifications (WCAG and other parameters and guides).

In terms of access to content, the user must be able to access to the learning material and to download it. This accessibility level is technically ensured by specific parameters and tools for converting content in alternative formats (from text to audio, subtitling of videos, alternative descriptions for graphics, etc.).

In terms of access to the activities the user must be able to carry out the activities that take place in the platform and that require to communicate and interact with other people: debates in the forum, collaborative works, knowledge sharing, collective writing on the wiki, synchronous communication.

The standards for technological accessibility are effective on the first level and, in part, on the second one: in fact, is not sufficient to allow students logging in the e-learning platform and download content in differentiated formats. Tools, communication and interaction modes, tasks and working load should be designed to guarantee the access to all students; when it is not possible to ensure that all students participate in a given activity, an alternative but equivalent activity should be proposed. This problem has been faced at different levels and contexts. We are thus able to identify five different points of view from which authors, organizations and institutions have addressed the issue of the accessibility of e-learning courses:

a. The point of view of accessibility of e-learning platforms and software: in this area are comprised the technical specifications for the design of the platforms, for the profile of the users, for the compatibility with assistive technologies, for the implementation of communication tools and languages. The emphasis is on the accessibility of the interface (Straetz, Kaibel, Raithel, Specht, Grote, & Kramer, 2004; Rotta, 2005; Gay, 2006; Arrigo, 2008; Nuccetelli & De Monte, 2010);

b. The point of view of the accessibility of contents: technological standards and recommendations to make contents accessible, and create modules and learning objects by making available educational materials in alternative formats. The emphasis is on the delivery of content (IMS Global Learning Consortium, 2002; Aharpour, Guelfi, Masoni, Conti, & Gensini, 2005);

c. The point of view of the organization of the course: in this case the recommendations are addressed no more to the technical experts or to designers and developers of the course, but to the teaching and managerial staff, who are provided with guidelines and checklists based on the paradigm of universal design, or referred to specific disabilities. The emphasis is on the educational process (Palmer & Caputo, 2003; Australian Flexible Learning Framework, 2003; University of Guelph, 2004; CAST, 2011);

d. The point of view of methodology and teaching: the focus is on the education, with the user as the protagonist of the process. In this perspective we find several works that propose "holistic" approaches, taking into account the different dimensions of a course in terms of participatory planning, providing generic indications that do not enter into the merits of operational strategies and educational activities. The emphasis is on the learner's progress (Kelly, Phipps, & Swift, 2004; Kelly, Sloan, Brown, Seale, Petrie, Lauke, & Ball, 2007; Bel & Bradburn, 2008; Seale, 2009);

e. The point of view of the policies and norms: recommandations and regulations at Community or national level, to ensure the accessibility of technological devices and products and e-learning course concerning specific sectorial areas (e.g., public administration), geographical areas or typologies of disability. The emphasis is on the educational systems (European Charter, 2004; CNIPA, 2006).

In all examined cases, the common indication is to make accessible the training process and open to all students the experience of online learning; nevertheless, no one explains in detail what approaches, strategies and teaching techniques to apply.

3. Designing for all: Universal Design

My research was aimed at filling this lack through the implementation of guidelines that allow designing and implementing accessible e-learning courses, providing methodological and strategic indications. The guidelines realized can be defined as a design framework applicable to academic courses and addressing the needs of students with sensory, motor, multiple and learning disabilities. They have the following characteristics:

- Adaptability: the guidelines are characterized by dynamism and flexibility; as a "wide mesh fishnet" model, they allow to intervene in a versatile manner in accordance with the individual characteristics of the student and of his special needs;
- Individualization: the guidelines guarantee individualization, providing a diversification of approaches and strategies towards the achievement of the same learning objectives (design of alternative but equivalent activities);
- Universal design: the guidelines are set according to the paradigm of Universal Design, which focuses on the user with disabilities and their needs.

Universal Design (UD) is a new paradigm based on the assumption that objects, services and environments should be designed in an accessible and usable way for everyone, not only for users with disabilities, so that there is no need to intervene in retrospect for the removal of barriers (Backroad Connections Pty Ltd, 2002; Council of Europe, 2009). The aim of UD is to simplify life to all, making products, communications and environments universally usable, with benefits for people of all ages and with different forms of disability. From UD are derived two approaches applied specifically to education: Universal Instructional Design (UID), developed by North Carolina State University, and Universal Design for Learning (UDL) whose principles were developed by CAST (Center for Applied Special Technology) (Evans, 2008; Messinger-Willman & Marino, 2010; CAST, 2011). UD is a change of perspective and a reconfiguration in the vision of the education system, with significant repercussions in the educational practices and teaching strategies (Granić & Ćukušić, 2007; Higbee & Goff, 2008).

However, UD is still little known and applied. Although many countries have norms to ensure access to education for all students, there are still barriers represented by curricula, teaching materials, teaching methodologies and assessment mode; despite the growing number students with disabilities enrolling in university courses, educational practices have not significantly transformed in response to their special educational needs. Courses are designed and delivered for a typology of student who responds to a "norm", and students who have diversity are generally classified as "other", for which are studied *ad hoc* interventions and solutions (UNESCO, 2005). In the case of Elisabeth, the teacher has circumvented the problem, exempting her from making online activities and practically depriving her of the opportunity to live a social and collaborative experience with her classmates. In this way the teacher has demonstrated that the course was based on a concept of disability as inadequacy of the person with respect to the product or service. This has caused the exclusion of

Elizabeth and of all students with disabilities from the learning experience, since according to this paradigm is the student who is not able to take part in the course and its activities. But if we consider disability as a health condition influenced by an unfavourable environment and by architectural, communicative, cultural and social obstacles, our vision changes: if Elizabeth is unable to take part in the course, she is not inadequate, is the course that can not address her special educational needs.

4. The design framework

The design of inclusive e-learning courses should involve several stakeholders: lecturers, learning technologists, support workers, developers, managers, and students (Seale, 2006). Although design is a networking and recursive process, we can identify three main steps: a pre-design phase, a methodological phase and a technological phase (Guglielman, 2010).
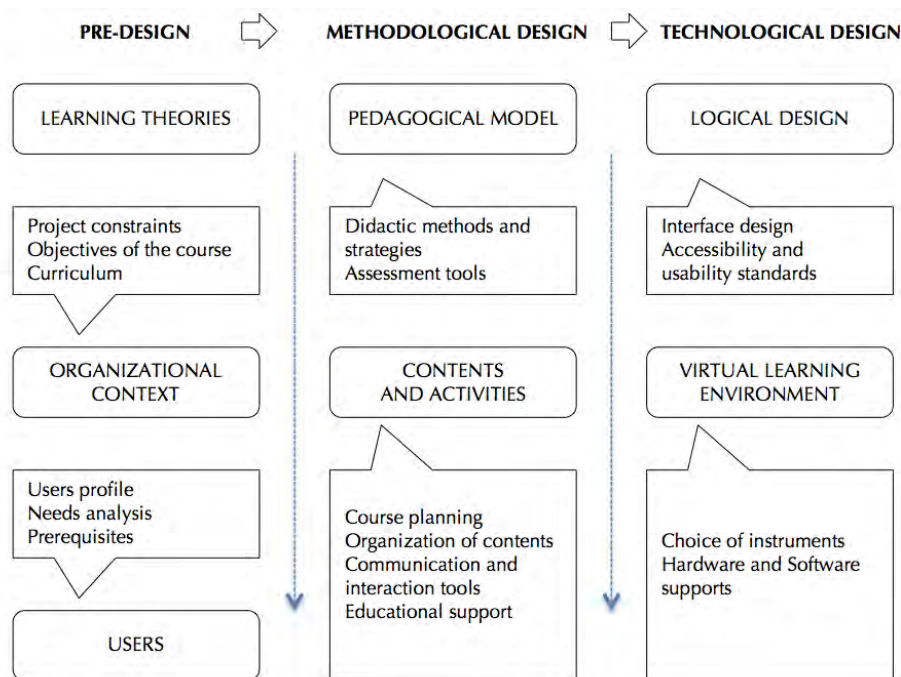
Figure 1. The design framework for the online courses

A. Pre-design

In pre-design we must start from the paradigms and theories that are the basis of the e-learning model we intend to apply. The choice of model implies a theoretical choice and, consequently, the choice of the teaching architecture; in instructional design, models represent the most general level, within which is possible to outline didactic methodologies, strategies, and activities. Only if we have clear the theoretical foundations that are the basis of the assumptions about learning and knowledge process, we can appropriately design the learning environment. Then we have to pay attention to organizational context taking into account the following elements: the design constraints, represented by the available human and financial resources; aims and objectives of the course; timing; number of students that will be enrolled. The further stage is the analysis of potential users: profile, needs analysis, prerequisites. To identify the specific needs of users, we can use a general classification:
- sensory disabilities: blind, visually impaired, deaf;

- learning disabilities: dyslexia, dysgraphia, dysorthography, dyscalculia, reading disorder, dyspraxia;
- multiple disabilities.

A more detailed description can be made with the support of International Classification of Functioning, Disability and Health (ICF), which allows to uniquely and objectively identifying for each person the level of functioning, the potentiality and the ability in relation to the environment (World Health Organization, 2001).

B. Methodological Design

In this phase we progress identifying teaching and communication strategies according to the chosen educational model; a model, in fact, provides the procedural frameworks for the systematic realization of educational paths, allowing defining roles and tasks of the actors, activities, instruments and assessment strategies and tools. Here we describe and schedule the learning paths, plan activities, contents and resources, choose the communication and interaction tools, define the support by teacher, tutors and non-teaching staff. Support staff has a crucial role: it should have organizational, technological, and educational competences and, more specifically, special education competences, also regarding assistive technologies and inclusive e-learning.

C. Technological design

The construction of the virtual learning environment starts with a conceptual design, which consists in defining the communication architecture and the interface design, toward technical usability and accessibility. The design of the virtual learning environment considers, in detail, the design of communication and interaction tools to set up and implement in the course, the identification of the technical support staff, and the hardware and software devices of adaptive and assistive technologies.

The guidelines described in this paper are limited to the first two steps, pre-design and design methodology; the third step, the technological design, refers to the existing usability and accessibility parameters and standards.

5. The guidelines

The term "guidelines" was born in the context of medical science and was subsequently transferred to the technical field. Guidelines are systematically developed flexible and not mandatory procedures that must be applied taking into account the variability of situations; they are used to guide the practitioner in decision-making by providing parameters (Graham, Mancher, Wolman, Greenfield, & Steinberg, 2011).

The guidelines proposed in this paper fulfil the criteria of flexibility to respond to the complexity of the situations in a personalized way, facing change and taking into account the technological innovations. Flexibility is necessary because guidelines refer to various disability typologies: the design of a learning environment can not be generic, but must provide differentiated solutions for each typology, solutions that will be implemented from time to time depending on the profile of disabled users enrolled in the course. The guidelines are structured taking as reference models the existing standards and guidelines for the accessibility. They have been articulated according to the three-steps design framework. Each guideline consists in:
- Reference to the design step: A. Pre-design and B. Methodological design;

- Reference to the stage: A1. Course organization; A2. User profile and identification of prerequisites; B1. Didactic methodologies and approaches; B2. Course planning; B3. Design and structure of contents; B4. Activities and tools; B.5 Didactic support;
- An indication of the type/s of disability to which the guideline applies: visual, hearing, motor, learning disabilities;
- The indicator, which is the recommendation;
- Methodological-didactic descriptors, providing practical guidance and operational strategies to be implemented to address the recommendation;
- The corresponding WCAG 2.0 (where applicable);
- References.
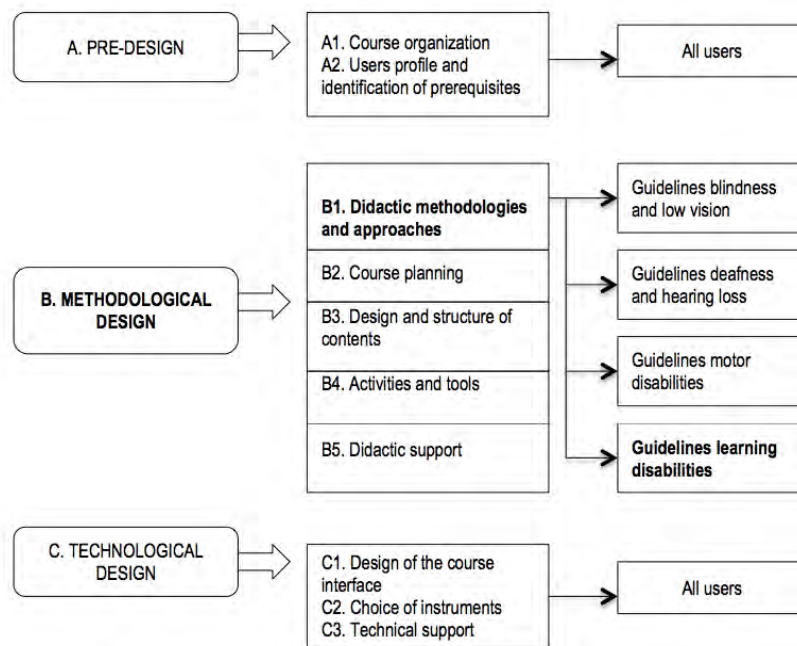
Figure 2. The guidelines framework

The first realized prototype includes 35 guidelines, each one relating to almost all considered types of disability. These are generic recommendations; however, since each type of disability expresses peculiar special needs, it is necessary to decline the guidelines to meet these needs through strategic directions that enter into the merits of teaching strategies and provide solutions for the design of inclusive activities.

B. METHODOLOGICAL DESIGN Typologies of disabilities: visual, hearing, motor, learning disabilities
MACROAREA *B1. Didactic Methodologies and Approaches*
INDICATOR B1.8 – MOTIVATE STUDENTS TO HELP THEM FOCUSING PROBLEMS

Descriptors

a. Ask students to explain the key concepts.
To facilitate understanding of the key concepts you can ask students to discuss them together and organize them building a conceptual map. The map is useful especially for students with hearing impairments and learning disabilities. Alternatively you can ask to comment a video.
b. Invite to summarize the topics.
The summary can concern a topic of the published contents, a lesson, or a debate on the forum.
c. Invite to compare two arguments.
You can ask students to work in groups and use a grid on which to record the points in common and the differences between two arguments.

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Table 1. Example of a guideline

As an example, I declined the B1. guidelines for students with learning disabilities, obtaining 9 guidelines in which are described operative teaching suggestions to realize accessible online activities.

6. Conclusions

My research originated from a series of questions and observations, as an attempt to fill a gap by proposing a first approach about e-learning accessibility, trying to go beyond the mere technological aspects and focusing on methodological-didactic dimension. The guidelines produced represent a first attempt to systematize the indications to make online learning activities accessible to all students, integrating such indications with the standards and parameters for technological accessibility according to the state of art. The analysis of previous researches has shown that so far there are no guidelines for e-learning accessibility that enter into the merits of operational teaching strategies and approaches, and that involve the various professional roles working in the course, in particular teachers, trainers and tutors.

The research had to be limited to a first conceptual framework: time limit imposed to structure the guidelines in a general form, declining only a part of them for learning disabilities. A further work should consider the definition of the guidelines for each specific disability and a testing with students.

Accessibility should not be a matter for specialists: the entire staff of the course should have the competences necessary to effectively participate in the design, delivery and management of accessible online courses. The definition of a new professional role, the e-tutor expert in accessibility, and the acquisition of accessibility competences by the other consolidated roles should contribute to the improvement and enrichment of academic educational offer and to the enhancement of support services for students with special educational needs.

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Application of ICT in pre-service teacher education: The case of Jimma University, Ethiopia

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Abstract
The purpose of the study is to explore the use of ICT in pre-service teacher education program in Ethiopia from the perspectives of student teachers and teacher educators. To this end, an in-depth interview was conducted to solicit data from 12 teacher educators and 14 student teachers. Accordingly, the study shows the use of ICT both by student teachers and teacher educators as a vital pillar for the preparation of would be teachers. However, the use of ICT in each group seemed to vary and further classified depending on the purpose and the degree of use. For instance, ICT use by student teachers identified as learning the application of the ICT as well as learning by using ICT. Learning by using ICT further sorted into teacher educators' directed and self-directed use of ICT. Thus, the article presents these diverse practices of ICT use along with narratives from participants. Finally, implications for further actions for the betterment of ICT use in the area were unveiled.

1. Introduction

The 21stcentury societies demand teachers who are capable of facilitating learning environment in the way it encourages students to interact with and construct knowledge on their own. The demand emanates from the fact that knowledge and innovation are changing rapidly and in a sheer volume, hence, it is difficult for teachers to instruct all essential knowledge at school (Jung, 2005). In addition, as abilities, skills and attitudes required of the real world of work remain fluid and competencies required today can be changed soon in form and quality; students need to develop the capacity and attitude of learning and relearning so that they can respond positively to the changing situations

According to Jung (2005) one way by which teachers could cope up with such demands is through using ICT in their teaching. Citing different studies, Zhang, Tousignant, & Xu (2012)portrays that using ICT in education setting assists teachers to expand broadness and depth of their teaching. Besides, use of ICT facilitates collaborative learning and redefinition of relationship among students and teachers(UNESCO, 2002).

Moreover, teachers' use of technology enables students to see simulated real environments in a class, get exposure to the same thing from different perspectives that supports them not only to broaden their knowledge but also to challenge their understanding, which leads them to be remained active learners (Whetten, 2007).Similarly, it allows students to get connected to external experts and relevant classrooms even in other countries, just from their classroom. In this manner, learning can be initiated in the classroom then students continue with at home and other places where they could get an internet connection (Tacconi, 2009). By and large, ICT also assists teachers as a tool to continue to learn in the course of improving their teaching repertoire(Jung, 2005).

Nevertheless, the integration of ICT use in education setting is not an easy task and it has been a challenge all over the world (Goktas, Yildirim,& Yildirim, 2009). In order to utilize ICT in school settings, teachers need to be equipped with the capacity of integrating ICT in the curriculum and their teaching. The prime venue where they could be trained to do so is the teacher education(UNESCO, 2002). According to Zhang et al. (2012)use of technology should be emphasized in teacher education program so that the graduates will have reasonable abilities of using ICT in their teaching. Thus, this ultimately requires the integration of ICT use in teacher education program.

Keeping this in mind, the article intended to analyze the use of ICT in the new secondary school teacher education program (Postgraduate Diploma in Teaching), hereafter named as PGDT, which is hosted by the Institute of Education and Professional Development Studies at Jimma University (Ethiopia).Accordingly, the article focused on exploring how did teacher educators and student teachers experience the use of ICT in the course of secondary school teachers' preparation program.

2. Context of the study

We believe that it is worthwhile to present for our non-Ethiopian readers the bird's eye view of the context in which teacher preparation in Ethiopia has been conducted. Historically, teacher education program for Secondary schools have been undergone reforms twice within the last ten years. The first reform came into effect as a result of the study conducted in 2oo2 by the Ministry of Education (MOE) which showed that teachers were ineffective in terms of content knowledge and pedagogical skills (MOE, 2003). The report added that the problem was rooted in the teacher preparation program in terms of its structure and instructional approach used. As per the first, the program had existed in a way prospective teachers got less

exposure to school experiences where the practicum was arranged only at the end of the program for a month. Moreover, the didactics utilized by teacher educators were also more of teacher dominated way of using chalk and talk. These factors led to the overall reforms in teacher education program introduced in 2003 whereby high emphasis given to school practicum in such a way that students got school experiences throughout the program.

Besides, One year on the-job training for teacher educators introduced as a requirement to participate in teacher preparation with the intention of equipping educators with pedagogical knowledge and skills (MOE, 2003). However, the recent reform comes to effect in 2010 since the above mentioned program couldn't solve the prevailing problems in addition to its inability to absorb high caliber entrants to the (MOE, 2009). This leads to the current teacher education system (add-on) program which recruits "best performers" among graduates of a three-year bachelor degree in a relevant discipline for secondary school subjects. Ten Universities with sound teacher education background have been selected to host the program where Jimma University is one of them. In this manner, new graduates of all universities in the country from relevant disciplines screened by the Ministry on the basis of their academic achievement and placed in teacher education hosting universities. Thereafter, hosting universities admit after conducting further screening. However, we have a feeling that this approach may not guarantee the recruitment of "best teachers" to the system in the way the Ministry intended. Literatures from countries with high performing schools such as Finland (Sahlberg, 2012) and Singapore (Goodwin, 2012)witness that a selection of teachers need to go deep into the academic background, achievement on matriculation and personal passion applicants have for teaching. In these countries, teaching is among the top professions that attract best achievers. For instance, only one of the ten top applicants have the chance to join teacher education in Finland (Sahlberg, 2012). Taking back the issue to the point of our discussion, prospective teachers we have been discussing are recruited from Social Sciences, Humanities and Natural Sciences disciplines as these are harboring subjects that can be taught in secondary schools. These disciplines, particularly programs which have a direct relationship with secondary school subjects are the last field picked by university entrants. As a result, the academically less prepared students forced to join the program and at the end year relatively best achievers among them are recruited for teaching force.

Coming the program component and approaches, *one size fit all style* of curriculum used in the teacher education. All program aspects and procedures designed centrally by the Ministry of Education and distributed to teacher education institutes for implementation. For instance, curriculum framework of the teacher education program and detail syllabus for each course developed at the center and dispatched for implementation. The same trend is happening in the government secondary schools. All secondary schools are using the same textbooks and for many subjects (nine subjects in this academic year) the same mode of delivery-*using satellite plasma television* transmission has in operation for the last nine years (MOE, 2012). For the nine subjects, the lesson is directly transmitted from South Africa where one period has 42 minutes out of which 30 minutes covered with plasma and the live classroom teacher use the remaining minutes for introducing and culminating the lesson. As our aim is not to argue for or against the plasma television use, we leave our readers with these references in case they need to know what has been written down about the situation of plasma teaching in the country (FDRE, 2004; Bitew, 2008; Dahlström & Lemma, 2008;). In a nutshell, this is the context in which the study was conducted.

3. Research methodology

The aim of the study is to explore the application of ICT in the selected teacher education program from the perspective of student teachers and teacher educators, hence, we opted for a qualitative research approach believing that it would enable us to draw practitioners' experience- based knowledge about the use of ICT. As discussed in Evans, Coon, & Ume (2011), getting into deeper and inner experiences of practitioners is mandatory in the attempt of drawing practitioners' experience about the use of ICT. Such case is possible through the hearings of testimonies from practitioners (Tacconi, 2011) understanding the phenomena from the viewpoint of participants (Mortari, 2009) and then systematically constructing evidence grounded knowledge(Strauss & Corbin, 1998). In a nutshell, the study made use of the mix of grounded theory and narrative inquiry on the basis of qualitative research tenets elaborated above.

Having this in mind, we conducted an in-depth interview with 12 teacher educators and 14 student teachers. All interviews were recorded, then transcribed verbatim. Then, we adapted grounded theory principles (see Strauss & Corbin, 1998) to generate categories as per ICT use in the process of teachers' preparation. Accordingly, the analysis was done through reading and re-reading of interview scripts and labelling the description into concepts. The two authors did this first independently then through joint discussion. The coding was done by considering the major idea brought out by the sentences in relation to ICT use. In doing so, we tried to use the terms used by participants in order to keep the code close to the reality accounted by participants. In addition, we made annotated notes during coding for each concept (practice noted): who did that, how, why and when? In the process of coding, we have compared descriptions against the code already provided within as well as across cases so as to maintain consistency across labels. Following similar procedures, we worked together in letting concepts emerged into core categories according to their similarities and differences (see figure 1). Finally, the presentation of the categories accompanied by narratives produced by participants with particular reference to the corresponding category. In general, all decisions made in the analysis were informed by the critical analysis of testimonies of the participants.

The analysis of participants' interviews as per the application of ICT in the teaching and learning processes had light on the use of ICT by teacher educators and student teachers. The sections to come will present the detail.

4. ICT use by student teachers

ICT use by student teachers viewed by participants from the perspective of learning the application of ICT and using ICT as a tool in the process of learning. In both forms student teachers' use of ICT appears to be in different form and level.

4.1 Learning the application of ICT

Two of teacher educators involved in the study have witnessed that they have been involved in facilitating the Instructional Technology course. They disclosed their experiences of handling the course in the following ways:

When I give them a project […], they are complaining that they don't have ample time for access to the internet. [...] the Institute doesn't have a computer centre meant for them. So, we have taught only

theoretical aspects. [...] Even I am focusing on the media aspects, [i.e.]using local available instructional material than the technology. By the way, the syllabus is also giving emphasis to teaching of instructional aids from locally available resources than technology. We are conscious that we cannot assist them develop skills in using ICT in this way (T8/2). [...] I modified the syllabus in the way technology aspects get more emphasis but I couldn't implement it because of access to ICT facilities. As a result, even students are commenting us that we put the learning of ICT in the course outline but that was remained untouched (T8/4).

[...] no resource centre[…] to teach the practical aspect of the course. […] I am simply showing them how they can use for example, LCD, overhead projector, internets and the like (T9/2). […]At the end of the semester, I asked them to evaluate the course. Then, the first feedback they gave me was ...<In general the course is good and equipped us with important skills we need as school teachers. However, your course is falsifying itself, it didn't touch the parts that seemed main target in the syllabus >. Yes, I didn't deny and explained to them why it was happened and promised them as well to treat well for the next batch (T9/8).

As can be understood from the above accounts, learning the application of ICT did not go beyond the theoretical concept. Almost all student teachers participated in the study shared similar opinions with these educators. Here is a remark taken as a sample:

There is one course named instructional technology, and we are taking that. We are learning ICT [...] but we are not practicing with it. [...] I don't think that it is even useful since the facilities like computers; the internet and the likes are not available in [remote] schools where the majority of us are working(S1/2).

Moreover, it is worthwhile to consider the following heart touching expression from one student teacher who further takes us to his habit of learning the sole theoretical concept of ICT use in his undergraduate program.

To be frank, I don't have the skill (*of using ICT*). Theoretically, no problem as I have taken the course […] at undergraduate level. The problem is with the practice and having of skill as a result. At our undergraduate level, we have taken ICT courses with two credit hours. We learned the theory and taken the theoretical exam. I never touched computer throughout the course. In this program, students of other departments are using the computer lab of their department but we are not getting that […] however, it is possible to use from the library but for a limited time. It is not helpful for a person like me who doesn't have basic skill of computer use (S9/2).

Learning the basics of ICT is a stepping stone for the successful use of it in the daily routines of citizens. Therefore, mastering the operation of ICT to a certain level is a requirement for its successful application in the area of interest and that is why the government has introduced ICT as a subject of study starting from Secondary school (MOE, 2012). However, from the above narrations we can learn that learning the use of ICT in the undergraduate program and learning the application of ICT in teacher education programmes remained to be theoretical, which made the current student teachers lame of using ICT.

Learning by using ICT

Participants of study witnessed not only learning of theoretical concepts of the application of ICT but also revealed that student teachers are using ICT as a tool in the process of their learning.As presented in the sections to follow, they are doing so either due to the direction from their educators or on their own.

Educators' directed use of ICT

Teacher educators found to be directing student teachers toward learning through ICT for various reasons. Among which purposefully designing lesson in the way student teachers accustomed to the use of ICT is one. The following quotes are samples taken from interviews:

[…] Whenever I give assignments, I always encourage them to use PowerPoint and overhead projector for their presentation […](T1/6) […]. In my class there are 24 students and I divided them into four groups. And I gave them assignments but to make the presentation using either PowerPoint or Overhead Projector. It is surprising that one group composed of six members refused to use such devices mentioning that they didn't have the skills to manipulate. Then, I insisted and I assisted….showed them how they could use it. I even gave them the material to practice at their own time. Finally, they managed that way. So, reluctance is probably because of the fear that they don't have the skill, otherwise when they did their presentation with PowerPoint and after that, somehow they were happy (T1/1o).

In the syllabus nothing was stated. But my experience is quite different. My students are involved in the ICT lab. [...] they use the internet from there to prepare presentations. […] For example, I asked them to search for the concept of teaching algebra in school. It could be from grade 9-12 and then I asked them to search for its application, the value of teaching it in high school and how of teaching it […]. This is my creativity and it is not mentioned in the syllabus. Because I know that the issue of ICT use is not included in our teacher education system (T6/4).

We are taking different subjects but it is the subject didactic instructor who taught us the use of ICT in teaching. He did not only teach us in the classroom but also he gave us assignments that we have to use a computer. At the first instance, we told to use a computer from the Education library but that is only for 30 minutes and the30 minutes have gone while the curser is rounding up to open the site we put on. Then, we explained the situation and asked him to change the assignment so that we could do with our own preferences. However, he insisted and found the way out where we would use the computer as much as we want. He made us to use the Physics lab (S12/2).

In addition, others are guiding students to learn by using ICT as supplementary to the conventional mode of delivery they used. Stated hereunder is a report from one teacher educator among others who have claimed of doing in a similar way.

To address the issue of ICT in my course, I included in the course outline some websites. Then I provided them assignments […] and warned them to synthesis their report after making thorough reading of materials from the internet as well as other sources. Moreover, I usually advise them to refer to the website recommended where they can get plenty of resources on multicultural education with a single click (T7/2).

Still there are others who are leading student teacher learn through ICT just to ease the burden from their side. Hereunder is the case to mention:

I gave them the assignment to look for an article related to methodological aspects of Civics Education from online sources and present the synthesis of the article of their choice. I was awaiting them for sometimes but they couldn't do it. I don't know maybe they may not know the how of searching online resources. [...] I wanted them to look for the article not because I wanted to expose them to ICT use but to ease my burden. Finally, I gave articles from my own database; I have about twenty of them which I have used for different purpose (T5/2).

As can be seen from the above descriptions, teacher educators' intention of letting student teachers lean by using ICT differs and that has an impact on the extent to which they insisted

on scaffolding learners to the extent they mastered the use of ICT. Accordingly, as can be understood from the narration of T5/2, he provided an assignment that involves the use of ICT just as a means of getting time for his own business, but his students failed to locate resources and perform the task he required them to do. Then, he provided them the hard copies from his database rather than supporting and pushing them in the way they might have developed the skill. Similarly, there is no evidence of assisting students to use ICT as a means of learning from those educators who have been claiming the use of ICT as a supplementary to their conventional approach. However, teacher educators who integrated ICT with the intention of assisting student teachers develop the skill of using ICT were noticed in pushing students to use ICT till they reach where they wanted them to be. As can be seen from the narration of T1, he scaffold particular group of students who couldn't make use of ICT. In a similar way, T6 & S12, have been engaged in facilitating resources where student teachers could get the opportunity of practicing with ICT facilities rather than being frustrated and diverted their plan as a result of resource constraints.

Self-directed use of ICT

As already indicated, student teachers participated in the study witnessed the use of ICT in the processes of learning at their own time without having strict notation from educators. Of course, there are pulling factors for that, among which student teachers' prior exposure to the internet use is remarked as an important factor among respondents who reported that they are using ICT as a routine in the course of their learning. The following extract speaks about this claim:

I have been using a computer from the time of secondary school. While I was in grade 11 , I used all my free time to explore a computer. The teacher locked me in and I used as much as I wanted. In the university, again I kept on using as of the first year. Now, access to an internet connected computer is relatively okay and I am using it regularly. […] Internet is becoming my primary sources for assignments, and getting relevant information on my area of study (S10/2).

In addition, the "efficient" way of getting the required knowledge from the internet and the provision of learning tasks like assignments even if teacher educators don't give directives for the use of ICT in performing the tasks are other reasons for student teachers to keep on using ICT in their own way. The following quote is ground for the points mentioned.

The existing situation itself pushes us to use ICT. Now, going to libraries and searching of hard copy, then reading the whole or portion of a book to get the required information is tiresome. So, approaching friends who have a laptop, searching the relevant information by putting assignment questions on the internet site and then, taking note of available information is becoming a usual task for us (S4/4).

However, it has to be noted that the use of ICT in teaching and learning process should not be let to encourage academic dishonesty and duplication of facts and myths overcrowding the web pages. In this situation, ICT falls short of serving the purpose it meant for: enhancing the skills of identifying relevant information and synthesizing knowledge on their own than duplicating what has been stated in the textbook. Apart from this, the above accounts show us that learning through the use of ICT is possible even in the resource constraint context as long as student teachers have the interest. Such interest seems to be emerging from the previous exposure to ICT use. This has an implication for working towards equipping students from the lower levels so that they may see the value of using ICT in their daily routines.

5. ICT use by teacher educator

Participants of the study have also considered the use of ICT by teacher educators as one the important aspect of ICT application in the teacher preparation process. Educators' use of ICT in the process of facilitating teacher education classrooms has a dual purpose. The first and the overt advantages is the facilitation of student teachers' learning of the content. The other is the tendency of letting prospective teachers replicate the use of ICT in the process of teaching. They may observe what their teacher educators are doing and such observation may lead them to imitate the practice in their later teaching. For example, the majority of secondary school subjects presented through plasma television but student teachers are not practicing with such technology during their teacher education program. However, one of the student teachers interviewed in this study claimed that such gap would not have an impact on her teaching as she had undergone her secondary education through such transmission. This implies that even the way student teachers learned in secondary school has an impact on the extent to which they prepared to use technology.

[...] I learned my secondary education in plasma and I know well what is expected of the classroom teacher. You need to find the plasma program from the internet, then reading on the area ahead of a class since the plasma teacher may teach something you don't know. In that case, it is a problem if students ask you a question. [...] So, in the same way, I may read ahead and get prepared for the student's question (S3/10).

In relation to this idea, there is a saying that teacher are teaching in the way they themselves were taught. Hence, educators' use of ICT in their teaching has even more influence on prospective student teachers learning as they would easily notice the benefit it has for students' learning from their own experience as a student. However, the issue here is how far do teacher educators in the context of this study use technology and how far is that effective in facilitating learning of the would be teachers? In this case, most teacher educators' use of ICT is not beyond PowerPoint presentation. As shown in the following quotes, we came across only one teacher educators claiming of going beyond that at least in using Videos from YouTube in his teaching. Of course, one of the student teachers mentioned one teacher educator whom we didn't interview as active in using this kind of resources in teaching contents requiring visualization.

Actually in the delivery, most of the time I am using PPT (T1/6).
I have tried to use PPT slides in my teaching. And this has an implication as they are getting exposure at least (T7/2)
[…] I am using videos from YouTube for my lesson and at the same time showing them that they can use for a similar purpose from such sources (T9/4)

6. Discussions

The article intended to explore the application of ICT in pre-service teacher education from the perspectives of student teachers and their educators. This has been presented under different thematic areas in the above sections.

The application of ICT in the teacher education program under investigation presented the use of *ICT by teacher educators* and *student teachers*. Previous literatures on ICT application looked at the way learners used ICT in the process of learning rather than that of teacher educators (Goktas, Yildirim, & Yildirim, 2009; Jung, 2005). However, ICT use by teacher

educators seemed to reinforce the occurrence of similar behaviour in student teachers. Nevertheless, limited number of teacher educators' use of ICT in their teaching: even that is limited to the use of PowerPoint and YouTube video is a challenge as the majority were using the conventional approach.

Coming to the ICT use by student teachers, *learning by using ICT* and *learning the application of ICT* emerged as a major point of focus. Learning the application of ICT entertained through inclusion of "Instructional Technology" as a common course. Although growing bodies of literature speak of learning through ICT than learning the use of ICT for the successful transfer of ICT use into classroom teaching (Angeli & Valanides, 2009; Engida, 2011; Jung, 2005); teaching the application of ICT until they master the skill deem important as having the basic skill is a prerequisite for successive use. However, the problem is when student teachers' learning of such skills is merely more of a theoretical and doesn't lead itself further to the mastery of the skills, which is the case in the context of this study. The effective use of ICT in education setting demands integrating the knowledge and skills of Technology with that of pedagogy, content and the existing context (Angeli & Valanides, 2009;Engida, 2011). Merging the learning of ICT as an instruction method in specific discipline particular discipline didactics would help as a stepping stone for the development of such abilities. However, it is a pity that such case was noticed only in one course syllabus.
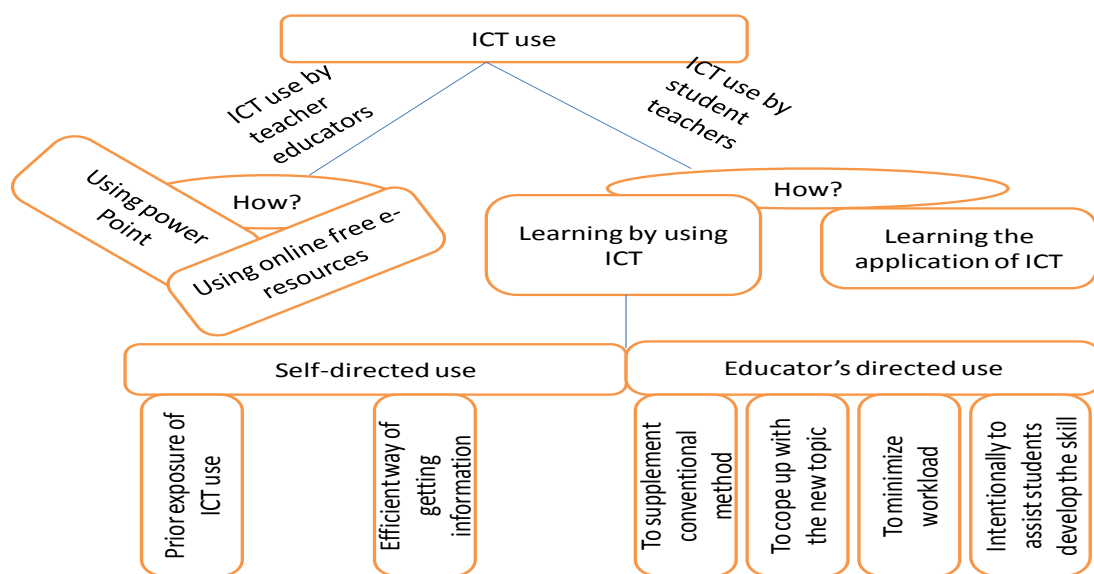
Figure 1: ICT in use

As per *learning by using ICT*, learners engaged in the process either been *directed by their teacher educators* or on themselves, and we named these respectively as *educators directed* and *self-directed use of ICT*. There are various driving forces behind both ways of learning by using ICT. Deliberate attempts to assist learners develop the skill, for the sake of supplementing the conventional approach of teaching, minimizing teaching load and coping up with the a new topic were identified as driving forces behind the educators directed use of ICT. Educators who claimed that they were leading student teachers to learn through ICT for the purpose of assisting them develop the skill differed from the others in orienting, facilitating resources and scaffolding student teachers to the extent they master the skill. Whereas others who were reported of leading student teachers use ICT as a means of reducing the load from themselves and as a way of providing supplementary resources didn't force or

enforce the student teachers use of ICT. What is more, we would like to bring forth the logic behind leading learners use ICT as a means of coping up with a new topic, as reported by one educator. He was handling the only course that harboured portion of using ICT to teach secondary school subject. The case was new for him hence he gave the portion as an assignment which was to be presented in class. At the same time, he said he was preparing himself using the same websites until the date of the class. In this case, ICT assisted not only student teachers but also educators as a resource. Besides, including ICT use in the nationally prepared course syllabus is relevant in enforcing educators to implement it in their teaching even if they don't have prior experiences.

Regarding the rationale behind student teachers' self-directed use of ICT as a tool for their learning, prior experiences of using ICT and perceiving ICT as an efficient way of getting the knowledge they required were richly indicated.

In sum, the application of ICT in teacher education program ranges from the use of ICT by teacher educators to student teachers with different purposes and levels. Among this, it is obvious that it is the self-directed use of ICT that has long lasting effect for learning and using of ICT in their subsequent professional career. To reach such peak, however, directing student teachers towards learning by using ICT is commendable. Moreover, use of ICT was not seen as consistent across teacher educators and student teachers. Some teacher educators were using ICT in their teaching and also intentionally pushing student teachers to learn by using ICT while others seemed that they were far from such practices. Some student teachers are actively using ICT in the process of learning disregarding the existence of pressure from educators while others were reluctant and setting the prerequisite conditions as an excuse.

6.1 Implications

The study comes up with the following points as areas for further action to ameliorate application of ICT in the preparation of pre-service teacher education.

- Learning the operation of ICT is skill based and skill based learning requires practice otherwise what is learned remain to be inert knowledge. Therefore, training of students on ICT at different level needs to be reconsidered.
- It seems that the application of ICT in the programfalls short of using for the purpose of collaborative and independent learnng as well. Therefore, this could be a key area in the case of redesigning the program in line with ICT integration.
- Some teacher educators were using ICT in their teaching and also intentionally pushing student teachers to learn by using ICT while others seemed that they were far from such practices. Some student teachers are actively using ICT in the process of learning disregarding the existence of pressure from educators while others were reluctant and setting the prerequisite conditions as an excuse. Therefore, further investigation that would pin to factors to be strengthened and others that need to be ameliorated so as the attempt of equipping the would be teachers with competences of ICT use is required.

6.2 Limitations of the study

The study is qualitative in nature, hence it may not be generalized to other contexts. Besides, the page limit didn't allow us to present the details of procedures we went through while developing the categories.

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Online tutoring as a teacher's challenge in higher education

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Abstract

The situation of counseling and tutoring is often complicated whether it takes place in traditional or virtual environments. The most central theme in both face-to-face and online-tutoring is the relationship between the teacher and the student, i.e. the dialogue. In addition, a teacher acting in a teacher-tutor's role is a group-leader and group dynamics and group processes become equally important. The aim of this research is to find out experiential outsets for the teacher-tutors´ continuing education promoting wider and deeper themes of online-tutoring. The target group of this study are teachers who participated in the education of teacher-tutors (N=14) in Oulu University of Applied Sciences (OUAS) in 2012-2013. The research questions are: (1) What are the teachers' conceptions of the challenges of supporting individual learning processesand dialogues in online tutoring (2) what are the teachers' conceptions of the challenges of supporting collaboration in online tutoring and (3) what are their conceptions of the needs for professional development in online tutoring? The findings show that online-tutoring was conceptualized from the paradigms of contact teaching and face-to-face tutoring and the teachers felt ill-equipped in front of the new demands. Reflecting on their experiences during the tutor education helped them face the contradictionsand re-conceptualize the themes of online-tutoring.

1. Introduction

The present study will deal with online tutoring as a teacher's challenge in higher education. The study concentrates on tutoring and tries to explain how to conduct an individual counseling discussion and construct active working groups in the web.

The theoretical background of the research is collaborative learning based on humanistic-constructivist learning conceptions and socio-constructivist views. Tutoring is a central concept in this study. It can be defined by examining its relationship to teaching and counseling. The shared "heart" of teaching, tutoring and counseling mean dialogic support of learning. Tutoring is located somewhere between teaching and counseling andit overlaps them both (figure 1). Teacher-tutors' tasks include both individual support of learning and professional growth as well as the leadership of the student group. Teacher-tutors are in a teacher's and tutor's role simultaneously.
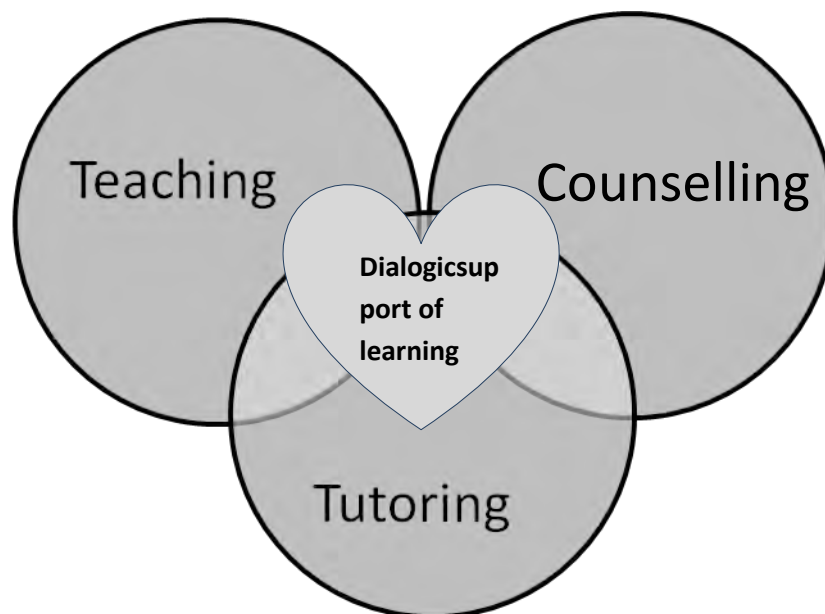
Figure 1. The relationship between teaching, tutoring and counseling.

Teaching, tutoring and counseling have common elements in classroom as well as in the web. Online tutoring refers to tutoring with some synchronic applications like Adobe Connect. Web tutoring is considered a larger concept; it is defined as tutoring via any web-based applications.

Online tutoring was one of the topics in teacher-tutors' education. The topic was carried out as an aquarium discussion. The purpose was to join experienced and inexperienced teachers. Aquarium discussion is a collaborative learning method, where a few students or experts reflect a given theme while the rest of the group is listening. The listeners join the discussion after 15 minutes. Aquarium discussion starts from reflecting experiences and goes on to the shared knowledge construction.

Four themes were formed for the discussion. They concentrated on individual tutoring, group formation, supporting learning and developing online counseling and tutoring.

- How does online individual counseling differ from traditional individual counseling?
- How does online group formation work and how is the process promoted?
- How is learning supported virtually?
- How can online counseling and online learning be developed?

The themes didn't delimit to online-tutoring which would have been a difficult topic alone. Instead almost all the teachers had experiential knowledge of web teaching which is a close theme with web tutoring. As defined earlier, teaching and tutoring are overlapping concepts.

2. Research methods

The research was carried out with phenomenographic approach which brought the concepts, beliefs and assumptions of the teachers to the focus of the research. The aim was to find out experiential outsets for the teacher-tutors´ continuing education with wider and deeper themes of online counseling.

The questions of the study were:
1. What are the teachers' conceptions of the challenges of supporting individual learning process and dialogue in online tutoring?
2. What are the teachers' conceptions of the challenges of supporting collaboration in online tutoring?
3. What are the teachers´ conceptions of the needs for professional development in online tutoring?

2.1 Participants

The target group of this research were teachers who participated in tutors´ education (N=14) in Oulu University of Applied Sciences (OUAS) in 2012-2013. Participants presented five different educational fields.

2.2 Material and research setting

The material of this study is a transcription of a video from the earlier mentioned aquarium discussion during the teacher-tutors' education. The duration of the discussion was 56 minutes. Three experienced teachers started the discussion and the others joined after 15 minutes. The themes were given in advance to the experienced teachers and were introduced to the others at the beginning of the discussion.

2.3 Study Method

This study was carried out with a qualitative approach. The method used was content analysis. Both qualitative and quantitative analyses were made. (Eskola & Suoranta, 1998; Tuomi & Sarajärvi, 2002.)The analysis units were utterances of a few words, one or more sentences or a dialogue which contained a meaningful conceptual and logical unity. The analysis units can be called meaning units. (Ahonen 1994, 143; Koskinen, 2011, 272 – 273.)The material yielded 83 meaning units.

The procedure is qualitative which means that there were no hypotheses set in advance. The questions to be answered were specified on the basis of the categories which emerged from the material. The research process is described in figure 2.
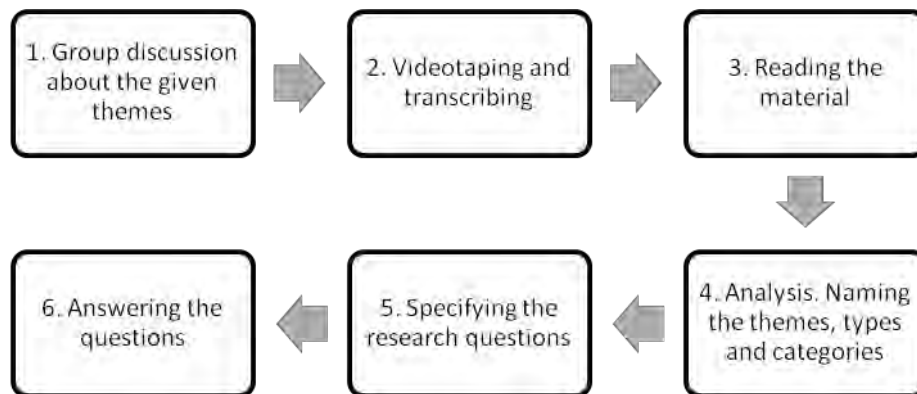
Figure 2. The research process

2.4 Reliability and the limitations

The results of this qualitative study are suggestive and, unlike in the quantitative studies, they are not to be generalized, but proportioned outside the target group (Alasuutari, 2012, 249 – 250). Attention has been paid to the reliability by performing the analysis with care and reporting accurately how the results have been achieved (Ahonen,1994, 131). The phenomenographic approach which was chosen includes the idea that conceptions are interpreted as a process of giving meanings which are deeper and wider than just opinions. The phenomenographic research is descriptive by nature and produces new data through the conceptions of the participants. (Ahonen, 1994, 117; Koskinen, 2011, 267-268).

3. Results

3.1 Qualitative analysis

During the reading and transcription processes the material was opened from three dimensions simultaneously. The first observation was that there emerged three themes from the discussion concerning people´s talk. The second notion was that the teachers talked about the pros and cons of online teaching and tutoring. After a closer study a typology of painful points, successes, knots and opportunities was formed. Thirdly there were distinguished categories that describe the meanings emerging from the discussion.

Themes

Themes that emerged in the discussion were:
- Supporting individual learning process and dialogue
- Supporting collaboration
- Teachers' needs for professional development

Types

Types that were formed were named:
- Painful points
- Successes
- Knots
- Opportunities

Painful points refer to teachers' speech about things in web-tutoring and teaching that don't work. It brings their negative attitudes and preconceptions to the daylight as well as their negative experiences. Successes, on the other hand, tell that there have been many good experiences of web-tutoring and web-teaching when teachers have succeeded and felt competent. Knots are themes that teachers felt uncomfortable with and recognized as demands coming from the organization and the change of the environment. It is remarkable that they could also produce suggestions of solutions to the problems they recognized. The knots can be called soluble problems or knots to be opened. Opportunities are good new ideas that may work and help the teachers. Opportunities also open the views to the future; they are corner stones which the transformation builds on.

Categories

Eighteen categories were formed from the material. Categories describe meanings given to online teaching and tutoring. The three-dimensional combination of themes, types and categories is presented in table 1.

Themes	Supporting individual learning process and dialogue	Supporting collaboration	Teachers' needs for professional development
Types			
Painful points	Dialogue in the web is inhuman.	Group forming in the web is unnatural, unequal and inefficient. Students have no competence.	Teachers have no competence, get no support and have no time.
Successes	Students' self-assessment works well in the web.	Students have shown activity in group forming and collaboration. Nice experiences.	Experiences of new ways of learning new skills.
Knots	Documentation of the development of competences. Should be modeled for everyday use.	Maintaining the students' activity.	Recognition of the demands of new competences to be mastered.
Opportunities	Might work in certain situations.	Students' self-motivated collaboration. Teachers' creativity.	All teachers have basic skills in IT. Motivating others and sharing good practices. The issue in not technical but collaborative.

Table 1. Summary of the qualitative analysis.

The painful points of virtual teaching and tutoring were, according to the teachers´ conceptions, the inhumanity of dialogue. The painful point in team building and collaboration seemed to be the labored character of virtual group work. Teachers considered their skills in online teaching and tutoring defective. IT support or support in pedagogical methods are not organized by the organization, and if they are sometimes available, the teachers have no time to train new skills.

On the other hand, teachers had also experiences of success in web teaching and tutoring. The students´ self-assessment appeared to be successful via the web. The teachers had also experiences of active and skillful students who drew all the group to virtual interaction with their action. Being student-centered, team building in the net took place naturally. Teachers´ personal positive experiences of interaction in experimenting various technologies were also revealed. As an example new kind of training days in virtual teaching were mentioned. Many-hour training days had been changed into short "quick tips" – occasions for which teachers had been able to arrange time.

The documentation of the student´s skills was seen as a challenging demand which is not yet under control. Online tutoring should be modeled to a familiar everyday tool so that it would not remain only for special cases.

Maintaining the students´ activity in online interaction was recognized as one of the challenges of teachers. It appeared that the students were active in online discussions for the first two weeks after which they gave up discussing. The promising start should be supported in the future so that the student activity will be maintained. The rise of the recognition of new competence demands of teachers is a very important and interesting category. Understanding the need of developing personal competence is a key and the first step to transformation among teachers.

The possibilities recognized by teachers also open perspectives to the future. They regarded online tutoring as a chance to improve the quality of thesis tutoring. Online tutoring would undoubtedly bring additional possibilities to tutoring, when the student carries out the practical training in another locality. It was also seen as a way of realizing the tutoring of socially sensitive students who find it difficult to discuss openly face-to-face. In promoting cooperative action teachers saw the opportunity of student-centered virtual team building and collaboration which will contribute online learning and tutoring. The teacher´s creativity and imagination exceeding the technical capacities of the chosen application to invite students to interaction was also brought up.

The teachers also recognized the possibilities of developing their own competences in online teaching and tutoring. All teachers already had sufficiently good basic skills in IT; nobody started from a zero. Motivating colleagues and sharing good practices also strengthened the teacher identity as an online teachers and tutors. Deficiencies in technical skills and the availability of technical support were brought up in discussion, but also the conception that technical challenges are not primary in promoting online teaching and tutoring; instead the question is about the teachers´ skills of cooperation and collaboration.

3.2 Quantitative analysis

The quantitative analysis of the meaning units (meaningful utterances) of the themes and types is presented in tables 2 and 3. Table 2 reveals that collaboration and professional development were the two most "inspiring" themes. The participating teachers possibly felt virtual collaboration the most challenging everyday theme from the viewpoints of both teaching and tutoring. Individual online tutoring was not in everyday use, accordingly there was less talk about it. The aquarium discussion was included into the teacher-tutor's

education in which they were participating and the situation offered an appropriate forum to face the needs to gain new competences collaboratively.

Themes of the discussion	Number of the meaning units (f)	Percentage of the meaning units (%)
Challenges of supporting individual learning and dialogue	12	14.5
Challenges of supporting collaboration	33	39.7
Teachers' needs for professional development	38	46.8
Total	83	100

Table 2. The themes of the discussion by the numbers and the percentages of the meaning units.

The quantitative examination of the typology emerging from the research material shows that most often the teachers wanted to discuss the painful points and difficult experiences connected to online teaching and tutoring most often (table 3). The emerging of the painful points indicates that there is a dilemma between the demands of the organization and the competences and the resources of the teaching staff.

Types	Number of the meaning units (f)	Percentage of the meaning units (%)
Painful points	31	37
Successes	14	16.5
Knots	18	21.5
Opportunities	20	25
Total	83	100

Table 3. The types of the discussion by the numbers and percentages of the meaning units.

The analysis shows that the aquarium discussion within teacher tutor training provided a good opportunity to deal with both the demands of the organization and reflections of personal resources and competences in joint interaction.

4. Transformative learning

The results of this study can be introduced as a process of transformative learning. The process proceeds from reflecting the experiences to the critical self-reflection of the assumptions and beliefs on which the interpretations of the experiences are based on.

Mezirow (2009, 94; 2011, 86) presents the process of transformative learning proceeding through 10 phases.

1. A disorienting dilemma
2. Self-examination with feelings (like anger, shame etc.)
3. A critical assessments of assumptions
4. Recognition that one's discontent and the process of transformation are shared collaboratively
5. Exploration of new roles, relationships and actions
6. Planning the course of action
7. Acquiring knowledge and skills for implementing one's plans
8. Provisional trying of new roles
9. Building competence and self-confidence in new roles and relationships

10. A reintegration into one's life on the basis of conditions dictated by one's new perspective

The phases from 1 to 5 were present in this study.

The process began with reflecting on the former positive and negative experiences, beliefs and assumptions of web-teaching and tutoring. Painful points presented the starting point of the process when learners interpreted their former negative experiences. They faced a disorienting dilemma rising from the discrepancy between the demands of the organization and their competences with negative feelings. On the other hand, there were experiences which were interpreted as positive and built the basis of transformation. Knots and opportunities represented the phase where the previous experiences were opened and discussed. It made it possible to enter the revision of concepts and shift the meaning perspectives towards new competences and a new identity of a web-teacher and web-tutor. Figure 3 illustrates the aquarium discussion as part of a socially shared transformative learning process (Mezirow, 2009, 91 - 93; 2011, 84 - 86).
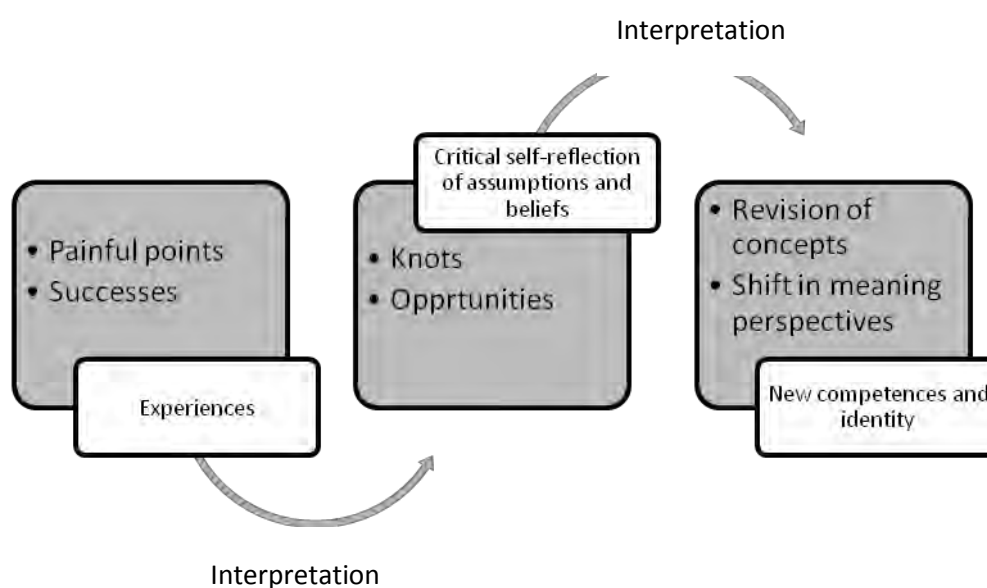
Figure 3. Aquarium discussion in teacher-tutors' education as a transformative learning process.

4.1 Individual tutoring in the transformative learning process

"It (web) is no way a human place for individual encountering." "Gestures are not real, you don't sense them." "They come with a delay."

The first quotations above bring out that the dialogue in web is challenging. That can be seen as a teachers' assumption that dialogue in web should be the same as in face-to-face encountering, which leads to an experience of a dilemma. In the next quotations there appear critical self-reflections of the concept of individual tutoring: what is individual online-tutoring, which are its goals, when is it useful and which are the roles of the teacher and student? The concept of individual tutoring is expanded; it shifts and transforms the conceptual framework.

"Self-assessment works". "Might work in certain situations (when a student is in internship or writing her/his thesis in a distant place, a timid student may prefer)" "Documentation of the competences in the web would facilitate both student and teacher."

4.2 Collaboration and group work

"Team building in the web is inefficient". "It isn't natural." It lacks socializing". "Students have no competence".

In the quotations above teachers talked about the problems of collaboration in the web. They seem to regard it as the same as in the classroom, and also think that students' inactivity is the result of their poor technical skills. The teachers continued in the quotations below by bringing out positive experiences and feelings. Also the reconsiderations of the students' autonomy and agency were brought to the discussion as well as the teachers' capacity of renewal. The concept of collaboration in the web came to include new meanings and, consequently, its framework was transformed.

"Students' team building has succeeded very well". There have been active and responsible students in the web". "Group work in the web is fun."

"Students are active during the first two weeks. How can we maintain their activity?"

"Students are active in the web when they are self-motivated". "Creativity and testing different methods of group work, (not limiting to the tools of the application) would help the teacher."

4.3 The teachers' needs for professional development

"We haven't yet succeeded". " Technology was the real problem". "It (support) lacks in the whole university". "It takes more time". "Just have no time".

The teachers talked first about the problems they had encountered when bringing out the assumption that online tutoring took more time than traditional tutoring and that the applications were insecure in use and learning to use the web tools was difficult.

"Teachers were able to arrange time for short instructions. Scaffolding helps in the start. Nobody starts from the zero with IT". "One needs to look at the mirror. This is a place of developing yourself." "The issue is not technical, but collaborative."

The discussion continued with the positive ideas concerning their earning. These opinions were very central in self-reflections. Recognizing the issues to learn and the obstacles to be crossed could be seen as critical self-reflection and the first steps towards new competences and new identities. Transformation begins when we ask ourselves what we want to learn and what we want to become? In this phase the teachers' talk seemed to convey a tacit question: Me as a web-tutor, what do I have to do to become a web-tutor?

5. Conclusions

By the extension of web-based learning, the need for web-tutoring correspondingly increases. Thus, this study anticipates the future. The current study explained that the teachers compared their conceptions of online tutoring to the face-to-face dialogue and traditional class room group work. The challenges of enhancing dialogue and collaboration emerged centrally from the material. This finding is supported by previous research. According to Bennett & Lockyer (2004, 237) and Matikainen (2003, 64 - 66) interaction in the web lacks social clues, and the phenomena of group dynamics in the web are weak.

Previous findings reveal that there are different views of the priority of mastering the technology. Mällinen (2007, 199) emphasizes teachers' autonomy in technical skills and the priority of pedagogic competence in learning to use web-based teaching. In this study the teachers' competence of collaboration was raised alongside with technical skills.

Collaboration is no doubt one of the most important competences of a teacher-tutor. The teachers recognized the future challenges and needs to develop themselves through critical self-reflection. According to Mezirow (2009, 94) the recognition of the needs to develop oneself is the first step in individual transformative learning process. The critical reflection of the teachers' former experiences, both challenging and encouraging, was enabled during the group discussion. The contradictions between the demands of the organization and the competences of the teachers were raised to the discussion as well as the teachers' needs for developing competences.

6. Discussion

Collaborative and transformative forums of learning are appropriate in developing web-based and online teaching and tutoring. Transformation of the meaning perspectives and learning new online culture in peer groups is a meaningful experience for teachers.

Transformation from online tutoring vs. face-to-face tutoring to *blended tutoring* (Garrison, 2011, 75 - 76) is worth discussing. Garrison (2011, 23 - 24) introduces the concept of *social presence* meaning the students' and teachers' ability to produce socially and emotionally identified personalities in web-based learning environments. Individuality and personality in online tutoring and experiences of social and emotional meaningfulness are remarkable themes of future research as well as blended tutoring.

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Digital literacy in teacher education. An integration model

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Abstract
Teacher education in Sweden has been subject to criticism for not providing teachers-to-be with relevant knowledge and skills concerning the pedagogical use of ICT. Only as late as in 2005 a nationwide investment was launched and three projects commenced with the overall aim of enhancing ICT competence within teacher education.

One of the projects was called LIKA (Learning, Information, Communication, Administration) which brought together four institutions of higher education in Stockholm region. This six-year project engaged approx. 600 teacher educators and 6 000 pre-service teachers in 245 different activities with the scope of integrating digital literacy in teacher education programs within the participating institutions.

The project developed a holistic model for integration of ICT with digital literacy as a key concept including theoretical, didactic/pedagogical, and technical competences.

In a holistic model, digital literacy is established both on the individual and organizational levels with the goal of developing a learning organization where collaborative knowledge creation and learning constitute vital parts of everyday actions. This can be obtained through long term commitment of all personnel in systematic improvement of courses and curricula through experimentation and competence development.

Keywords
Digital literacy, teacher education, competence development, learning organization.

1. Introduction

Digital literacy as a generic skill is regarded as a condition for economic development in knowledge based society and will enhance student's and children's desire to learn (Recommendation of the European Parliament, 2006/962/EG). Swedish teacher education has long been criticised for not providing enough training in ICT for teacher students. These were some of the reasons for the Swedish Knowledge Foundation (http://www.kks.se) to initiate a large investment in implementing ICT in teacher education. One of the development projects was called LIKA which was launched in 2006. Key target groups for the project were teacher educators, teacher students and in-service teachers. The project was a six-year collaboration between The Royal Institute of Technology (KTH), Stockholm University (SU), Royal College of Music in Stockholm (KMH) and the Swedish School of Sport and Health Sciences (GIH).

The goals of LIKA were to introduce digital literacy as a progressive part in courses and programmes throughout the teacher education, strengthen the relevance and quality of teacher education on a long-term basis and also to enhance integration of ICT in teaching practices so that technology would become a natural component in the profession of teaching.

To work in a time of pedagogical change is a challenge. The shift from teaching to learning, from teacher centred to student centred education raises questions on what learning is about. Teachers need to find new ways of teaching and learning. Active learning, such as collaboration, communication and creation of meaning and understanding, is important (English, Hargreaves & Hislam, 2002).

In this paper, we discuss the experiences from a development project that aimed at taking another kind of approach to ICT implementation combining the latest technology and participatory and collaborative approaches to teaching and learning.

2. This is how we thought. About project ideology

The central idea of LIKA was to regard digital literacy holistically as processes of Learning, Information, Communication and Administration, which teachers must acquire in order to develop professional teaching and learning activities in a modern society. Digital literacy could serve in all the activities of a teacher. The project wished to avoid the idea of ICT as something additional, something separate. On the contrary, it was to be seen as a part of all work.

The acronym LIKA combines the four processes central in the project: *learning process* means that the individual knows how to apply ICT as a pedagogic tool in a teaching and learning environment and knows how to explain fundamental aspects of ICT in society and how the technology will influence ethical values. Further, the individual needs to learn to analyse his/her own digital competence. *Information processes* imply that the individual is able to understand information search and to judge relevance, validity and reliability of information and be able to explain fundamental legal aspects of information use. *Processes of communication* refer to the ability of the individual to demonstrate how to manage and mediate different media (data, text, photo visual, audio visual files, pictures) for presentation, communication, teaching and learning. In *administrative processes* they must be able, as teachers, to demonstrate how to apply ICT as an administrative tool and be open for new applications and demonstrate understanding of documentation processes, respecting secrecy and integrity.

The holistic view implies that the challenge of the project was how to systematically integrate digital literacy in teacher education. ICT needed to be seen as a natural 'ingredient'

in a learning organisation. There is evidence that ICT projects have too often been separated from the everyday activities and thus remained marginal in educational organisations (Riis et al., 2000). We wished to avoid this pitfall and invested in a holistic view right from the beginning.

First of all, the project needed to define 'digital literacy' - how it would be understood in this project so that a common ground for project work would be established. This was done together with the teacher educators and teacher students through interviews and a large survey. The investigations resulted in a threefold definition of digital literacy including three different competence areas: didactic/pedagogic, technical and theoretical competences.

A digital theoretic competence requires up-to-date knowledge about research within the field of ICT and learning and understanding of the implications of different theoretical perspectives to the use of ICT.

A digital technical competence implies the ability to use ICT and be updated regarding the technical developments in order to be able to use ICT as a tool in teaching, information, learning and administration.

A digital didactic /pedagogic competence is to be able to judge when, what, why and how ICT can be used as a pedagogic and methodological support for learning. Teachers should be able to choose methods and digital tools suitable to the content and the context.

Having established the ideas of all-encompassing, holistic approach and the three perspectives to digital literacy, the project moved to the second phase, the actual implementation of ICT in teacher education programs.

3. This is how we worked

3.1 An organisation for competence development

From previous projects (Riis et al., 2000) and our experiences we drew the conclusion that it is of vital importance to have a holistic perspective to change, otherwise the project would just die out after the initial launch due to lack of resources and engagement. The holistic approach, in our understanding, implies that an organisation needs to be treated as one whole entity and planned development activities need to be tied together into a meaningful whole, not forgetting that each individual in the organisation needs to be engaged in the development endeavour. The sense of common ownership of development is crucial for its success.

The organisation of development work in the form of a project is also problematic. Project is limited both in time and resources, and the work often ends when the project is over. Development work needs to be embedded in the organisation in order to achieve permanency and sustainability. Otherwise the change that has started within a project will die out as the project ends.

Many a development project has been depending on a single person – a pioneer, an enthusiast – that has given everything to the project and when this person has left the organisation or burnt out due to the lonely effort, the organisation has just continued with its old ways and the development work that was initiated disappears from the agenda. It often happens that when a single person takes the initiative to an innovation, others in the organisation handle over the responsibility to this person and act as if they had no part in the development work. Leaving development work for a single person is not a sustainable strategy but, unfortunately, a very common one.

Introducing "DKA"

Regarding the lessons of the past projects and experiences, we introduced in our development work a slightly new role which we called "digital competence responsible" (in Swedish: digital kompetens ansvarig, DKA). We recognised the vulnerability of a single person and hoped to create a more sustainable organisation through a network. The function of DKA was introduced at every participating department so that we thus could also create a network of people working together with the development activities over the department boarders. It was essential to give this person a clear mandate from the department leadership and also to provide the resources for the activities. In this way, the department leadership could signal that the work is important for the department, as time and other resources are assigned to it. It was no longer an assignment for one single person but a common task of developing the whole department together.

When choosing the person, it was important to find someone not only with a genuine interest in pedagogical use of ICT but also someone who would be able to support and help colleagues to initiate and develop pedagogical ideas in relation to ICT. We were not looking for a technical support person which so often becomes the sole role of an ICT-pedagogue.

Technical support needs to be resolved in an organisation within the overall technical service structure. Our vision for the DKA was to be a person who would stay à jour with the developments in the area of educational research, be acquainted with the latest research in pedagogical use of ICT, act as an inspirer introducing novel ideas and technical possibilities in the organisation, a matchmaker bringing together different competences and perspectives for fruitful collaborations, a visionary with the ability to show possible paths towards an exciting and challenging future, and also a practical planner responsible for the overall planning of the development activities.

Being a DKA was, of course, a very challenging task and those who accepted the job developed slightly different strategies for carrying out the task. Some of them worked in pairs at their department being thus able to give more visibility and power to the development activities. They could seek support and inspiration in one another and the project was not as vulnerable as it would have been in the case of a single DKA.

Introducing development group

A strategy that we found successful was the one when the DKA established a development group right from the beginning of the project with the task of planning and carrying out the development activities within a department. The group would also monitor the development and evaluate the work continuously.

The members of a development group were in many aspects those who Rogers (1983) defines as "early adopters", those with genuine and profound interest in the ICT and in the ways of finding pedagogical application for the technology.

The two core activities within a department of higher education are teaching and research. These are to be combined in ways that facilitate fruitful interaction between them. Research activities should be linked to teaching so that teaching activities can introduce new research results for critical examination and feeding back to research with new ideas and questions in a constant flow. This is how we can contribute to the quality of both education and research.

In addition to the dynamic relationship between teaching and research, creation of favourable conditions for a learning organisation even other dimensions are required: systematic competence development and experimentation. These two can be seen in close connection to both research and teaching. Experimentation can be part of both teaching and research giving the teacher/researcher possibility to try out novel ways of working. This can

be done individually, but as we found out during the project, the work becomes much more fruitful and rewarding if it is done in collaboration between colleagues.
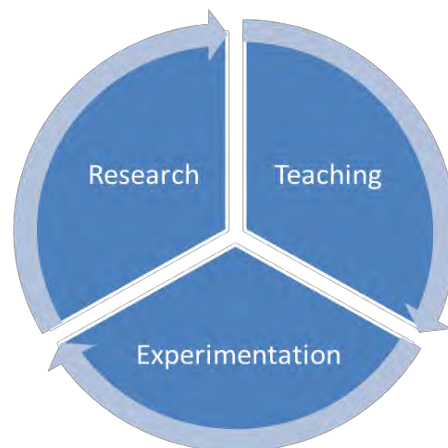
Figure 1. Learning organisation

The fields of activities shown in Fig. 1 were gradually merging into a continuous process of interaction and knowledge creation. Engeström (1987, 2001, 2010) calls this 'expansive learning' where the learner no longer is a single individual but a collective or a network. In our example, at the core of the learning collective was the development group who planned and carried out various development activities. The members of this group often showed their ways of 'doing things' to their colleagues in informal situations and helped out in 'emergencies'. This created a relaxed atmosphere of trust and friendliness where achievements were not the issue but where equal colleagues would explore, experiment and discover together new practices with the technology. Learning situations are thus open, flexible, and informal. In addition, there is immediacy to them: they emerge out of a need or curiosity when colleagues sit down together and discuss and solve the dilemmas of everyday actions.

4. Activities of competence development

4.1 Systematic integration of ICT through course syllabi

One of the activities centrally initiated in the project was the syllabus inventory. This was done with the purpose of making visible the teaching practices that already included ICT. As teacher education had been so heavily criticized over the years, it was important to show both within the organisation and outside the organisation what actually had been done and was being done every day. This approach was more constructive and gave the teachers/researcher possibility to discover and define on their own what was in place and what needed to be developed.

Another aim of the inventory was to start a more general discussion about the role of ICT in teacher education and the meaning of digital literacy in this context. Even though some general guidelines and goals have been established for teacher education regarding ICT, it is still essential that each teacher defines their personal practices and the practices and contents that need to be part of their subject matter and course materials.

The actual inventory was carried out with the help of a general matrix developed and provided by the central project. The matrix was based on the three competence areas that were established as defining digital literacy.

Term	Course	Didactic competence	Theoretical competence	Technical competence	Examination	Course literature

Table 1. Matrix for the syllabus inventory

The inventory of syllabi brought to light the difficulties in meeting different goals and interests. ICT is often regarded as an additional subject that is 'stealing' time and resources from other subjects. What we needed to do was to change the mind set of teacher educators in this respect: ICT was not there to 'steal' but, on the contrary, to 'support' and 'enhance' teaching and learning activities. The goal of implementation was to integrate ICT, i.e. to teach with ICT, not to teach about ICT.

The matrix worked well in both making visible the use of ICT that already was in place and pointing out the areas where further competence development was required. From the organisational perspective, it was of great importance that specific time was allocated to the inventory and that it was done in connection with a general syllabi revision, all this signalling that ICT was not something additional but an integral part of educational activities.

Experimentation

As a way of working with competence development we were forced to think in novel ways as the traditional courses, seminars, and workshops were not particularly successful forms of competence development. Extremely occupied teacher educators were seldom available for activities they regarded as something not directly connected to their teaching. This is why we encouraged experimentation with their teaching. Development group turned out to be a good support in experimentation. Colleague-to-colleague discussions, tips, hands-on situations made it easier to both understand how things could be used and also gave the necessary 'push' to actually try out and implement new practices with ICT.

A vast amount of development activities were carried out during the six years of LIKA project, some 245 in total. Here are some examples showing the wide range of activities that took place.

- Math coach, student teachers help pupils in schools with mathematics. A special program was created in order to support pupils in schools with mathematics. The same idea of coaches was later applied in language education for refugee children. Both activities became very popular among pupils and the programs are still continuing.
- Video in sports and health education. At the GIH, teacher students and teacher educators experimented with documenting sports sequences with video clips and then analysing the images in order to better understand the movements.
- Mobile learning was one of the many areas where experimenting small projects were carried out at all four institutions using different devices. This was connected with the parallel developments in schools with laptops, tablets, and smartphones.
- Student teachers worked and analysed lessons they held with interactive whiteboards.

- Study circles were formed with the purpose to give teacher educators a possibility to learn about latest development in educational research in ICT.
- Work with photos. In teacher education specialising in preschool, a digital photo archive was created to support essay studies and research.
- International exchange, among others with the Netherlands. We worked with knowledge exchange and visits between the Netherlands and Stockholm University regarding digital portfolios. All teacher students are supposed to work with digital portfolio in their in-service training at Stockholm University and Avans School of Teacher Training and Learning at Breda.

5. This is what we learned

The aim of the project was to systematically implement ICT in teacher education in ways that suited the different educational institutions. Collaboration between the four institutions, the Royal College of Music, Stockholm University, Swedish School of Sport and Health Sciences and the Royal Institute of Technology gave us a lot of opportunities to exchange ideas and try out different strategies for development.

6. A tool to understand digital literacy

Applying the model with the three different areas of digital literacy among teacher educators, researchers and students was helpful in the systematic integration of ICT in teacher education. The model made visible the three central aspects in digital literacy and thus helped the teacher educators to reflect systematically on their teaching practices from these three specific angles. The model made the notion of digital literacy more concrete and palpable and at the same time it gave boundaries to the development work: it was within these three areas that we needed to work.

From the technical perspective, we discovered that it is important to be able to use ICT and have confidence in using it as a tool in teaching. This requires that there are sufficient opportunities to train and acquire experience. Available technology, support and guidance must be planned for and organized to make teacher educators comfortable working with ICT.

The theoretical perspective implies that awareness about the relationship between ICT and theories of learning is needed for a deeper understanding of ICT and its possibilities. We decided not to take a standing for a specific theory but rather take into account various theoretical views of the teacher educators.

The didactical/pedagogical perspective is probably the most complex one as it implies that ICT needs to be understood in the context of teaching and learning not as a separate phenomenon. It was essential to elaborate with both theory and practice as well as to problematize the integration of digital competence in teaching and learning. It was central to understand how the use of ICT would change the way of teaching and thus affect learning (Cox and Marshall, 2007). This was something each teacher educator needed to discover and experience by themselves. New practices needed to develop out of conscious didactic/pedagogical choices.

Internet promotes different styles of teaching, thus new ways of working together for teachers and students were found (Lawson and Comber, 2000). Today, teachers have to be open for interactive teaching with creativity, group discussions and a lot of various teaching methods (English, Hargreaves & Hislam, 2002). This underlines the importance of being open to new things in the profession. In an expansive learning context, experimentation becomes

possible and is encouraged through collegial interaction and exchange of ideas and methods. Teachers' self-confidence is not to be underestimated when working together with colleagues. Collaboration can enhance and build-up the confidence that is needed for working with new tools and methods, like ICT (Sime & Priestley, 2005).

7. Organisational conditions for ICT integration

An important understanding was that digital literacy needs to permeate all work and cannot be a side activity involving only a few in the organisation. It is too heavy for individuals to pull a whole department by themselves, even if the leaders support the work. Larsson and Löwstedt (2010) write that even if you have the ICT tools, the power of change is in the social system. You have to pull together as an organisation and create a joint vision. In order to do this, a learning organisation is required. A learning organisation focuses on competence development and realises what kind of learning is needed in relation to the environment (Pedler, 1996).

Tornero (2004) writes that digital literacy is a complex process involving not only an individual but also the organisation and culture of a department. A question we asked ourselves was how we can engage organisations in a constructive development, in an academic environment that includes lots of individual freedom? Is it even possible to implement something without engaging all levels in the organisation? We learned that it is a key to holistic development and learning organisation. We thought that the most appropriate organisational unit for development work within an institution of higher education would be a department as they often are independent enough and not too large for all-encompassing initiatives.

Information, open, distinct and regular, supports the learning within the organisation (Kezar, 2005). In a learning organisation it is everybody's responsibility to be informed about new developments in ICT and to communicate about them. Dialogue with the environment outside the university is crucial for development. Networking is one way of doing this.

Qualities that have been recognized for a sustainable development can help us from a theoretical point of view. What we also learned is that teacher educators' time and motivation are a huge challenge in development work.

In a holistic model, digital literacy is established both on the individual and organisational levels with the goal of developing a learning organisation where collaborative knowledge creation and learning constitute vital parts of everyday actions. This can be obtained through long term commitment of all personnel in systematic improvement of courses and curricula through experimentation and competence development. "The Learning University" is a concept D'Andrea and Gosling (2005) use. The university is not only a place where students learn, the university as an organisation is also learning.

The idea of a learning organisation makes it very clear that a successful integration of ICT can be obtained only through a holistic thinking where all parts of the organisation and all aspects of everyday activities are included in a continuous development work. This means that we need to abandon the idea of projects as solutions to development issues. Permanent change requires permanent organisation, a learning organisation.

During the project, we developed tools to facilitate a learning organisation (see table 2). In our holistic model we used Learning, Information, Communication and Administration as useful theme areas. The project shows that L-I-K-A is a useful conceptual model for transformation because it pulls together the areas that often are kept separate in development work. So we developed a similar matrix for each of the four theme areas.

Below is an example from a matrix developed to support to plan and organize learning in an organisation. First, the current situation is described in order to create a baseline. Secondly, planning for the required activities is planned. After the activities an evaluation is taking place leading to new inventory and planning for further actions. It is important to take all the three levels - departmental, group and, individual - into account. This cyclic, systematic approach was well received and laid a ground for a continuous development work.

Learning	Description of current situation Inventory	Planning How to proceed? Actions What/When/How	Evaluation Analysis New description of current situation Planning
Learning – Culture Is learning a natural and regular element? How to organize learning at different levels? How can the staff learn from each other's practise?	Dept. level Group level *Individual level*	Dept. level Group level *Individual level*	Dept. level Group level *Individual level*
Competence development Competences needed within the department. What are individuals or groups requirement to be able to be digital competent pedagogic, theoretical and with technology?	Dept. level Group level Individual level	Dept. level Group level Individual level	Dept. level Group level Individual level
Resources Individual and materialistic resources at different levels. Courses/scaffolds to help teachers develop digital competence. Digital media and support Learning environments	Dept. level Group level Individual level	Dept. level Group level Individual level	Dept. level Group level Individual level

Table 2. A Learning matrix for competence development.

Through the matrix, participants were able to gained valuable information of and insights into their own organisations. It also helped to raise important questions about competence development. It soon became quite obvious that learning requires a lot of administration, organising and planning. It could not take place by itself. Questions were raised: Does the institution have a culture that promotes learning? What resources are assigned to enhance digital literacy?

We were also able to show the central role of information. It must be up-to-date, transparent and regular which implies to communication as well. Open and inclusive communication is essential.

8. Conclusion

The six-year development project LIKA was successful in drawing attention to the possibilities and challenges of ICT and its implementation in higher education institutions in general and in teacher education in particular.

The systematic work with the notion of digital literacy has proven advantageous. Through the project, digital literacy has got a voice in the organisation bringing it to the everyday agenda of the institutions. ICT and digital literacy need to become natural, everyday practices, not something to engage with only through special occasions and projects. The rapidly changing technology also requires constant attention from us. The competence development needs to be continuous. Lifelong learning should not be just a buzz word but a true reality in the information society.

In order to realise lifelong learning, we need to create proper conditions for learning organisations. In LIKA project, we have learned that time and other resources are of crucial importance, but as important is the creation of collegial exchange, interaction and experimentation as a ground for mutual learning or 'expansive learning' as Engeström (1987) calls it. We can only agree with Pedler (1996) when he describes one of the roles of learning organisations to identify the needs for learning in relation to the context. A learning organisation is not just open inwards; it is also open outwards to the society and can thus register the new impulses of change and adapt to those.

A learning organisation is open through its members. Individuals need to be open and curious about new technological developments. In the case of ICT, there will be new tools all the time thus changing the conditions for teaching and learning.

Individuals in a learning organisation need to be flexible and daring as risk taking is part of change. They must have opportunities to train and acquire experience. Available technology, support and guidance are important. Yet another aspect of being part of a learning organisation in higher education is to recognise the dual role of educator: to be a teacher and a student at the same time.

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"School 21": a project to implement active citizenship skills in the Italian higher education. The role of ICT.

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Abstract

To face globalization challenge, education is required to develop complex attitudes and critical skills in students. Although the Italian secondary education conveys good contents and trains specialized professionals, it is in trouble to prepare critical and aware citizens. The project "School 21", proposed since 2009 by Fondazione CARIPLO (Milan, Italy) to the secondary schools and the vocational training centers (more than 3000 students involved), improves the curricula through an interdisciplinary teaching and training methodology focused on local sustainability problems. A detailed learning plan constitutes the essential instrument of the project; it allows the teachers to connect the citizenship skills of the students to the disciplinary contents, the educational methods, the teaching aids (ICT) and the expected output from the students. A set of quality criteria orientates the teachers in the planning of the knowledge process. Also the assessing process is supported by a system of indicators specifically defined by a preliminary participated research. In the project, ICT play the role of *educational place*, allowing the students to explore in a systemic and meta-cognitive way the disciplinary contents and to implement a solution to a local problem. ICT provide facilities also in the management of the project and in the coordination activities by the teachers' boards of the involved classes.

Keywords
ICT in higher education, active citizenship skills, educative place, sustainability, globalization.

1. Introduction

The recent developments of the systems science highlighted the complex network of interactions supporting the organization of living systems (Capra, 2007); however, for a comprehensive understanding of the phenomenon of life, this pattern of organization has to be embodied in a physical structure and this embodiment has to become the outcome of an ongoing process. But living systems are also social systems (Zeleny & Hufford, 1992) and, therefore, the systemic conception of life can be extended to the social domain integrating a fourth perspective: *meaning*. In the 80's of the last century, the dissatisfaction with the dominant understanding of the living as molecular-genetic, as well as of the process of mind and cognition as information processing, led Maturana & Varela (1980) to propose the concept of *autopoiesis* to define living systems and to realize that life and cognition are actively done by an agent, an autonomous being who does not suffer passive encounters, but shapes a world of *meaning* from within (Weber & Varela, 2002). The cognitive subject is never isolated and folded into itself but it copes, relates and couples with the surroundings and provides its *Umwelt* (Uexküll & Kriszat, 1934), its own world of sense.

Referring to the human social system, Bruner (1996) emphasized that the meaning-making process is central to the knowledge of the surrounding reality and that school education is one of the most effective tools to help people in this process; he stressed how teaching, in the human society, is an interactive and intentional process which takes place in contexts different from those in which the gained knowledge will be used. So, in order to face the complexity emerging from the reality, school education has to develop in students not only knowledges but also a net of critical attitudes and skills which will allow them to highlight the relationships between phenomena apparently distant, to include personal experiences in a universal context and to face the problems encountered in their everyday experiences in a systemic way (Morin, 1999).

The secondary education systems currently show difficulties to address the challenges arising from the emerging global perspectives both in national and international contexts (Carnoy, 1999). In Italy, formal education conveys good contents to the students, training professionals specialized and technically competent, but still shows problems in developing their critical thinking and their aware and responsible acting as citizens (Mayer & Tschapka, 2008). On the other hand, at the end of the secondary cycle the Italian Ministry of Education requires schools to assess and certify the students' key skills of citizenship, as recommended by the European Community (European Commission, 2007).

Aware of the need for a change in the attitudes of young people towards significant areas of knowledge involved in the issues of globalization and for a reinforcement of the skills to practice conscious and critical behaviors, CARIPLO Foundation (Milan, Italy; Delai, 2005) proposed in 2009 the "*School 21*" project, with the main objective to promote the improvement of the Italian educational processes and to encourage the commitment of young people in the local community.

1.1 The "School 21" project

"School 21" is a project addressed to the secondary schools and the vocational training centers of the Lombardia region (north-western Italy); as outlined by the title, the project refers directly to UN Agenda 21 (Stiraz, 1993), aiming to the involvement of the local community for a change in behaviors and lifestyles, and to a sustainable education (Sterling, 2001). It is focused on four sustainability central issues: biodiversity, renewable energy sources, environmental quality and climate changes. To address these issues, an

interdisciplinary teaching method is proposed to combine a rigorous analysis of the involved scientific concepts with the design and implementation of a concrete action which could contribute to the partial solution of an identified and related local problem. The proposed educational path must be included in the curricular activities of the participating schools and will feature an extensive involvement also of the whole institute (teaching, administrative and management staffs), a strong link between reflection and practice (Loughran, 2002), the awareness of the complex and uncertain nature of scientific knowledge (Funtowicz & Ravez, 1993) and a participatory and joint planning approach (Forester, 1999).

The path is arranged on two consecutive school years: the first includes the investigation of the students' and teachers' prior knowledge about the selected topic, followed by the direct involvement of the students in the global and local contextualization of the issue and in the collection of essential data crucial for the planning of a local action related to the problem; the second year is devoted to the implementation of the local action.

The "School 21" project has been designed during the 2008-2009 school year through a participatory planning process which was attended by selected representatives of all the parties involved in the path (experts, teachers and students), who benefited of a prior and brief update on the key sustainability issues. This planning team developed also the tools and the materials needed for an effective involvement of the schools.

The central instrument to design the educational path is the "*teaching plan*"; since the submission of the application form, each class plans in detail the structure of the learning units wich will allow to achieve its knowledge goals and to implement its local actions. Through this plan the teachers are required to link together the knowledge areas involved in each educational activity, the amount of curricular hours employed, the impact of interdisciplinarity in teaching, the educational methods and aids that will be applied, and the key citizenship skills that will be activated in the students. They have also to stress the *quality criteria* to which each planned activity refers, chosing them from a checklist previously set up by the planning team on the basis of the results of the SEED project (Breiting *et al.,* 2005). The quality criteria cecklist has not been established as a control device for the evaluation of the quality of teaching but to orient the teachers in the construction and planning of meaningful learning units. So, in view of the promotion of an effective educative process, such a teaching plan allows to reinforce the teacher's awareness about the close links between the object of teaching, the teaching features and the planning process of the educative path (Breiting *et al.*, 2005). In addition, to highlight the relationships between the quality criteria inspiring the educational activities and the teachers' and students' outputs allows to underline that in the School 21 project the educational effort is mainly aimed at the construction of a *scaffolding structure* (Wood et al., 1976) which allows to promote in students a direct responsibility in learning.

The assessment of the citizenship skills activation in students, requested by the Italian Ministry of Education, was developed according to Wiggins (1993); an observation grid based on 26 indicators, each declined on five levels of graduation, has been designed to guide teachers in the evaluation.

The project "School 21" was tested during the school years 2009/2010 and 2010/2011 through the participation of 34 selected classes (about 800 students involved) and then, after an upgrade of its features based on the obtained results, it was proposed via a call for funding in the following school years 2011/2012 and 2012/2013 (approximately 2500 students involved).

2. ICT and students' citizenship skills implementation

ICT play a central role in the School 21 project. A dedicated and structured website (http://www. fondazionecariplo.it/Scuola21) offers comprehensive information on the project; it provides the educational tools and materials that enable teachers to prepare the teaching plan and to evaluate the citizenship skills developed in students. In addition, it includes detailed accounts on the main results obtained from the involved schools and supplies a complete bibliography. All the bureaucratic procedures for the selection and funding of the proposals are also performed on-line.

However, also on the side of learning paths this project offers interesting insights on the role of ICT in education.

In recent years, a growing number of authors investigated the role of ICT as a *learning space*: their main focus was on *peer cooperation* (for an updated discussion see McLoughlin & Lee, 2007, 2008; Uden & Damiani, 2007; Cochrane & Bateman, 2009; Hara, 2009; Cochrane et al., 2012), on the *interactive class* (see MacLaughlin & Lee, 2010; Wilton & Lam, 2012), on *virtual learning environments* (see Chou & Liu, 2005; Wilson et al., 2007; Weller, 2007), on *lifelong learning* (see Punie, 2007; Ala-Mutka et al., 2008).

To contribute to the discussion, the concept of *anthropological place* defined by Augé (1992) can be extended to formal education, providing an interesting insight about ICT in education. The definition of *anthropological place* provided by Augé is: "*a place which is a principle of meaning for the people who live in it, and also a principle of intelligibility for the person who observes it*". How can ICT be turned from an educational space to an *educational place*? To answer this question we can analyze some results of the project School 21.

One of the requirements that characterize the project is the request, to each participating class, to provide the project Committee and uninvolved people with a complete and up-to-date information on the work in progress; both in the testing phase and in the call for proposals phase, websites, blogs or social networks have proven to be the most effective tools to communicate such information. The Italian schools have long used the Internet resources as a repository of teaching materials, information and documents (Gobbo & Girardi, 2001), but, if students are given the responsibility to administrate these instruments, something changes in ICT epistemology (Angeli & Valanides, 2009). To highlight such a change we can analyze some items coming from blogs or logbooks of the activities, administrated by the students.

To introduce on Facebook the work of their class, some students wrote:

"*The opening of this blog allows us to realize our project: to inform people as possible on climate change, on environmental problems, on their causes and remedies that man can find. We will do it through articles, photos, evidences and information about our studies and thanks to the initiatives that the school and the city offer us. You can participate in the blog by leaving comments and giving us your opinion about it*"

It clearly appears how, moving on the web, these students already show to be in touch with what has been proposed by Bruner (1996): to become a *principle of meaning*, education can support young people to give sense to the complex and highly interconnected surrounding world by shifting its focus from disciplinary knowledge to the learners' person (Weimer, 2013), to their culture and experiences. They also show to be aware that, to ensure a holistic view to the reality, interactivity should be the defining character of the educational processes (Bruner, 1996; Morin, 1999); along this process, the teacher should change his role from an agent of knowledge transmission to a learning scenarios maker (Hattie, 2003). All these are well known matters involving ICT in the educational context (Pelgrum & Law, 2003), and allow to bring technologies closer to the anthropological place concept.

The students of another class emphasize how a holistic view of the problems encountered may be an occasion not to be overlooked in an educational path and how, through the project's blog, this can be realized in practice:

"We particularly like that the project is shared between the different disciplines (more or less), so we could gather our whole knowledge. Everything plays for our advantage. We think it's an opportunity not to be missed"

Also in defining the features of the blog, a group of students reflects about the role of educational place of ICT:

"This blog was opened as an idea of our class. We think that being able to gather information on the achievements of our project and to investigate what is biodiversity could be an excellent opportunity for all, everywhere in the world"

Thanks to the youth extracurricular daily practice of the web, these students show to be aware about the usefullnes of sharing knowledge world-wide, having the concrete need to solve a local problem (Hendriks, 1999); their words also highlight how the activity of sense-giving to the surroundings should involve the whole individual knowledge and reflects the definition of *understanding* provided by Gardner (1999): the ability to apply proper skills, knowledges and theories, acquired during education, to a never experienced situation.

The nature of *educational place* that ICT hold in the *School 21* project is emphasized, for instance, even in the words of the administrator (a student) of the blog of a class, who takes part in a debate via Facebook on the use of the blog itself:

"This is a blog, right? So let's use it as such. We must report not only our well done, accurate and precise actions, but everything we do in the project. We are preparing a report to better explain to everyone what biodiversity is and why ecology and biodiversity are problems so important to us (and it should be for everyone). See you soon. Meanwhile, enjoy a video I found on Youtube"

While defining sustainable education, Sterling (2001) underlines that only a comprehensive, thorough and integrated knowledge can support a systemic thinking, which provides a holistic view of the reality; an educational path including attention to uncertainty and error and supporting a critical and reflective learning will allow to develop in students an inclusive vision that will help to identify the surroundigs' complexity and will facilitate the integration between thinking and acting. Thus, when integrated in a sustainable curriculum characterized by empathy, negotiation and consensus, the web shows its nature of *principle of intelligibility,* allowing to share assumptions, observations and experiences, both positive and negative. It is interesting to note that the responses to the post of the administrator were all similar to the following:

"Really a nice video, very impressive and informative and, above all, clear enough to allow people who visit the blog to understand the topic we are interested to deepen. Beautiful, beautiful, beautiful!"

The video assumed the role of a learning scenario. So, through the ICT, even students can contribute to build that scaffolding structure which, as stated by Bruner (1996), can support the learning of the whole community that comes in contact visiting the social network.

In defining the key competences for lifelong learning, the European Commission (2007) lays special emphasis on the fundamental role of collaborative networks to support the communication between citizens and the exchange of information. The skills for civic competence are linked to the ability to engage effectively with others in the public domain and to display interest in solving problems affecting the local and wider community; then, individuals must be equipped to fully participate in civic life based on knowledge and on the commitment to active and democratic participation. Constructive participation also support social cohesion and sustainable development. This emerges also from the blog administrated by the students of a class engaged in the *School 21* project, at the end of a discussion about the goals of the activities undertaken:

"Of course, is not just the blog the goal of our project. However, we hope that not only a few people (and always the same) take action in the blog: all the students of the two classes must be involved. It is a first step we take to introduce us, to better understand what we are doing, to share our thoughts and to provide a tangible evidence of the project School 21"

3. Conclusions

Among the experiences coming from the different classes involved in the *School 21* project, many other examples could allow to identify ICT as a *place* for education, in the sense given by Augé (1992); a more detailed analysis will be carried out later. At present, however, it is possible to propose some preliminary remarks which outline the context that allows the characterization of ICT environments as *learning places*.

It should be firstly emphasized that, currently, the abilities of young Italian people to use technologies to communicate show not to be envernly distributed in the students populatin; furthermore, both in Italy and in other countries these abilities have been built mainly outside the school (Livingstone & Helsper, 2007). So, the goal of the Italian secondary educational processes improvement provided to the *School 21* project should pass also through the deepening of ICT skills in students and teachers and thorough the understanding of the role of technologies in the educational process. ICT offer a hardly replaceable *space* for the collection of information, of documentation, of teaching materials and tools, and facilitate contacts and exchanges between a large number of people both inside and outside the school; but, in education, to have a learning *space* at the disposal (both material and virtual) is not the only factor that ensures the effectiveness of the educational actions, and the consistent designing of such a *space* does not directly translate into an authentic, critical and enduring learning. As stated by Gardner (1999), when faced with a problem the students should be supported by an effective educational path to express their understanding through their whole culture, applying proper skills and sharing knowledge and experiences with other concerned people. So, to allow young people to become active and aware citizens, school should help the students to use the tools of sense-making (Bruner, 1996); when directly related with concrete experiences and with the meta-reflections of students and teachers on school practice and on the surroundig reality, ICT can thus assume the meaning of *learning place*. Technologies then become a powerful tool to gather the sense of what happens around and to make these meanings understandable to those who are not involved in the experiences.

The words of two teachers, responsible for a school path of the project, effectively translate these considerations:

"We are in a very special moment in the life of the Italian school and in the lives of our students: experiences of growth and training are at stake. Therefore, the involvement of all

members of the school in the educational process is appropriate not only in communicating school activities, but also in the construction of paths and projects in which the boys could be co-responsible builders of knowledge in their real living place, under the guidance of adults who serve as mentors experts of different disciplines and of the processes of training and learning. It is good that our students can learn to think about their future not only in terms of employment, but also about the place that they will occupy in the world and about how and where they will intend to be involved in the society. Thereby, it becomes fascinating to think about the experiences they have in the school: the experience of knowing, intended as concrete and operational actions such as the discovery of the processes that are in and around the knowledge and also the experience to connect the general elements of knowledge to their daily lives; but they never have to lose the awareness of the relationships between what they learn, who they are and how their individual identities of young people can connect the simple everyday experience to the macro-knowledges they learn and deepen".

For these teachers, as happened also for others who participated in the *School 21* project, the school has assumed the character of *educational place*.

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From traditional usage of ICT to Transformative On-line Learning Environments in Vocational Higher Education

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Abstract
Virtual teaching is essential in the Finnish tertiary education. The Finnish Ministry of Education and Culture states that there shall be electronic learning material and other resources freely available in the network. By 2020 all people working in the educational field shall have sufficient skills to use technology in a pedagogically meaningful way.
In Oulu University of Applied Sciences (OUAS) the amount of online teaching and tutoring will be increased considerably: Master programs proceeded in the net and teachers' ICT competences supported. Teaching will be made flexible by emphasizing a few recommendable, supported technologies. This research aims at finding the ways of vocational Higher Education (HE) teachers to produce online learning material and their needs of support. The research was carried out using mixed methods. The research material was collected from official documents and the teachers in the Master programs (N=31). If traditional teaching models are imported directly to virtual learning and teaching, pedagogical ICT approaches are not fully availed of. If technologies are used only to support e-learning, the learning design will be correspondingly conservative and secondary to technology. Instead, the full potential of virtual teaching should be used meaningfully. Social media challenges teachers to learn new things, in new environments with new methods.

Keywords
Barriers in integrating ICT, ICT competences, Social media, Stages of ICT learning, Supported e-learning.

1. Education vs. equipment in ICT

Schank and Cleary (1995, p. ix) state that "Today's Schools are organized around yesterday's ideas, yesterday's needs, and yesterday's resources (and they weren't even doing very well yesterday)." However, a great deal of the education continues using conventional methods even today.

There is not a universally accepted definition of ICT (Information and Communication Technology), because the concepts, methods and applications involved in ICT are constantly evolving on an almost daily basis. A wide use of technology in education is still limited and especially the use of high-level technology is surprisingly low, even though computers have been in classrooms for more than over two decades. Teachers have barriers in integrating ICT to their teaching and they need help in it. Barriers are often related to teachers' pedagogical beliefs. (Hinostroza & Mellor 2000.)

The practices of the pilot project have shown that teachers´ skills and understanding of using ICT are on various levels. Rogers (2000) speaks of this same aspect and states that it is important to recognize the teachers´ competences in ICT.

Teachers are under significant pressure to change and they feel the lack of time which creates barriers in ICT learning (Clarkson 2002, 277). They have two kinds of barriers: internal and external. The internal barriers come from the persons' attitudes or perceptions about technology. Besides personal competences, the external factors include the availability and accessibility of the necessary hardware and software. The presence of personal and institutional technical support and the staff development program including opportunities for skill acquisition and maintenance does not solve all problems. There are external barriers that can and should be overcome with planning. (Rogers 2000.)Cole (1999) has stated about planning that the focus must be on the educational needs. Over a decade ago planning emphasized technical devices and equipment, but today the aim is teaching and learning.

Teachers vary considerably in their attitudes, understanding and behavior in relation to ICT, not only in teaching, but also in their daily lives. It is necessary that we increase our understanding of teachers' beliefs of using ICT as a part of our efforts to increase teachers' technology skills and usage of ICT in education. This is important, because more developed teachers seem to be less stressed about ICT in education. (Clarkson 2002, 315-319.) Boud (1988) describes the ICT uptake with a typology in which he divides the users of ICT into four categories of stages: dependence, counter-dependence, independence and interdependence (Figure 1).

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Dependence   Counter-Dependence   Independence   Interdependence

Figure 1. The four stages for learning the ICT (adapted from Boud, 1988).

Each of the four stages describes how teachers act and how they react to ICT in their teaching. At the beginning of the model, at Dependence and Counter-Dependence, the teachers see weaknesses and they perceive the lack of ICT support. At the other end of the typology, at Independence and Interdependence, more developed teachers share ideas with and for others and they cooperate with each other. (Clarkson 2002, 318-320.)Some teachers are rather negative about their own technical capabilities. The negativity is not limited only to novice teachers and their technical skills. Also more ICT aware teachers are sometimes critical to the lack of stability and certainty of ICT. (Brundage & MacKeracher 1980.)

Dependent teachers feel dependency with the support systems and evade their responsibility to engage themselves in learning ICT. They feel lack of control over the situation when they think of ICT and education. They continually question their own roles and seek for simple examples. *Counter-dependent teachers* have taken their first steps towards independence. External support systems and their ability to handle frustration may influence on how long the teacher stays at this stage of development. They desire independence, but do not yet have the required skills. Some may criticize the support systems and even regress to their first principles of teaching.

Independent teachers show the characteristics of good self-directedness with ICT. They feel that they control the device. The support should be adapted to their special needs in ICT. They choose group activities and use structured applications. *Interdependent teachers* show the willingness to share and learn with their colleagues and students, and the usage of ICT has become almost the second nature to them. They have no difficulty in incorporating ICT whenever necessary. (Clarkson 2002, 330-343.)

2. ICT in education

The threat that traditional teaching models are imported directly to the virtual learning and teaching contexts as well as to the social media means that the full potential of the virtual teaching is not utilized. Pedagogical approaches are not available or they are not employed in the pedagogical meaning. If the technologies are used only to support e-learning, the learning design will be correspondingly conservative; if they are used to support technology-driven learning, the learning itself may be secondary to technology (Kukulska-Hulme & Traxler 2007). In case e-learning is used purely for knowledge acquisition in traditional face-to-face context the use of technologies does not bring sufficient added value to education and learning experiences. The challenge is to describe models of e-learning processes to demonstrate what the added values of e-learning are. Collis (2002) stated as early as 2002 that ICT has affected education less than other areas of life.

The idea that technology helps teaching and learning raises a question: how should technology be used meaningfully? The answer is: the meaningful use of ICT shall not be concentrating primarily on studying the technical applications only, although they form a greater part of traditional ICT teaching. Instead, the focus should be placed on the teaching processes of the contents. (Newby & al. 2000.) It shall have a clear impact on the curricula and pedagogical measures. It shall also make teaching and learning more alive by integrating contents to relevant everyday functions (Kukulska-Hulme & Traxler 2007).To define traditional methods in ICT teaching, the description could be that dependent or counter-dependent teachers (figure 1) change contact teaching to e-learning using the same pedagogical methods as previously. They do not take advantage of the chances of e-learning, but restrict the scope of pedagogy into the traditional area.

3. The research design

In OUAS the amount of online teaching and tutoring was and will be increased in 2012-2015 considerably and Master programs proceeded mainly in the net. The teachers are being acquainted more thoroughly with ICT in education and their ICT competences supported corresponding to teachers' special needs in ICT. Teaching is made flexible by emphasizing a few recommendable technologies which will be given full support, but at the same time teachers

are encouraged to use a variety of ICT applications in education. One purpose is to develop teaching and teaching methods as well as the usage of e-learning environments. The aim is not to develop new e-learning environments. The present research aims at finding the needs of teachers to produce online learning material and the measures how to support vocational HE teachers in using ICT.

The research questions were:

1) Are there any common themes in all OUAS Master programs in vocational higher education?

2) What kind of ICT learning models would support transformative online learning?

The research material was collected from official documents including aims and curricula of all Master program courses (research question 1), and from the teacher interviews engaged in the Master program (N=31) (research question 2). The study was carried out using mixed methods. The research approach was qualitative. The material was analyzed with a contents analysis.

4. Themes in online learning

In 2012 the common focus areas of OUAS strategy were named and the permeable themes were decided to be the following(figure 2):
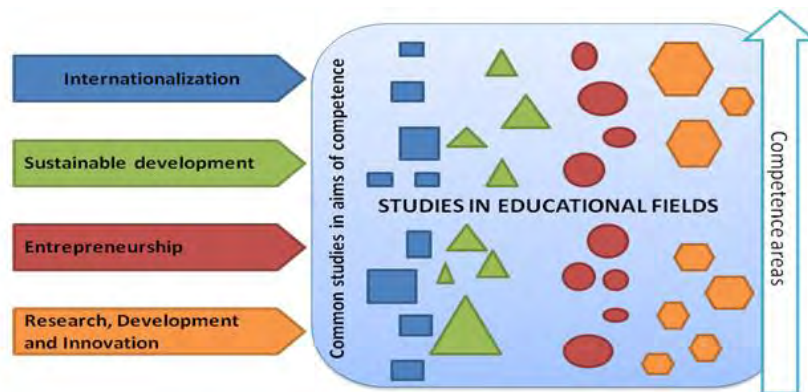
Figure 2. The common focus areas of the educational strategy in OUAS.

When the documents of the Master programs were studied, they revealed that the common focus areas of the strategy in OUAS, shown in Figure 2,were not significant drivers of the contents of Master programs. The common focus areas were only occasionally found in the study courses and they did not form a coherent whole. In addition, the pilot project around the ideas of common course production in OUAS Master programs (2011-2012) revealed attitudes contrasting the development of self-sustained ICT skills: the teachers explained that they would like to have a whole-time personal assistant for their ICT teaching. They also wanted to have a list of ICT applications in education and wanted to know what to do with each of the applications. They also wanted to have training in using various ICT applications in education.(Paaso et al., 2011). It seems that technical services come first in the selection, and pedagogical issues follow after. It means that pedagogical usage of ICT is still considered a skill to use technology only, although it is a question about a new type of learning environment and a new culture of actions (Tozer et al., 2011). These refer to the stages of dependence and counter-dependence in learning (Boud, 1988). The analyses of the documents show also

that production of teaching material was scattered and varied from a teacher to another as well as how ICT was used in education.

Online learning and tutoring as well as traditional learning environments have their roles in education. Today the students in the Master programs in OUAS work and study whole time simultaneously and need special online applications for their master studies. For that reason teaching will be made flexible by emphasizing a few recommendable technologies which will be given full support. Since the number of supportable technologies is thus reduced, the attention is possible to be directed to all who need support. Observing the teachers practicing newly adopted technologies is also easier, when the number of applications is limited. Consequently, it is possible to be aware of the level of teachers' ICT competences, as Rogers said (2000).

The development project aimed at increasing the amount of shared multi-subject study courses to the Master programs as well as produce specialized courses for different programs including common topics. The first step was to find the existing common areas in the programs by a content analysis. The analyzing process concerned the contents of the Master programs as well as the present local situation of both virtual and multimode teaching

The document analysis (research question 1) revealed four themes which were taught in all Master programs in OUAS. They differed from the themes of the strategy as shown in the figure 2. The actual themes found from the document analysis were:

1) Anticipation and understanding of future work life
2) Entrepreneurship competence
3) Research, development and innovation competence
4) Competence in leadership and management.

The realization of similar courses is presented inFigure3. Concerning the themes, the practices of realizing them varied greatly as did also their extent and credits. In every Master program the teachers produced material independently to the studies within the themes. Online courses were only very occasionally available depending on teachers' personal interest in online learning. Even in the neighboring programs the realization of similar courses varied greatly as shown in Figure 3.
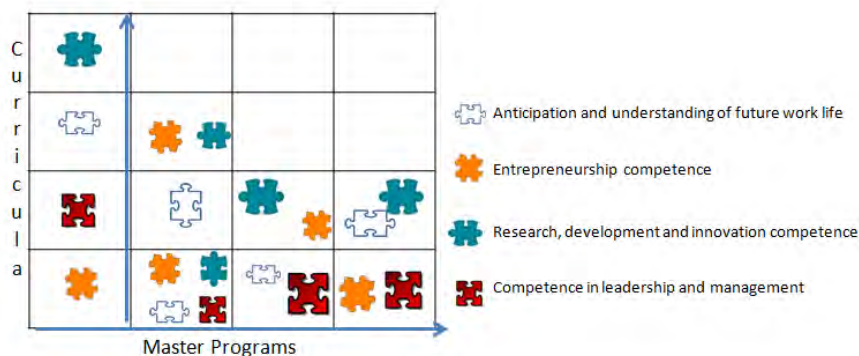
Figure 3. Realization and extent of similar courses in different Master programs vary greatly.

Figure 4, shows how the aimed competences and focus areas will be available in the Master programs:
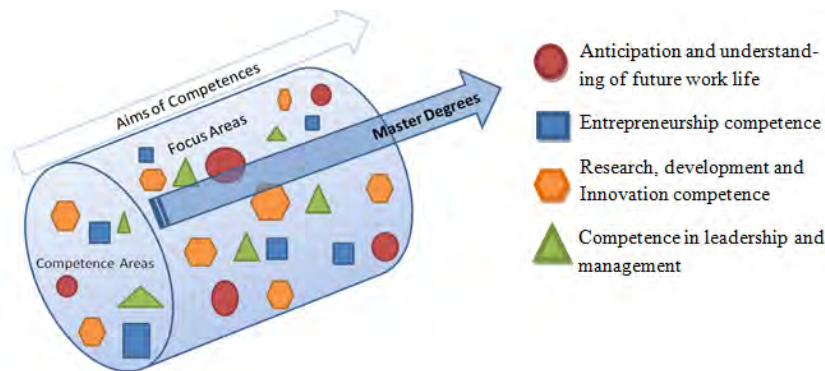
Figure 4. The "study mill" of Master programs in online learning of adjacent courses.

The aim is that the common courses, shown in Figure 3, are available to all Master program students in OUAS. Teachers will produce course materials together considering the focus areas, competence areas and aims of competences.

Side by side with analyzing processes, good practices in different Master programs were also explained in order to apply them widely to various fields of learning. After the analysis the necessary measures were evaluated and the existing measures compared to them to find out the lack of support and needed education. This evaluation was carried out through teachers' self-assessment. The evaluation resulted in the cooperative support services to promote the use of virtual and multimode teaching as well as to enhance the use of social media. The use of social media was also studied in a parallel project (Paaso et al. 2011).

To sum up (research question 1): the themes of Master programs were revealed and they showed very different realizations in neighboring courses. Four main themes that were partly deviant from the themes of the online strategy were mentioned: (1) anticipation and understanding of future work life, (2) entrepreneurship competence, (3) research, development and innovation competence, and (4) competence in leadership and management. The piloting projects have already been started in OUAS, but the results are not available yet.

5. Transformation in education

"We are heading towards the future which presupposes completely new competences: holism, emotional intelligence and sensitivity to applications. The demands of adaptation to change, continuous learning and flexibility are frightening, but they also offer a chance of creating an inner miracle." (Saarinen & Lonka, 2005). Developing learning and competences of the staff is essential, but information, knowledge and technology are not the only issues to be concentrated on. They are invisible, "value-based soft variables of learning" (Saarinen &Lonka 2005). To be effective transformation actually requires reciprocal forms of association: to build joint efforts in an organization together with the staff in the following way, for instance:
1. Both parties should work with promoting further development, which means learning to understand how each of them works in their various contexts.
2. By promoting collaboration of practitioners, administration and officials who are given the opportunity to elaborate practical theories the staff and leaders will become mutually engaged towards common goals.

3. Common practices enhance professional dialogue. (Yetman and Sachs, 1995.)

What are the desired outcomes for politics of transformation? It means that there is a change of existing structures and processes in an educational organization. It necessitates a profession of teachers who are proactive and able to develop mutual respect and trust. (Sachs, 2003.)This kind of transformation is going on in OUAS which is the target organization in this research. The administration has been able to achieve long term views and agendas; the staff is identifying the goals to be prioritized (Argyris, 1999).

As to e-learning and the above-mentioned agendas and perspectives, ICT is not always ready for pedagogical use as such, but learning environments need the reformation of action cultures, teaching methods, learning assignments and evaluation. Action cultures and pedagogical practices do not develop alone, but joint efforts to achieve new models are needed. Collis wrote as early as in 2002 that the impact would grow considerably in years to come and that ICT would become a strong agent for change among many educational practices (Collis 2002). The development is still slow and presupposes leaving off something and taking new methods in a transformative way. Teachers should be active in creating and developing pedagogical practices that are needed in ICT. (Kankaanranta et al. 2011.)

6. ICT learning models to support transformative online learning

The research results (research question 2) show that most teachers felt that they needed tutoring in the basics of online pedagogy and even in online writing. They lacked everyday practices in online teaching, although they could use basic desktop applications. It means that they did not have a holistic conception of the online learning and its different benefits. They wished that they should have an ICT support person available all the time they were teaching or using online methods. The teachers listed single techniques, devices or methods they would like to have tutoring in. In this case the full potential of the virtual teaching is not utilized, and the use of technologies does not bring sufficient added value to education and learning experiences. Many teachers seem to be at the dependence or counter-dependence stages (Boud 1988).

The research revealed the gap between genuine online pedagogy and traditional pedagogy imported to online environments. The research helped also to find existing common themes, while the ways how to realize them will need a lot of work. In order to produce material on the basis of real needs and in bigger amounts, the production process of virtual learning material has to be supported (Paaso 2012).The added value in this development project will come from the possibility of joint building processes.

After finding common themes of studies, the ways of implementing online learning were sketched. The teachers who participated in the project had neither reflected the basic questions connected to the realization of online teaching nor its interaction and the changing nature of learning in it. Successful online learning requires both teachers' attitudinal changes and investments in the ICT equipment, tutoring in its usage and maintenance of the device.(Lasonen & Ursin 2011; Gonzales 2009; Yair 2008).The persons in the administration, leading, management and specialist jobs see a lot of possibilities in online teaching, while the persons responsible for teaching arrangements see numerous problems in realizing online teaching (Aittola 2011).

7. Outcomes

According to the preliminary analysis of the present material (including curricula, course materials, teacher discussions and self-assessment) and the evaluation of existing technologies used in the OUAS Master programs, a basic action model was developed. The developed model is presented in Figure 5.
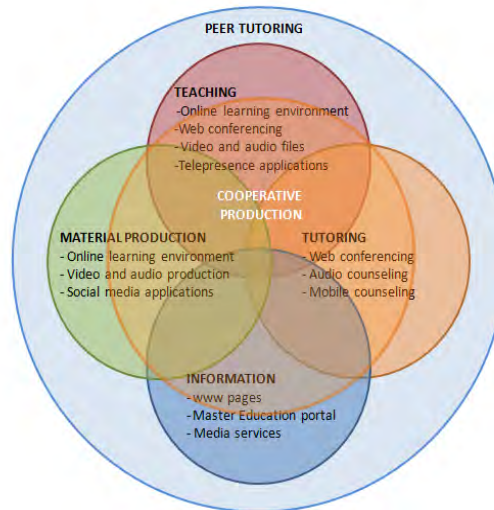
Figure 5. A basic action model for the Master programs online course production.

The model presents the phases and adjoining technology of online learning in general by emphasizing a few recommendable, supported technologies. A limited number of technologies are easier to adopt in education. The model is developed considering the fact that teachers are at different stages in using ICT in education. The peer tutoring encompasses the whole model. With peer tutoring it is possible to be aware of teachers' ICT competences and offer individual support. Each section of the model contains only a few recommendable, supported technologies. More advanced teachers are encouraged to use versatile technologies including social media. With planning the focus stays on the educational needs, not on the technologies.

Based on this research the first pilot project has been started concerning strategic human management resources in February 2013. The results of the pilot project will be available in May 2013. The next course based on the present pilot study on entrepreneurship will begin in March. Its results will be available in June.

8. Discussion

The results show that online learning needs a lot of support in the OUAS Master programs. The barriers are not impassable, but will need a lot of work both at individual and organizational levels. The organizational level is today better prepared for the change than individuals. The guessing is that change resistance against the orders from above are strong (Lasonen & Ursin 2011). The challenge today is confirming the teachers of the necessity of the change and the gains from it. The prevailing view of today´s students and knowledge workers is that they are digital natives and fundamentally different compared to previous generations in how they learn, what they value in education, how they use technology and how they interact (Bullen & Morgan 2009).

In today´s changing conditions retrospective way of forming future solutions should be avoided. Instead, transformative criteria for the present and the future should be provided. Prospective teachers are essentially future-oriented and may rest on narrative resources, but ground their teaching in the future. (Nissilä 2013.) Transformation presupposes the change of both the teacher attitudes and skills and the organization to provide accordant chances of renewal. Future pedagogy is launched by social movements and engaged in conversation to provide for the development of its new potential (Bernstein 1996, 79).

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Designing competence in New *Licei*. Research & training by group DidaSco

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Abstract
The present work shows the results of the first research & training project stage called *I nuovi Licei alla prova delle competenze. Guida alla progettazione nel biennio* (Assessing competence in New *Licei*. Planning two-year courses) in which 21 *Licei* (High Schools) in Apulia have been involved. The project aimed at designing a *shared* educational model among teachers for the first two-year courses. The project's main aim tried to overcome traditional, disciplinary and knowledge-centred teaching in favour of competence-based teaching in which every discipline contributes to the creation of multidisciplinary and interdisciplinary education by means of a methodology designed by a group of teachers.

Keywords: competence-based teaching; qualitative research; teacher training; teacher education; school Education.

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[1] Loredana Perla wrote the paragraphs: 1, 2 and 3; Viviana Vinci wrote the paragraphs: 2.1, 2.2 and 2.3; Nunzia Schiavone wrote the paragraph: 2.4.

1. Theoretical research framework

European Recommendations define competence as "the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development" (2008), asking all the European school systems an intense rearrangement of the existing structures towards a competence-based education system rather than a simple skill-based (skills and knowledge) methodology. This curricular and methodological reorganisation is going to be achieved though it is a difficult process: the idea of *competence* has a twofold meaning, therefore it is not a definite concept within the so called *educational cité scientifique*. Nevertheless, competence can be assimilated into professional and technical education systems rather than in *Licei*, the latter being discipline- and multi-discipline-oriented. *Competence* is a mixture of what one can do (Malglaive, 1990) and the power generated by knowledge (Rey, 2003). In Italy, the national Ministry for Education prepared an analytical classification of competence for *Licei* (Decree 21/08/2007, no. 139) divided into four common areas for every course of study (six for language studies; four for mathematical studies; three for scientific and technological studies and historical-social studies; eight for citizenship studies). However, shifting these notions to practical methodologies, competence-based teaching still represents a problem for teachers in *Licei*. This problem implies issues in choosing appropriate contents (what contents should be preferred in order to develop competence in *Licei* without distorting the distinguishing features of this kind of school?) as well as assessing methods (how should competence be assessed in *Licei*?).

These are the basic principles that caused group DidaSco[2] to create a research & training project called *I nuovi Licei alla prova delle competenze. Guida alla progettazione nel biennio,* conceived by means of an agreement between the former Faculty of Educational Sciences (now Department of Educational Sciences, Psychology, Communication), University of Bari "Aldo Moro" and Ufficio Scolastico Regionale (USR, Regional School Office) of Apulia. During 2011 and 2012, 93 teachers of 21 different *Licei* in the provinces of Bari, Barletta-Andria-Trani and Taranto were involved in order to develop a competence-based teaching model useful for two-year courses in *Licei* which could be applied nationwide. Research is based on three theoretical frameworks: *empirical phenomenology* (Van Manen, 1990; Mortari, 2010; Perla, 2011; 2012b); *self-study of teacher education practice* (Schön, 1999; Loughran, 2007); *narrative inquire* (Clandinin & Connelly, 2000). There are some basic questions dealing with research phenomenology: "What does competence mean from teachers' perspective?" and "Is competence-based teaching possible in *Licei*?" These issues involved the investigation of teachers' role in comparison to their practical experience. Since meaningful results are produced by sharing and telling one's experience, thus making it an observable phenomenon, an on-line community (COL) was created in order to share materials and experience among teachers. Another methodological framework comes from the so called Self-study of Teacher Education Practice model, a direct consequence of Dewey and Schön's pragmatism which gave reflective thinking a central role within educational studies aimed at identifying problems as the starting point for process analysis (considering Dewey's theories) or relating thinking processes in action (Schön's *reflection-in action* and *reflection-on-action*) (Schön, 1993). The third methodological framework is represented by *narrative inquire*, defined by Clandinin & Connelly (2000, p. 20) as the way experience is meant and analysed through the relationship and collaboration between researcher(s) and participants. Considering this theoretical framework, the methodology used in this research was collaborative (Desgagné, 1997; Desgagné, Larouche 2010; Charlier, Dejean, Donnay, 2001; Lenoir, 1996;

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[2] *Didattiche scolastiche,* research group coordinated by Prof. Loredana Perla.

Perla, 2010; 2011) therefore more useful for all the teachers involved in the experimentation of this technique.

The aim of the first two-year experimentation was the creation of a model made of teachers' practical experience, both written and oral. This model had to be consistent with the above-mentioned areas so that it can be tested nationwide. In this way this new approach can go beyond the traditional disciplinary method.

2. Tools used in this research&training project

Here is a concise list of the tools used to carry out the project.
1. Preliminary questionnaire about competence-based teaching;
2. Focus group on competence and planning practices;
3. On-line Community: an e-learning platform in order to share products and research&training experience;
4. Narrative writing-actions (*scrittur-azioni*) about ordinary teaching practices;
5. Creation of a glossary for *Licei*: lemmas are created by DidaSco and teachers, autonomously;
6. DidaSco model: a tool used to plan and assess competence during the first two-year courses in *Licei* which considers all the different outgoing figures at the end of the two-year course;
7. Sharing of disciplinary and interdisciplinary learning modules created by the teachers involved;
8. Specific seminars held by scholars dealing with research-related topics:
    a. connections between competence and knowledge (Silvano Tagliagambe);
    b. Assessing and attesting competence (Sandrone Boscarino);
    c. Digital learning mediators for the development of competence (Gino Roncaglia);
    d. Discipline learning in *Licei* (Ernesto Galli della Loggia).

Only some of the project steps will be here analysed. The whole process is described in detail in Loredana Perla's volume (in press) with particular emphasis on the results produced after the first research year.

2.1 Preliminary questionnaire about competence-based teaching

93 teachers were given a preliminary questionnaire. It contained four sections:
- Personal details;
- Definitions: the notion of competence conceived by the teacher, with reference to outgoing figures, its features and the most critical situations teachers have encountered in comparison to the "competence-based teaching culture" found in *Licei*;
- Competence-based teaching: the way teachers plan and assess according to competence-based methodologies;
- Teaching strategies: list of the most used teaching methods and strategies in order to foster and "elicit" competence from students.

The average age of the sample (93 teachers) was 48.97, mainly women (80.6%) with a mean length of service of 21 years. Analysing their answers, competence is defined as the ability to use personal knowledge and skills when at work, ability to face complex issues, problem-solving ability. Creativity, multidisciplinary ability, portability, awareness are the key concepts when defining competence. Among the critical issues found during the introduction of a competence-based learning culture in *Licei* there is the lack of teacher

training, the scarcity of structures and time to carry out reflexive activities about school, the inability to work in a team. Competence planning and assessment were recently introduced in high schools, even though assessment is less likely to be carried out in classrooms. The most innovative and incisive teaching methods and strategies to encourage competence are: problem-solving education, multitasking activities, encouragement of creativity, workshop activities, research-based education.

Summing up, a student has competence when he/she understands the meaning of his/her education, when in situations/problems that let him/her "dig up" his/her personal resources to face issues, when he/she associates different knowledge and identifies diversified competence and disciplines. Teachers' responsibility is crucial, as he/she has to go beyond an individual point of view, being flexible in choosing contents and encompassing multidisciplinary approaches. By looking for new methods, teaching models are more effective. This is a revolutionary way to conceive education, as it focuses on the meta-cognitive nature of knowledge as well as the important figure represented by students and their consequent needs.

2.2 Focus group with teachers and headmasters involved in the project

A focus group allowed a deeper examination of some key concepts:
1. understanding competence from classroom experience;
2. competence planning;
3. role of different disciplines in encouraging competence;
4. teaching strategies to encourage competence;

Focus group sessions were held by a moderator and an inspector. Actual transcripts of each focus group were analysed using two techniques. A computational, linguistic analysis was carried out using software Nvivo8 - Non Numerical Unstructured Data* Indexing, Searching and Theorizing Vivo; a qualitative data analysis followed (Glaser & Strauss, 1967; Strauss & Corbin, 1990).

The first stage of analysis using "CAQDAS" technique (Computer Assisted Qualitative Data Analysis Software) aimed at exploring focus groups data resulting from recorded and transcribed corpora. Nvivo feature *Queries* was used in order to process and show data with diagrams and charts, using well-defined selection criteria, Boolean and semantic elements. The specific tool used in *Queries* was *Word Frequency,* that is the actual frequency of keywords.

Graphic representations of keywords were coded into lists in alphabetical order: the most frequent keywords were represented with bigger fonts. This list is also known as Tag Cloud and allows a graphic representation of the most recurring ideas and key concepts.

Qualitative data analysis was carried out using Glaser & Strauss' (1967) and Strauss & Corbin's (1990) principles which allowed the identification of several categories which could explain teachers' representations.

Data analysis shows a series of definitions of competence, the latter being considered a complex idea and a praxis-based activity. There are also various and contrasting viewpoints:
*   there is a functionalist-utilitarian perspective according to which competence is seen as useful knowledge in everyday life;
*   another point of view defines competence as the ability to face life issues. It is a human, personal and unique quality;
*   it matches knowledge and skills.

There are several categories concerning competence planning and the strategies involved in competence-based teaching; on the other hand, the role of single disciplines in this method is more undefined, as competence and disciplinary contents are seen as separate entities.

2.3 DidaSco, an on-line community

In order to favour communication among teachers and with DidaSco's researchers, an on-line community was created using *Moodle* (Modular Object-Oriented Dynamic Learning Environment), a Web-based learning platform. This community represented a virtual space where people shared research products and daily teaching experience, considerations of various kind, educational methodologies used with students.

Analysing this kind of data, competence-based knowledge emerges as the result of this interaction among teachers. Here are some salient considerations:

- it requires a long preparation and a significant modification of learning environments and tools;
- it is based on students rather than the discipline itself;
- it aims at providing independence and responsibility to students;
- it fosters creativity, originality, collaboration, multi-disciplinary competence;
- it is based on complexity, unpredictability; it depends on specific situations;
- it mixes emotional and cognitive skills;
- it requires narrative, synergistic and constructive assessment tools.

Planning competence means "change", not only learning environments, but also school as it is conceived nowadays, even in the role of teachers. This is a real revolution, a new idea of education in *Licei*.

2.4 Scrittur-azioni (narrative writing-actions)

Scrittur-azioni (narrative writing-actions) represent another tool to investigate teachers' experience (Perla, 2012a). All the teachers involved in the project, divided into four disciplinary areas (language studies, 36 teachers; mathematical studies, 14; scientific and technological studies, 16; historical-social studies, 14), narrated their ordinary teaching experience and their competence-based assessment and planning practices. Data was then analysed according to the procedure known as Grounded Theory (Strauss, Corbin, 1990; Cipriani, 2008; Tarozzi, 2008) [3].

The main aim of the analysis was the identification of a categorisation of the most used teaching methods, so that teachers could be aware of the fact that competence-based teaching models need new educational approaches that can foster multidisciplinary competence, practical teaching (e.g., workshops), the relationship between education and work. Here are some results.

Teachers stated that they prefer teaching strategies that let students meditate, search for sources (manuals, documents, iconographies, cartographies), enable understanding processes, interpret data without simply storing them mnemonically. They prefer active methodologies, mainly practical (workshops). Those who have expressed a certain "hunger" for teaching innovations were foreign language teachers: many of them use a methodology known as CLIL (Content-based language instruction) which is based on the definition of tasks and collaborative methods. Nevertheless, the most widespread tool is the traditional class. It is interesting to underline that the paradigm for this tool is not the so called *lectio Magistri* (Castagna, 2007) but a question-based lesson (Perla, 2011): classes represent the cornerstone of education, in which both teachers' exposition and students' participation are of paramount importance. Feedbacks and considerations by students arise from solicitations offered by their

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[3] For further information about data coding: N. Schiavone *L'analisi delle scrittur-azioni* in Perla L. *I Nuovi Licei alla prova delle competenze. Per una progettazione nel biennio, Laterza, Roma-Bari* (in press).

teachers and by all the learning tools he/she uses. Among the most popular tools used by teachers in *Licei* books still have a key role. In addition to them, teachers provide other documentary tools such as concept maps and tables, but also traditional tools such as vocabularies, research material (see Table 1).

Class involving students
Frontal lecture
Interactive class
Debate-based class
Study and research groups
Reading and writing groups
Workgroups
Circle time
Practical learning (Workshops)
Multimedia tools
Concept maps, maps, diagrams, notes, summaries
Inductive methodology
Peer learning
Cooperative learning
Guided visits
Guided tutorials
Functional-communicative methodology for foreign languages
Content-based method
Films (cinema discussions)
Role-playing games, debriefing stage

Table 1. Learning methods and strategies (language studies area)

As for the planning procedures, corpora analysis showed that the main discipline planning model starts from the definition of the different purposes, then contents are selected and intervention strategies are carried out. A final assessment is then performed (Tessaro, 2002). A competence-based teaching method is seldom used. Nevertheless, this methodology overcomes traditional, purpose-based schemes in favour of holistic and dynamic learning frameworks. However, additional considerations could be added. Teachers have stated that competence-based planning methods require a reorganisation of planning procedures in order to concentrate on competence fostered by different learning units. In other words, competence-based methods require contextualised contents and situations rather than simple disciplinary contents. Choosing and using appropriate teaching methodologies becomes a fundamental step in order to acquire competence. *Problem-based learning* is needed to let students discuss and solve problems; *cooperative learning* is needed so that students may make decisions and plans; *peer education* is useful because students find out how to communicate; workshops and frontal lessons are useful to transmit contents and to make sure students use appropriate terms, logical reasoning, language fluency. Data analysis also showed that this model cannot be easily applied to educational methods in *Licei.* As for the category "limitations of interdisciplinary method", part of the core category "organisation and collegiality", there are many flaws that prevent the implementation of competence-based planning methods, especially in the language studies area. Here are the most relevant ones: *inability to work in an interdisciplinary context, lack of shared educational methods among different departments, lack of organisational coordination.* Another criticality deals with time: the final purpose of such an approach needs scheduled times which do not match academic years.

As for assessment procedures, there is an unvarying position among the different areas involved in the project. There are two main points of convergence concerning assessment

procedures: students' learning level *control* and teachers' teaching strategies *supervision*. As a consequence, assessment procedures are not competence-related: corpora analysis reveals that assessment procedures evaluate performance. A teacher says; "evaluating means describing students' performance, trying to provide an objective, unbiased value". This value is represented by marks. Nevertheless, providing a numerical value does not mean concentrating on performance. In the light of this perspective there are several elements which deal with assessment procedures: *Perseverance, diligence, concentration, participation, learning independence, homeworking, a learning methodology, previous knowledge, progress, the possibility of being mistaken, precision and ability to analyse re-elaborate tasks even in an interdisciplinary perspective.* Each teacher states that assessment procedures are part of the organisational process, a sort of "test bed": assessment is the final stage of the educational process, teachers' main feedback and a guidance tool in classroom experience.

Teachers admit using many assessment tools such as framed tests, questionnaires, individual oral tests, group tests, workshop activities; multimedia tools seem to have less potential in this kind of procedures. Moodle, in this perspective, can be really useful, as a teacher states: [...] "Moodle is a tool that keeps track of students' activities so that teachers can infer their learning progress: what is more, this is a new form of control they accept". This learning platform can assess students' learning independence and enables collaborative methods. Teachers also state that tests, examinations and assessment grids are commonly shared within the different departments; traditional grids are somehow unsuitable to assess competence: they have indexes for each disciplinary area, but they do not consider competence as a learning-educational criterion.

3. Preliminary conclusions

The first research & training project year allowed the achievement of two main aims: the (cooperative) creation of a competence-based planning tool to be shared with the professional community as a possible framework within the complex competence planning and assessment procedure; and the creation of a rough competence-based teaching model for *Licei*. In particular, our team has found that this tool may help teachers have a more practical approach in their competence-based learning methods, the latter now considered more definite.

A shift from the analysis of ordinary practices to recommendations, ending with practices again (after the implementation of the tool) has illustrated how useful a radical change in ordinary education in *Licei* is.

There is an urgent need to change the existing organisational model of *Licei* so that competence-based teaching *cultures* may be identified. A particular role was played by the so called *Research Departments* within the schools taking part in the project. Teachers involved became a guide for their colleagues in the different disciplinary departments, thus overcoming a sectoral division which is typical of secondary school.

The present collaborative research & training tool, in which the University of Bari had an aggregative role, was much appreciated. This implies the creation of scientific committees within schools with advisory functions; they could also suggest new organisational methods and use spaces autonomously in order to achieve results, but also to create teaching materials *in situ,* thus validating the dissemination of this new competence-based teaching planning. Only by re-considering education this competence-based teaching culture may be encouraged.

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Learners of Digital Era between data evidence and intuitions

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Abstract
This article moves from the so-called "digital natives" debate, namely the corpus of knowledge describing the nowadays digitalized generation of learners. They are expected to have some common traits because of the "digital milieu" in which they have grown up. Unfortunately, such expectations are not based on an enough solid and unquestionable evidence-based research (but rather, much more on interesting intuitions).

Moving from this presumed disalignment between reasoning and reality, the NewMinELab started the *Learners' voices* research project, aiming to explore which assumptions are effectively applicable to Learners of the Digital Era.

In order to avoid biases and limits due to the adoption of other pre-comprehensions and readings of the described issue, a theoretical framework was built to observe such topic with a wise and cautious perspective; being a complex reality, the framework was built at the crossing of four disciplines – namely: Anthropology, Communication Sciences, Pedagogy, and Sociology. The main references informing it come from theories such as Constructivism, Media Education, Personalism and from the work of thinkers such as Ong, Rogers, Castells, Maritain, Baumann.

The paper describes such theoretical framework and presents main results conclusions of the consequent *Learners' voices* research project.

Keywords
Learners of Digital Era, ICTs in HEI, eLearning, Media Education, Theoretical framework

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[1] Note of authorial responsibility: the article was developed in collaboration, and it was written by E. Rapetti.

1. Addressing the topic

Learning and teaching in the digital era cannot help to take into strategic consideration the important role of ICTs (Information Communication Technologies) and to adopt them (Oblinger & Oblinger, 2005).

Following this assumption, during the past two decades, a huge number of publications appeared, in order to explain how to teach the so-called generation of "digital natives" (Prensky, 2001), also known as "net-generation" (Tapscott, 1998), or "Generation Y" (Howe & Strauss, 1991), or similar – namely, people born, average, after 1980 and grown up in a full-of-media milieu.

This corpus of knowledge was not based on an enough solid and unquestionable evidence-based research (but rather, much more on interesting intuitions. Though, such view of the theme took place worldwide and became very popular among different audiences of involved professionals (teachers, educators, HEI administrators, politicians journalists). This dynamics is verifiable every day, just checking the number of times the above labels appear in newspapers, scientific articles or public policies; to the point of bumping into books and articles devoted to describe in details common traits of this cohort, in order to inform and orientate policies of educational agendas (Bennett et al.,2008; Bullen et al.,2009; Schulmeister, 2010).

1.1 Why "digital era"? Who areLoDE?

As per today, the widespread expression "knowledge society" represents more a promise and a potentiality, rather than being a descriptor of a matter of fact (Rapetti, 2011). It is a rhetorical artefact, which can be useful to communicate and to sum up the complex reality of post-modern times, but it implies a number of assumptions and expectations; some of those are questioned by data-evidence, for instance the infinite possibility to access knowledge.

The same happens to many labels attributed to nowadays learners, expected to bear common distinctive traits. Hence the need to adopt non-misleading concepts to build on the discourse about this topic. "Digital era" is used to describe – in the most neutral way is possible – the current reality of the large majority of OECD (Organization for Economic Cooperation and Development) countries, that is the permeation of digital devices in everyday life experience. "Learners of Digital Era" is a new expression coined to refer to all the people who – formally or informally – use ICTs in learning experiences

1.2 Many voices. Three views

The need to adopt a new (more concerned and wise) expression comes from the literature review on the so-called "digital natives" debate. Indeed, in other works (e.g.:Bennett et al, 2008; OECD, 2012; Schulmeister, 2010) weaknesses and misunderstanding of such approach have been unveiled.

Figure 1. A word-cloud showing the most diffused labels to define nowadays learners

Here it is important to say that the analysis of the literature review put in evidence – at least – three different views. Doubtless, the following repartition is an abstraction, a "compass" to move within such a large and complex territory. We identified:

1. **Enthusiasts** (about the impact of ICTs on learners' skills and behaviours) are firmly convinced that digital technologies are making the generation of young learners a very skilled one. Within them it is possible to further distinguish three different approaches, depending on the observed area of ICTs' effects on learners behaviours and attitudes:
   a. The *historic-sociological approach*;
   b. The *psycho-cognitive approach;*
   c. The *socio-pedagogical approach*.
2. **Concerned ones** accept as well this idea of a digitalized generation of learners, but focus on the potential dangerous effects, such as violence, dumbness, harassment, addiction, etc.(e.g.: Bauerlein, 2008).
3. **Critics** question the idea of characterizing the set of skills of the young generation simply in function of ICTs' usages, criticizing overgeneralizations, and requesting deeper studies and localized analyses (e.g.: Bullen et al., 2011).

1.3 Looking for a unique perspective

Aiming to overcome bias involved by any of the above, it can be useful to face the issue with a fresh attitude. This is why, at NewMinELab, we opted for a new label aiming to a comprehensive perspective: that is Learners of Digital Era.

It is necessary to promote the idea of innovating learning and teaching practices because children and adolescents master the use of their digital tools enhancing their access to sources of information. This does not mean at all to simply introduce new media in education, but rather to educate through new media. This is why a comprehensive perspective about current learners is useful and needed, as the first step to elaborate a shared and sound eDidactics.

Respect to the three views, LoDE perspective: takes into account the review of rhetorical artifacts and trends, proposing a criterion to interpret it is built on a solid pedagogically-build theoretical framework (detailed in next paragraph); aims to save all is worthwhile.

Summing up the key concepts promoted by the *enthusiasts* as a whole group, it seems that the claimed and needed revolution in pedagogy is mainly the call to emphasize and exploit the digital know-how of nowadays students.

The group we named *concerned ones* express a number of concerns, from social aspects to medical ones. For the scope of this paper, it is important to focus the attention on difficulties in teaching due to the distance between usages of ICTs in education and in leisure time; and on the unbalancing between the easiness in information retrieval and the effort needed to achieve solid knowledge.

Finally, LoDE perspective is enriched by the fallacies highlighted by *critics,* such as: do not implement generational opposition; there is not enough scientific evidence to state a different brain functioning; do not approach the topic with determinism or recipe-style; do not offer worldwide generalization; do not take for unquestionable the stereotype of tech-savvy young people; consider that skills developed in informal experiences of learning (e.g.. online social networking) do not transfer easily to formal contexts.

Furthermore, LoDE can be an acceptable label in reason of the following:
- It is not age-based;
- it is not ICT-centred;
- it is not excluding any learners;
- it is not predicting or assuming any behaviours or characteristics;
- it puts the focus on learners;
- it underlines the importance of digital as a context factor.

2. A theoretical framework to observe LoDE

2.1 Why and how?

In order to avoid bias and limit due to the adoption of other pre-comprehensions and readings about learners and new media, a theoretical framework was built to observe such topic with a wise and cautious perspective; the contribution aims to offer a consistent, coherent and comprehensive vision.

Due to the scattered nature of such topic, a theoretical framework is needed in order to decrypt what comes from the literature review. So, the discussion is enriched by the contribution of four different disciplines: Communication Sciences, Pedagogy, Sociology, Anthropology.
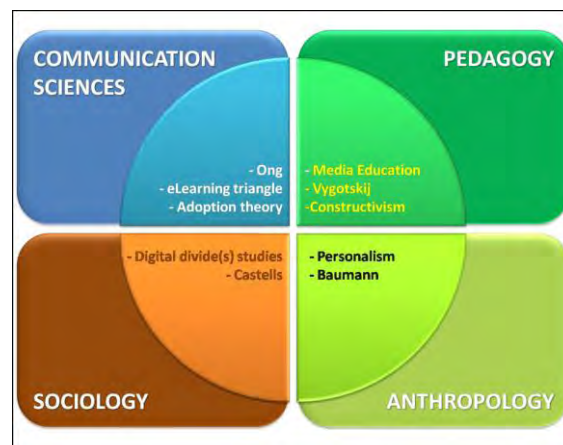
Figure 2. The interdisciplinary theoretical framework

2.2 Building an interdisciplinary theoretical framework

The interdisciplinary theoretical framework is meant to overcome a *naïf* view of the discourse: the goal is to understand why and how the spread of digital is affecting learners' everyday life, rather than simply accept or refuse the idea of a digitalized generation of learners.

The key-question leading the approach the framework is "Which idea of learner is inspiring us and are we promoting, when we set and provide eLearning?"; any presented reference will serve to find the complete answer. The rationale behind such perspective is that Media Education and eLearning are meaningful concepts if critically questioning the existence of media learner and/or eLearner, and her/his characteristics.

The next four tables summarise some answers coming from the chosen references (for the complete discussion of them, see Rapetti & Pedrò, under publication).

References		"which idea of learner must inspire us and have we to promote, when we set and provide eLearning?"
Communication Sciences	Ong's "second orality"	The reasonable existence of a new form of communication requires to develop new forms of didactics, able to respond to new dynamics in communicating. The objective is not to substitute, rather to integrate, the classical concepts of orality and literacy.
	Rogers' Adoption theory (+ media appropriation)	The rate of adoption must be investigated, individually analysing the different communities of potential adopters of eLearning. It is necessary to not superimpose the diffusion of innovations with the speed of development of human habits (especially in education). We must be aware that, at the end, adoption is a social phenomenon but what influences communication and learning styles are the individual processes of appropriation.
	NewMinELab's Triangle	This approach asks us to balance among the three vertices of the triangle of instructional design (persons, methods&tools, contents&goals). In light of that, we should refuse the faith in means and any deterministic drift

Table 1. The contribution of Communication Sciences

The mentioned references can be explored in the following texts:

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MEDIAPPRO. (2006). *An European research project. The appropriation of new media by youth*. Bruxelles: European Commission.

Ong, W. J. (1982). *Orality and literacy. The technologizing of the word*.London - New York: Methuen

Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.).New York: Free Press.

Wenger, E., McDermott, R. A., & Snyder, W. (2002).*Cultivating communities of practice.A guide to managing knowledge*. Boston, Mass.: Harvard Business School Press.

References		"which idea of learner must inspire us and have we to promote, when we set and provide eLearning?"
Pedagogy	Media Education	The approach of media education is an useful way to overcome the opposition between education and communication mediated by technologies, and it can inspire efficient pedagogical strategies. The digital context of learning can be understood thanks to the concept of media convergence; this must also become a focus in didactic. To explore effective media usages and their relevance in learning tools like media diet diaries can be exploited.
	Vygotskij	The zone of proximal development can receive many benefits from the digital environment. Learners are, nowadays, in condition to receive significant support to their performance, thanks to ICTs.
	Constructivism	The 21st century learner is an enhanced learner, s/he lives in an environment where learning processes are personalized and democratic. Digital technologies are the keystones, since they offer to the learner the possibility to become co-constructor of knowledge.

Table 2. The contribution of Pedagogy

The mentioned references can be explored in the following texts

Bevort, E., &DeSmedt, T. (1999). Évaluation des pratiques en éducation aux medias, leurs effets sur les enseignants et les élèves. Paris: Editionsdu CLEMI.

Calvani, A., & Rotta, M. (1999). Comunicazione e apprendimento in internet. Didattica costruttivista in rete. Trento: Erickson.

McLuhan, M. (1964).Understanding Media. New York: Signet Books.

Rivoltella, P.C. (2001). Media education modelli, esperienze, profilo disciplinare. Roma: Carocci.

Rivoltella, P.C. (2006). Screen generation, gli adolescenti e le prospettive dell'educazione nell'età dei media digitali. Milano: Vita&Pensiero.

Vygotskij, L. S. (1978). Mind in Society: The Development of Higher Psychological Processes. Harward: University Press

References		"which idea of learner must inspire us and have we to promote, when we set and provide eLearning?"
Sociology	Castells	In the digital environment, the learner has to learn how the "network logic" works. This is the physical and theoretical concept behind the organization of knowledge and power in the knowledge society.
	Digital divide	In the net, only the ones who are connected exist. Educational processes have to be implemented in order to fight any kind of digital unplugging and divide. The educational experiences of technologies have to offer to the eLearner the appropriate set of skills to face job market and, even more important, to exercise the citizenship.

Table 3. The contribution of Sociology

The mentioned references can be explored in the following texts:

Castells, M. (2000). The information age.The rise of the network society.(2nd ed.). Oxford: Blackwell Publishers Ltd.

Marshall, S., Kinuthia, W., & Taylor, W. (2009).Bridging the knowledge divide educational technology for development. Charlotte, NC: Information Age Pub.

References		"which idea of learner must inspire us and have we to promote, when we set and provide eLearning?"
Anthropology	Personalism (Maritain – philosopher of education)	Humans can not be understood within simplistic, determinist or instrumentalist visions. Even if they experiment the condition of *homo technologicus*, their anthropological freedom must guide the concept we have of them. It is better to refuse the pedagogical scientism, since it contrasts with the needed metaphysic foundation of education.
	Baumann - philosopher of sociology	Liquidity fragments the social action and reduces the integrity and identity of humans. Technologies which "pack in boxes" interpersonal communication can result alienating. The *homo consumens* no longer recognizes her/himself for what s/he is, but for what s/he has or would have; hyper technologization of learning can reduce a person to a consumer of digital knowledge.

Table 4. The contribution of Anthropology

The mentioned references can be explored in the following texts:

De Kerckhove, D. (2003). La conquista del tempo società e democrazia nell'era della rete. Roma: Editori Riuniti.

Maritain, J. (1973). Integral humanism. Notre Dame, IN: University of Notre Dame Press.

Bauman, Z. (2007). Homo consumens. lo sciame inquieto dei consumatori e la miseria degli esclusi. Trento: Centro Studi Erickson.

2.2.1 An overall vision

Doubtless, all the contributions mentioned in our theoretical framework are far from being an exhaustive framing of the problem; though, it has to be underlined that when "learners' voices" started(2008) there was a dramatic unbalance between a huge amount of descriptions of LoDE, and a very little corpus of theoretical reflections in this field.

According to Edgar Morin, we have to say that a *tête bien faite*(Morin, 1999) is the goal of any educative, formative, or training process. Current times – also due to the massive pervasion of digital technologies – ask for a reform of what we think knowledge is, and how knowledge is teachable and learnable. It must be underlined that, in the pedagogical reform suggested by the French philosopher, ICTs are not a driver or a goal; not because technology is not relevant, rather because it must be understood like an environmental factor which permeates any aspect of education in the 21[st]centuryand the focus need to be kept on human beings.

3. The "Learners' voices" research project and consequences

3.1 "Learners' voices" in brief

The methodological protocol was built moving from a deepened literature review about the topic, creating a taxonomy of interpretation, categorizing different approaches, and collecting all the characteristics attributed to today's learners. Then, a combination of quantitative (questionnaire) and qualitative (LEGO sessions) methods was implemented to collect data.

The research was run – from 2009 to 2011 – in the university institutions of Ticino (Università della Svizzera italiana and Scuola Universitaria Professionale della Svizzera Italiana), sampling 562 students (for all the details of this research data and to check the database, see E. Rapetti PhD thesis, free readable at http://amala.rero.ch/record/30474).

3.2 From the whole process of research, six key-messages

This paper is describing a theoretical process from the analysis of dominant reflections to an empirical study emphasizing the learners' perspective; from which might grow reflections useful to our understanding of education and new media. Actually, six key-messages can be drawn.

No predominance of technology in education

Neil Postman, in *The end of education* (1995), already put in light that there is an overestimation of the importance of technology, when reflecting about education: «In considering how to conduct the schooling of our young, adults have two problems to solve. One is an engineering problem; the other, a metaphysical one. The engineering problem, as all such problems are, is essentially technical. It is the problem of the means by which the young will become learned. It addresses the issues of where and when things will be done, and, of course, how learning is supposed to occur. [...] But it is important to keep in mind that the engineering of learning is very often puffed up, assigned an importance it does not deserve» (p.23).

"Learners' voices" confirmed that assumption.

Of course students like to have more technology at hand, but that is not their focus.

In facts, they are highly in favour of classical ways to learn (as quantitatively confirmed by the questionnaires' results) since their more frequent (and efficient)learning experiences take place via face-to-face didactic. If the eLearning platform does not work, they are disappointed but if the course is weak they are significantly more critic (as emerged during one discussion commenting LEGO sessions).

Socio-demographic variables are not unequivocal to explain ICTs adoption in education

Data from quantitative part of our research do not show any strong and univocal relation between age, gender, country of origin, and/or field of study variables and a declared ICTs-attitude in learning. As expected, students of our sample are great users of new technologies; nevertheless they are not really conscious of the permeation of media in their everyday life, and just some of them can be considered advanced users.

On this purpose, Bullen and colleagues (2009)report – as relevant theme coming out from their studies – the "limited toolkit" issue: «Despite a vast availability of institutionally supported and freely available (web 2.0) tools, the student 'toolkit' was surprisingly limited. Student use of technology could be distinguished as belonging to one of two sets: general communication tools, and program specific technical tools, [...]such as AutoCAD» (p.7).

According to these authors, three drivers lead the choice of a new technology in educational experiences: familiarity, low cost, and immediacy. As if to say that young people are very less digital than expected, when learning.

Labels can be catchy, but are not so useful in education

The recent book *Deconstructing digital natives* (Thomas, 2011)clarifies this point, in an excerpt, which summarizes the entire publication: «The digital natives argument [...] overstates the difference between generations, and understates the diversity within them. Many so-called digital natives are no more intensive users of digital media than many so-called digital immigrants. There are by no means as technologically fixated or as

technologically proficient as is often assumed. They don't necessarily have the skills, the competency or the natural fluency they are assumed to possess. Much of young people's use of digital technology is mundane rather than spectacular: it is characterized not by dramatic manifestations of innovation and creativity, but by relatively routine forms of communication and information retrieval. Contemporary children have many of the same interests, concerns, and preoccupations as children in previous generations -even if the way they manifest these through their use of technology are likely to be rather different.» (p.x).

In the same text, the smart inventor of digital natives wrote: «Of course dividing human beings into only two groups is a huge generalization. Even dividing people into "men" and "women" leaves out all sort of categories. But we do it, often, to make, or highlight, useful points» (p.16)

Marc Prensky states also that ICTs can make people "truly wiser", and – in order to go beyond the counter-position natives/immigrants – he suggests the new label *Homo Sapiens Digital*.

The importance of communication in using media

Communication studies provide an important piece of knowledge which is confirmed by our results: as expected, tools and facilities related to communication are widespread diffused and adopted by LoDE (it is enough to remember that 78,1% of our sample email everyday).

In the so-called Knowledge Society the widespread presence of media is continuously impacting our lives, and, as a consequence, our communication experiences in learning contexts: who lives and grows up in this environment is familiar with such dynamics, and is likely to develop abilities related to the management of communication via ICTs. Indeed, communication and education are fused together in any learning experiences involving ICTs (Cantoni 2006).

In short LoDE are primarily (contents-)communicators.

The importance of search in using media with learning-purposes

Only one thing is more frequent than communicational activities: using search engine, done everyday by 79,3% of respondents.

It has been observed that media – especially ICTs – are powerful "integrated components" in processes of elaboration of culture and civilization (Ceretti, 2007); search engines are particularly relevant in this analysis because they make extremely more complex and extremely more rapid access to any cultural contents, linking potentially everything (Battelle, 2005).

If the prevalence of search engines is a quite well-known and explored phenomenon, the consequent – complex – open question is about how this impacts learning habits and skills. It is reasonable to conclude that there is an attitude towards a massive usages of "Google & co",to seek information. Nonetheless, there is not enough evidence whether such familiarity provokes a correspondent learning ability; especially for what concerns the processes of critical choice and critical analysis, leading from information to knowledge (Pedró, 2009).

According to our results, LoDE are largely (information-)searchers.

The importance of eLearning as a context and as a strategy

Observing results from LV@USI-SUPSI it is possible to draw important conclusions about the nature of eLearning for LoDE. The first one is that no simple direct eLearning recipes can be derived; the reality is too many-sided to allow unique or universal solutions.

The second is that eLearning must be conceived either as a context – every learning in the knowledge society deals somehow with that "e-" –, and/or as a strategy. In facts, «To have more and better eLearning, we do not necessarily need more ICT, we need to be aware of their role in the overall living experience of learners and teachers (context), and to activate them if and when needed (strategy)» (Cantoni, 2011).

So, LoDEare learners. Then, contextually, are eLearners; and, if strategically provoked, can be wise eLearners

4. Conclusions

This article aimed to put in evidence a lesson emerged from our experience in "Learners' Voices" research: in social and human sciences results can be richer, more complex and faceted than expected. Especially if a problem is observed within a solid and consistent frame, addressing theoretical contributions useful to understand it broadly and deeply.

As it has been noticed (Cantoni & Tardini, 2010) it is necessary to overcome simplistic counter-positions, such as: the young learners vs the older ones; techno-fanatics vs techno-luddites; digital vs classical way of teaching. Rather, educators and pedagogists are asked to adopt a wise, cautious, and comprehensive perspective, in order to respect, interpret, and integrate the "media convergence" adopted by LoDE. This concept is well synthetized by one student in our research who gave this definition of "reading": «Reading means: having a book on the desk and a marker in my hand, checking on the net what I do not know, using the phone when a I need help, printing materials which are useful for me»

Finally, two pieces of conclusions come from the participation to the ATEE2013 conference in Genua. The first is a legitimate doubt raised in the discussion after the presentation: since our results are "old" (quantitative data refer to 2009, when tablets were not diffused), maybe our conclusions are not updated. On this purpose, our humble opinions is that unquestionably iPad (and similar devices) are powerful tools with great potentialities in education; nonetheless, their adoption need to be framed in a proper didactic/instructional design, and not just used because of they are *à la page* or because we suppose to face digital natives who love digital gadgets.

The second is the *caveat* expressed by VitorReia-Baptista about the need to stress the link between media education and media literacy, not confusing it with ICTs competence or media ability.

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An intelligent tutoring system to support student and teacher activity

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Abstract
The paper describes the beta version of the ITS prototype created within the I-TUTOR European project. The prototype here proposed is framed in the Self-Regulated Theory emphasizing the role of student self-concept under a phenomenological view and a cognitive self-monitoring.
The system is currently being tested in three different educational contexts and the paper describes the piloting occurring within a postgraduate course of study at the Department of Education Science, Cultural Heritage and Tourism of University of Macerata (Italy). Different kinds of concept maps are created through a statistical analysis and used to support the teacher and the tutor in monitoring the course and in the regulation of its development, but also to help the student in the self-regulated learning.
The prototype uses an intelligent system based on computational linguistics to build the maps. It works on a database from which statistical data are extracted in order to identify the number of word occurrence in documents present in a hidden archive, in texts provided to students as studying materials and in the texts created by students in their online discussions and in their assignments.

Keywords
Intelligent tutoring system, prototype, higher education

1. Introduction

Intelligent Tutoring for Lifelong Learning (I-TUTOR - *http://www.intelligent-tutor.eu*) is a two year European project started in 2012 and coordinated by University of Macerata (Italy). The project's aim is to highlight the need of a deep interplay between Artificial Intelligence (AI) and Education, specifically its main objective is to develop a multi-agent based intelligent tutoring system (ITS) to support online teachers, trainers and tutors.

ITSs are «computerized learning environments that incorporate computational models in the cognitive sciences, artificial intelligence, computational linguistics, and other fields that develop intelligent systems» (Graesser at al., 2012, p. 169) and their development history in the different research areas covers more than 40 years.

As underlined in the overview of the project objectives «The parameters of the project are based on the specificity of the European scenario, characterized by a strong fragmentation of languages and educational systems. These two elements implies the inability to adopt solutions for ITS, i.e. based on natural language, which could be usable by a large number of users» (Paviotti et al., 2012, p.149).

The prototype, created within the I-TUTOR initiative, requires the creation of a concept map and of statistical tools based on educational data mining, those tools are useful both for the teacher to monitor the course and for the students to identify their behaviours in the learning process. The present article will deal with the creation and functions of the concept map.

The system of concept maps visualization is based on data retrieved from texts present in the online platform used for the teaching learning process. The statistical analysis works for any language and is based on a bag-of-words model as described in the following paragraphs.

The visualization of maps is a tool to be used both by teachers/tutors and students to obtain different levels of representation about the domain key concept addressed in a specific course and the consistence between each student's behaviour in terms of his/her written productions and the domain.

2. Theoretical framework

The I-TUTOR project's aim is to develop an adaptive system in which students are supported to become self-regulated learners, and teachers are able to take advantage of a set of automated data visualizations to improve both their tutoring actions and the effectiveness of their course design process.

How can students become primary masters of their own learning process? Since self-regulated learning (SRL) should include «social forms of learning such as modelling, guidance, and feedback from peers, coaches and teachers» (Zimmerman, 2001, p. 1), teachers and students as a whole system need to be provided with the proper tools to visualize the situation of the co-activity system.

The ITS prototype designed and here proposed is framed in the SRL theory emphasizing the role of student self-concept under a phenomenological view and a cognitive self-monitoring.

The rationale of the prototype starts from the perspective that one of the key aspect of SRL is being active in one's own learning process and being able to activate a self-directive process. In order to set a learning environment able to offer such an opportunity for students it's undeniable the need to provide a self-oriented feedback loop (Zimmerman, 1989), that is «a cyclical process in which students monitor the effectiveness of their learning methods or strategies and respond to this feedback in a variety of ways ranging from covert changes in

self-perceptions to overt changes in behavior, such as replacing one learning strategies with another» (Zimmerman, 2001, p. 5).

Self-awareness is a key concept and the I-TUTOR prototype aims at helping learners acquire a domain-specific self-concept, that is the "beliefs and perceptions of their ability to direct and control their cognition, affect, motivation, and behavior in a particular type of learning situation or context" (McCombs, 2001, p. 87).

3. The piloting

The piloting was activated with the course "Didactics of Education" within the curriculum of the "Science of Education" postgraduate course of study at University of Macerata (Italy).

The course is run in face to face modality and implies 50 hours of instruction organized in two classes a week. The course structure was enhanced taking advantage of an online environment set through the Learning Management System (LMS) "Moodle" to develop further activities and discuss topics related to the main areas addressed by the teacher during the course.

All students were invited to register in the online environment and actively participated in the provided activities. The online activity started in February 2013 and lasted about 10 weeks.

Almost 60 students enrolled and followed regularly the progress of the assignments, discussion forums and accessed the resources uploaded in the LMS.

The course was administered by a teacher and two tutors supporting the students both in the technical and subject matter related questions.

It has been organized around 3 modules which were all available and visible from the beginning of the course since they are related to topics strictly intertwined.

Module 1 is a starting module which has a twofold objective: to introduce key words and key concepts that frame the whole course, and to let students familiarize with the online platform.

The first approach with the course is also meant to explore initial basic concepts connected to the teaching/learning process, as understood by students with their different background and experiential history at school of the same concepts.

Two forums monitored by tutors support students in their progress and a set of resources is provided to clarify the subject area. The students prerequisites and tacit knowledge is explored by a questionnaire designed by the teacher around 4 key concepts (teaching, learning process, didactics and instructional design).

The Module 2 requires a more specific tasks and both individual and group activities. Assignments in this step of the course are related to the design concept. Instructional design is approached through a practical perspective in which students are firstly asked to analyze a case (a ready-made design of a didactical unit).

Module 2 alternates self study and self reflection processes and collaborative assignments to be accomplished. Several digital resources are provided in terms of theoretical documents. In order to go deeper in the understanding of key concepts already approached and complete the Module 2 questionnaires students are expected to study specific sections of the text books and rearrange their readings and previous understanding with the new practices experienced during discussion forums and group works.

In the final step of the course, Module 3, students are motivated to create in small groups a brand new design according to a given model, the Learning Design Support Environment (LSDE - *www.ldse.org.uk*), software developed by London Knowledge Lab and Diana Laurillard as project leader.

Technical documents consisting on tutorial format resources and guidelines focusing both on the software download procedure and on the design process, as developed in LDSE, are uploaded in the platform in order to make students have a well supported hands-on approach.

4. The prototype

In the following paragraphs two key elements of the The I-TUTOR prototype will be described, domain concept map and the database, both integrated in the LMS.

4.1. Map

The I-TUTOR prototype uses the domain concept map to analyze topics addressed during the course and their relations.

It's possible to get different kinds of maps: the general subject matter domain map with all the topics in each module; the map connected to the group class in which some zones of the previous map are highlighted to show the activities that were accomplished; and the student map, that is, the general map in which topics and related documents approached by the student are highlighted.

In such a way the student can analyze which aspects of a general domain are addressed in the course and, moreover, which resources he/she has explored and what activities has completed.

Those maps support the teacher and the tutor in monitoring the course and in the regulation of its development, but also help the student in the self-regulated learning.

Each kind of map is organized into 4 levels of data representations. The maps are rectangular in shape and each zone of the map is characterized by a key word. Border zones of the map also have a conceptual relation. The first level represents the whole domain of the course, clicking on a zone a sub-domain is showed. If we click on the sub-domain zone we get a further sub-domain. The last level is accessed passing with the mouse over the previously mentioned zones and, in this way, the map highlights the key words related to the documents connected to the key words (Fig. 1).
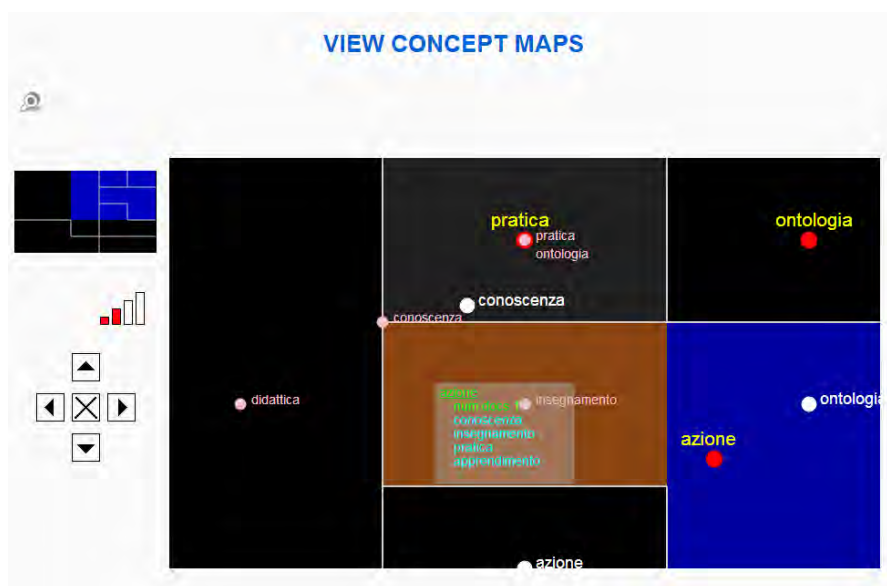

Figure 1. Concept map

4.2. Database

The prototype uses an intelligent system based on computational linguistics to build the maps. It works on both documents present in the database of the course materials, the documents written by students as assignments, and finally a hidden database which contains documents not visible to the students due to copyrights issues. Those documents are also needed to let the system create a more refined map. From the analysis of those documents key words are retrieved and also the closeness and distance among the different concepts. The choice of such a statistical approach is motivated by the opportunity to use the system in courses run in different languages.

As previously said the hidden database is a key element of the I-TUTOR prototype. Moodle platform offers the opportunity to add a database labeled in the LMS as an "activity" item. In the case here presented the database is a teacher led element not visible to the students and, thus, not aimed at being directly used by them.

Just teachers who are in charge of implementing it should manage its sections and have editing rights. The database created in the course "Didactics of Education" contains about 270 entries and it's wide enough to be able to offer a proper source of statistical significance in terms of subject matter course content.

The database is organized in a way the teacher can easily add entries, search for them and list the whole repository. For each entry the system requires a title, key words (either a single word or a multi-word), and to choose the typology of content ("definitions" and "insights" labeled content).

Content can be added either uploading a file (available formats are PDF; Doc; Txt; PowerPoint) or inserting the text directly in a provided field.

To develop a database related to the course core concepts means creating a "semantic space" from which statistical data are extracted in order to identify the number of word occurrence (according to a bag-of-words model) not only in the documents put inside the database, but also in the texts provided to students as studying materials and the text created by students in their online discussions and in their assignments. The statistical analysis works on all documents (visible and not visible to students) and all texts displayed in the course by students.

Specifically the Latent Semantic Analysis (LSA) has been used as a technique to capture the semantic relationship between text documents and words they contain.

As underlined by Landauer et al. (1998) the above mentioned analysis can be used to «(1) simply as a practical expedient for obtaining approximate estimates of the contextual usage substitutability of words in larger text segments, and of the kinds of—as yet incompletely specified— meaning similarities among words and text segments that such relations may reflect, or (2) as a model of the computational processes and representations underlying substantial portions of the acquisition and utilization of knowledge» (pp. 3-4).

4.3. How to use the map

As previously mentioned three typologies of maps are available. The general map of the course is the result of a summative description of the domain automatically created thanks to the hidden documents. It's almost an ontology in which the 2D map shows not only the main concepts, but also their positions making it explicit the closeness and the distance among them.

The chance to visualize the documents connected to the second level sub-domains provides the students and the teachers with two kinds of information: the first is related to the course

and the ability to see what parts of the domain are analized in each course module; the second lets the user connects the main topics to the documents.

The map that makes it visible the connection between the contents and a single document offers a further piece of information, in fact, if the student has visualized or downloaded the materials present in a specific zone of the map, that zone appears with a different colour ranging from red to blue depending on the number of documents analyzed.

Such a visualization is relevant for the student to acquire awareness of the work done and of the materials/documents to explore, this opportunity also lets the teacher take advantage of the overview of the student's study behavoiur.

5. **Conclusion**

Just the beta version of the prototype has been created and it is currently being tested in three different educational contexts: a postgraduate course of study at the Department of Education Science, Cultural Heritage and Tourism of University of Macerata (Italy), a in-service course run at ITEC (Greece), and an adult education course at the Budapest University of Technology and Economic (Hungary).

The first data are showing both the potentialities of the system, and the changes needed to improve the prototype to make it more effective. The educational advantages are mostly related to the chance to visualize the conceptual domain and to connect knowledge to a spatial image.

As reported by Berthoz «the brain is a geometrical machine» (2012), a statement that underlines how «the body, or even the outside world, is represented in the brain by neural maps organised by "topies", which means that the neurons that receive information from the body or the world are distributed in the brain centers on maps the replicate the layout of the body or the world» (*Ibidem*). The concept of space simplifies the mental processes and the understanding of their relations.

Besides the creation of a map as a zone and not as a tree maybe let the user approach in an easier way the models of knowledge used by the brain.

The modalities used to create the map need to be improved also in terms of usability. How can the system, based on a statistical analysis, identify the key concepts and their relations?

The system has now a good level of approximation and the chance offered to teachers to modify the weight of some key words can facilitate the creation of a map that is more consistent with the domain.

Further changes and adaptations will be activated to make the process that from the map brings to the documents (texts and students' produced documents) more direct. In a course it is usual to have materials connected to the didactical path. The map lets students reach the documents also through the navigation of the conceptual domain. What effects can this process have on learning? We wonder if the two kinds of navigations, the one made through modules, and the other made through concepts, make the learning process more complex or actually simplify the teaching/learning process.

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Fear and Fascination of Media: Discussion of the New Dimension of Educators' Competence in Latvia

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Abstract

Teachers in Latvia encounter similar difficulties in using media in their professional activity to problems teachers face worldwide. 20 years have already passed since the collapse of the Soviet Union coinciding with the spread of the Internet all over the world. However, teachers still face specific problems rooted in the implication of totalitarian values in the conscience of the society in Latvia as a post-Soviet state. These problems have impact on the teachers' media competence and their evaluation of the pedagogical potential of media in their work at school. In 2011, the research "Media Competences in the Target Group of Students and Teachers" was carried out in Latvia. 839 comprehensive school teachers working in the forms 7–12 and 955 pupils from the forms 7-12 participated in the study. Qualitative and quantitative data collection methods and data analysis methods were combined in the research framework - a survey of pupils and teachers and in-depth interviews with teachers. The results obtained in the framework of the research revealed that teachers use media for professional purposes, but mostly – for performing their administrative duties instead of using media for didactic purposes – the most frequently accessed websites are school homepages and e-class (85%). The conclusion was drawn that teachers see media as information sources the same as, for instance, a book. According to Latvian teachers' opinion, a medium is an information provider for lesson preparation, but not the tool for interactive and modern teaching. This confirms the tendency to see the media environment as insignificant for the study process. Teachers' unwillingness to change their professional habits during their classes has the same roots. Such teachers' attitudes shape learners' attitudes, and the research results confirm that Latvian learners hold the view that they can achieve equally high results in their studies in the both cases – when using media or avoiding the use of them. The report focuses on the discussion of the media competence as an indispensable dimension of contemporary teachers' professional competence, explained by the idea of Dieter Baacke about "fear and fascination of the media", initiated by the abovementioned research in Latvia. The contradiction between a teacher as a professional and his/her private image was detected: teachers as persons living in the information society are fascinated by media. They are eager to make use of them and want the society to believe that they use media also in their professional activities - the same as any other representative of the modern society. However, as professionals, they are afraid of the necessity to change their professional activities and habits. The conclusion was drawn that the Latvian teacher, being tired of social transformations and multiform educational reforms, seeks to preserve the illusory stability by resisting the introduction of pedagogic and technological innovations in the classroom. The report provides recommendations for changing the situation based on the analysis of the results obtained in the discussion with the focus-group.

Key words: media competence, teachers' professional competence, post-soviet educational space.

1. Research Problem and Context

What the meaning of education is, what things people must learn, which the best way for the educator to work in the information society is – these are the questions attracting the attention of educators worldwide today. It is not only knowledge and the idea of power assigned to it, which undergo transformations in the information society, but also the vision of "the knowledge keeper" and "the knowledge sharer" – the teacher and the interpretation of the concept of competences undergo significant changes (Eriksen, 2005). The following statement is crucial for an educator as well as any member of the modern society: personal self-realization within today's labour market and in the society in general is not possible without the revolutionary use of media and information. Research reveals that educators belong to one of professionals groups demonstrating quite active resistance to technological innovations in their practice despite the processes going on outside the school walls; they tend to interpret media usage as entertainment which is not to be associated with the learning process (Spanhel, 2006).

Educators in Latvia, Europe and elsewhere in the world encounter similar media usage problems in their professional activities. Despite the collapse of the Soviet Union 20 years ago coinciding with the spread of the internet in the entire world, educators in Latvia and post-soviet countries still encounter specific problems rooted in the implication of totalitarian values in the conscience of the society. One of the challenges faced in the transition from totalitarianism to democracy is linked to a person's ability of reorientation from tight control in his/her judgments and actions towards the conditions of pluralism and diversity (Rubene et. al., 2008).

Education plays a significant role in political and social transformations aiming to help the society (existing and next generations) to digest new and different social behaviour. As the majority of Latvian educators received their education and professional experience during the Soviet times, when facing the necessity to implement changes initiated by the democratic society and information technologies, they feel frustrated and acknowledge that they are not ready for such challenges (Austers et. al., 2007). These problems have negative impact on educators' media literacy and their assessment of the pedagogic potential of media in the school context.

2. Theoretical Perspective of the Study

The research on the information society carried out by the anthropologist Thomas Hylland Eriksen reveals that, in fact, it is the year 1991 but not 2000 which can be marked as the beginning of 21st century. The events of worldwide importance and the ones having global consequences took place in 1991: firstly, the collapse of the Soviet Union and, as a consequence, the collapse of post-war politics; secondly, the internet commercialization. The Internet (the web) promoted unprecedented processes of democratization and decentralization. Many authorities have always wanted to control these processes, however, they have never succeeded in achieving this objective. Eriksen argues that the information space created by the internet is directly connected with the collapse of the Soviet Union, as it left no opportunities to keep the Soviet people in the information vacuum; the fall of the Iron Curtain and The Berlin Wall marked the beginning of the spread of the Internet (Eriksen, 2005).

The rise of the information society promoted democratization processes in the former Soviet Union, yet it created many new challenges for people living in the post-soviet space.

Although, in general, the Latvian population are active users of the internet and other information technologies (the data for the spring 2012 revealed that around 70 % of

inhabitants aged 15-74 used the internet during the past six months), educators use the internet for professional purposes rather cautiously (TNS, 2011).

Researchers in the field of media pedagogy highlight the principal paradox – the necessity to improve the technical part of social communication, which is the issue of fundamental importance, and the increasing number of technical opportunities and content offer go hand in hand with the increasing educators' anxiety and worries about the possible negative consequences of media usage in educational systems. Some educators are optimistic while others warn of threats rooted in new technologies, which can affect children's and teenagers' value scale and world perception, as, within this perspective, media are perceived as a threat to classical cultural values and personality development (Barsch & Erlinger, 2002). Therefore, the conclusion can be drawn that pedagogic innovations are a step behind technological innovations due to the fact that not only educators "cannot", but also they "do not want" to use technologies for didactic purposes in the framework of their lessons.

This paradox can be explained applying the idea of "fear and fascination of media" (Baacke, 2007; Rydin, 2003). The necessity to use media and changes and development they constantly undergo lead to ambivalent feelings among consumers revealing both the elements of pleasure and panic. Media fascinate –they are novelty and conceived with enthusiasm; and media also frighten – as every novelty frequently leads to resistance and a skeptical attitude and unwillingness to be inspired (Rydin, 2003).

3. Teachers' Media Competence. The Case of Latvia

The goal of the research "Media Competences in the Target Group of Students and Teachers" conducted in Latvia in 2011 was to explore educators' attitude to media and media usage in the learning process (BISS, 2011). The research sample comprised 839 educators working in comprehensive schools with 7–12 form group and 955 comprehensive school students of forms 7-12. The objectives put forward in the framework of the research were to identify, evaluate and compare media usage competences of educators and students in comprehensive schools both in everyday life and in the learning process. Both quantitative and qualitative data collection and analysis methods were used – questionnaires for educators and students, and in-depth interviews with educators.

The tendencies revealed were surprising. According to the research results, educators do use media for professional purposes. However, it should be highlighted that they mainly use media for administrative purposes, but not for implementing pedagogic tasks – the internet portals mostly used by educators are school homepages and e-class (85%). The use of such resources is the requirement set by school management, thus this is an educator's duty and it cannot be viewed as the choice made by an educator himself/herself. Based on the analysis of media usage among Latvian educators, the conclusion was drawn that educators see media as the information media, such as books, diaries, notice boards, visual aids. In Latvia, media are perceived as information providers for preparing lesson materials, but not the educational environment for interactive and modern learning. The enormous gap between the goals of internet media usage set by educators and students is apparent: students mostly use the internet for expressing their opinions and communication, but only 8% of Latvian educators use the internet as a tool for interaction and communication (forums, blogs). The data is opposite for the students - they do live active everyday life in the internet. The two dominant opposing positions were revealed in the research framework. Firstly, some of the educators strongly believe that the internet cannot be used for educational purposes, as, within this perspective, the primary function of the internet is entertainment. This is revealed in the following claim: "When I avoid using the internet in the school context, I protect a child from

media-addiction; children are endangered of media-addiction at every turn". The opposing opinion supported by some educators is that media fascination can be used as a motivator ensuring the new opportunities within the learning process – sharing materials, commenting in the internet, quoting, writing reviews, etc.: "The internet is one of the channels to be used purposefully and children should be taught to do this; this way we can achieve better learning outcomes". However, the argument put forward by educators using the internet environment are mostly based on economic advantages and convenience – no need to go to the library, to look for books and, as a consequence, no more excuses like ' the library was closed, there was no book available'. The analysis of home assignments which require the use of the internet also reveals that the tasks are mostly based on searching for specific information. This verifies the tendency that educators do not use all the opportunities offered by the media environment. The respondents claim that the internet resources can be used in particular situations and can be replaced by other study materials or reference sources.

Educators see certain obstacles which make the use of the internet in the learning process challenging. The main obstacles revealed are insufficient knowledge and skills and no scientifically grounded methodology for the work with media. The respondents also mention that internet materials are not always well-structured. Problems with time-management, as it is not always possible to find the materials for 40-minutes lesson framework, are also viewed as a significant disadvantage. Therefore, the development of media learning methodology, defining methods, achievable results, and streamlining programs and the development particular teaching materials are seen as an urgent necessity. Based on the data obtained in the framework of the research, the conclusion can be drawn that the amount of available interactive materials is insufficient, the materials are poorly structured and the attempts in form diversification are fragmentary. Educators have access to trainings in the development of skills necessary for creating interactive learning materials, but they are not trained to work with internet media, which makes the grounds for educators' media literacy, as a consequence, interactive tasks are used as visual aids and do not promote media literacy among either educators or students.

The fact that teachers of humanities and social sciences reveal more successful integration of the internet into the learning process than teachers of natural sciences and exact sciences is worth attention. For example, 25% of mathematics teachers believe that the internet is not necessary in the learning process.

In general, this can be interpreted as the fear of using unreliable information found in the internet. Mathematics is the subject with the content and programme which remained unchanged for decades. This is the reason why educators working within such a "serious science" give preference to materials which have proved to be of value and acknowledged for decades – books, tables, rulers. This argument is contrary to the main driving force of the technological age – the achievements of mathematicians. Another argument put forward by mathematics teachers is that students are more focused and memorize material better when handwriting. They highlight that this conclusion is based on research. Therefore, avoiding the use of the internet is rooted in teachers' willingness to achieve better learning outcomes. The data obtained in the framework of the research reveal that 20% of educators believe that the internet has negative impact on learners' achievements, as it creates the groundless illusion that their level of education is higher than it actually is. This can well be illustrated with the following example. A student is given an assignment and he/she completes the task by using a copy-paste function. The student believes that he/she deserves a good mark. The conflict of interests is apparent, as the assignment is completed but the student does not show any competence in the topic explored. The problem is that educators readily detect the problem but they do not perform the analysis of the situation and do not explore the roots of these problems, as they can be rooted in learners' low media competences. Therefore, the

conclusion can be drawn that educators' should address the issues of working with information, information analysis and assessment.

It should be highlighted that teachers' attitude has direct impact on learners' attitude. 20% of Latvian students believe that it is possible to achieve equally good results by using media or avoiding the use of media in their work.

The research results verify the hypothesis that Latvian educators as persons living in the information society are fascinated by media; technical possibilities offered by media are acquired via training, creating interactive learning materials, working with computer software (BISS, 2011). Educators show willingness to use media. Moreover, they want the society to both be aware and believe that they use the opportunities offered by media in their professional activities the same way as other progressive members of the modern society. However, they also experience the moments of fear when they face the necessity to change their professional activities or habits. Therefore, they frequently feel unsure of themselves when they need to use media for achieving their teaching goals and improving the learning outcomes in the learning process. Although they rightly say that by using videos and songs, they introduce media within their course, it should be stated that the awareness of educators of numerous opportunities provided by media should be raised. Therefore, the research results verify that Latvian educators feel rather confident with computer-based learning, but not the internet-based or e-learning.

Based on the research results, the following conclusions can be drawn:
1. Educators mainly use media for performing administrative tasks in accordance with requirements set by the management;
2. Educators use the information found in media as visual aids in lessons;
3. Educators' fear of media has direct impact on students' media literacy.

In general, the conclusion can be drawn that fear and rejection connected to media usage dominate over fascination. Fear dominates over media fascination in the minds of Latvian educators both psychologically and in the framework of the implementation of the learning process, but media fascination dominates socially thus uniting the society. Moreover, media competence is required by regulations. The conclusions drawn are important, as the gap between the daily life and requirements set for educators is apparent, as the media competence is one of the modern educator's core competences included in the list of educators' basic competences defined as the competence to adapt and digest the new. (SKDS, 2007).

3.1 Media Competence as a New Dimension within Teacher's Activities

In January 2013, the meeting with the focus group of Latvian educators was organized with the aim to explore educators' attitude to media competence as one of professional competences of a modern teacher.

The data obtained in the framework of the focus-group discussion reveal that Latvian educators can be divided into two groups having two different dominating perspectives on the issue under discussion and having two opposing working styles.

This conclusion is alarming, as although representatives of the democratic society can have different opinions rooted in a person's individual choice – they can either use the internet or avoid using it, educators' professional objective is absolutely different. The task of the teacher in the 21st century is not just providing knowledge to next generations. Educators should assist in personality development – the internet, its effective use and the overall media literacy are indicators of professionalism when graduates start performing their job responsibilities. As a consequence, if their media literacy is not developed to advanced level, they face challenges or are unable to perform their professional assignments. The inconsistency in the

use of the internet is apparent – the use of the internet for entertainment purposes is a wide-spread phenomenon, however, the use of the internet for educational purposes is rare. This fact leads to challenges related to insufficient media literacy when performing work responsibilities, as students have not had proper training in the educational process. Therefore, the question about the outcomes of educational activities is raised. The detailed analysis reveals that some educators are not afraid of difficulties they face when using the internet – they actively participate and learn together with their learners by sharing materials, processing information, working with audio and visual materials, interacting with students, parents, etc. and using all the opportunities offered by the internet.

The negative attitude prevails among the educators belonging to the second group.

They argue that students use computers outside the school all the time, therefore, they should devote their school time to reading books and gaining a reliable theoretical background. Educators also mention that sometimes avoiding the use of the internet is rooted in their fear to lose their authority, as they are well-familiar with the material presented in books and everything is under their control. Educators supporting this viewpoint do not acknowledge the importance of media competence as one of the main professional competences. This allows drawing the conclusion that educators experience difficulties in developing sufficient media competence, as it can be developed only through action or practice, as a consequence, they cannot develop the media competence in their students. This conclusion is alarming, as the media competence is the core part of education aiming to ensure the sustainable development of the society.

The Ministry of Education and Science of the Republic of Latvia makes attempts to change the situation-the development of the media competence is stated as a requirement in educational programmes; ICT courses are available for educators; educators are trained in using software and creating electronic learning materials. However, this process is not efficient which is confirmed by the data obtained in the framework of the research. The attitudes are also shaped by the practice – the convincing pedagogic and didactic grounds for using internet resources purposefully in the pedagogic practice are still unavailable.

It should also be highlighted that educators are afraid of being under-evaluated for not using media in the educational process. In 2009–2012, the quality assessment of educators' professional activity was performed (ESF, 2011). One of the assessment criteria was the use of information and communication technologies. This criterion was taken into account in educators' salary calculations. In the framework of the assessment procedure, teachers had to present the documents certifying their ICT skills. Another requirement was to present a self-assessment report of pedagogic activities. These requirements have a direct impact on the gap between the actual learning process and the information provided in reports and sharing opinions in the framework of studies.

4. Conclusion

A Latvian educator conventionally relates the media literacy to the professional competence frequently interpreting insufficient media didactic skills as a guarantee for protecting students from excessive media use and, as a consequence, from media-addiction. In the framework of the educational process, an educator's objective is to help the next generation to digest new social behavior. However, educators in Latvia frequently avoid introducing technological innovations into the school environment. This can be explained by unwillingness and fear of changing their professional habits. However, the positive tendencies are also revealed. Some Latvian teachers recognize and support the idea that media

fascination dominates over fear – they see themselves as full-scale members of the information society and are willing to use the opportunities of virtualization in their work.

Although the second group is the minority, the optimistic trend is apparent– the virtualization of education in Latvia has started.

At present, in 2013, we can illustrate the research conducted with the words from the speech of the Minister of Education and Science of the Republic of Latvia, Roberts Ķīlis: "When mass production of glower electric bulbs started, chandlers with their skills became unnecessary and they could not find a job". Our goal is to give a chance and show the way for Latvian educators to reduce their fear of media.

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Digital competence in teacher education

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Abstract
Digital competence includes several approaches and understandings when referred to in educational contexts. In teacher education one central approach could be stated to be "to be capable to teach with and through Information and Communication Technology (ICT)". In Norway the national curricula in teacher education has recently been reformed and now it includes digital competence as one out of five basic competences[1]. With this in mind, the present work aims to elaborate on how teacher education institutions handle the uptake of digital competence within teacher education programs. Methodological approaches include document analysis of national and local frameworks and institutional strategies in teacher education programs along with interviews with managers and groups of teachers within teacher education institutions in Norway. Key findings are that digital competence lacks acknowledgement from the management side; few teachers use ICT in teaching, and this affects how student-teachers are trained in digital competence. Together all this influence the implementation of digital pedagogies within the teacher educational programs.

Keywords
Teacher education, ICT, digital competence, digital pedagogies

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[1] The five basic skills: digital skills, oral skills, being able to express oneself in writing being able to read, being able to do mathematics, being able to use digital tools (Norwegian Directorate for Education and Training, 2012).

1. Introduction

Information and Communication Technology (ICT) in education has been important for many years, in Norway and elsewhere. As for Norway, a stated goal from the policy side has been to equip future generations to be better prepared to participate in the knowledge society, where technology increasingly affects our everyday lives. The latest educational reform; the Knowledge Promotion Scheme was launched in 2006 and introduced digital competence as one of the five basic skills children acquire through education. Digital competence includes several approaches and understandings when referred to in educational contexts. In teacher education one central approach could be stated to be "to be capable to teach with and through Information and Communication Technology (ICT)". The introduction of digital competence involved challenges to schools, school leaders, school owners and especially for the government when it came to putting in place adequate infrastructure, expertise in ICT operations, access to digital learning resources and expertise on pedagogical use of ICT, to name a few. And much has been done; ICT has become an important part of school activities as integrated in all subjects through curricula and frameworks (Egeberg, Gudmundsdóttir, Hatlevik, Ottestad, Skaug, & Tømte, 2011).

Following the education reform for schools, teacher education was reformed; in 2010, as the initial teacher training program was replaced by two new specialized educational pathways for elementary school teacher education; National Curriculum Regulations for Differentiated Teacher Education Programmes for Years $1-7$ and for Years $5-10$[2]. The new national curricula in teacher education are based on the educational reform from 2006 in that they also include digital competence as one out of the five basic competences. Still, it seems unclear how the teacher-training institutions cope with this, in terms of strategies for training teachers to use ICT for didactical purposes, to enhance relevant technological artefacts within the institutions and to develop incentives which undertake all teachers to use ICT when teaching. In this paper we are to look at this, by elaborating on how digital competence is understood and practiced in the teacher education institutions. In Norway there are 21 higher education institutions (HEIs), which offer teacher education, all public but one. Our aim is to explore what are the approaches and understandings on digital competence within these teacher education institutions. Based on this context, the key issues would be to address how teachers within the teacher education institutions are trained to enhance competence and professional expertise to use technology in their own didactic work and consequently, how student-teachers are being prepared to teach with and through digital tools.

2. Theoretical framework

There have been several approaches in order to grasp what constitutes what it takes to teach with and through ICT in education. The Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006; 2008) was introduced as a method to understand and describe teachers' knowledge for effective pedagogical practice in a technology enhanced learning environments. The authors stressed that effective technology integration for teaching specific content or subject demanded a mutual understanding and

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[2] Kunnskapsdepartementet (2010) *Nasjonale retningslinjer for grunnskolelærerutdanningen 1-7 trinn*. http://www.regjeringen.no/upload/KD/Rundskriv/2010/Retningslinjer_grunnskolelaererutdanningen_1_7_trinn.p df Downloaded March 2013.
Kunnskapsdepartementet (2010) Nasjonale retningslinjer for grunnskolelærerutdanningen 5-10 trinn. http://www.regjeringen.no/upload/KD/Rundskriv/2010/Retningslinjer_grunnskolelaererutdanningen_5_10_trinn. pdf Downloaded March 2013.

negotiating with the relationships between the components Technology, Pedagogy, and Content. Teachers ought to be capable to negotiate with these relationships. If successful, these teachers represent a form of expertise different from, and broader than, the knowledge of experts from the disciplines, technology or pedagogy. As will be demonstrated in this paper, this approach is recognized within some of the teacher education institutions in Norway.

Another approach is framed as "Digital pedagogies" and includes teaching and learning activities that engages with digital technologies in a seamless way. In this, ICT is transparent and serve as ways to support different ways of learning (Prestige, 2012, pp. 450).

Krumsvik points at the need to develop a definition on what constitutes digital competence for teachers in a particular Norwegian context as it evolves after the introduction of the educational reform known as the Knowledge Promotion Scheme (Krumsvik, 2008). Consequently he introduces a particular framework for teachers' complex digital competence, which embraces structures for ICT impact on teachers practice (ibid). The framework is springs out from his previous research, in where digital competence for teachers is understood as "(…) teachers' proficiency in using ICT in a professional context with good pedagogic-didactic judgement and his or her awareness of its implications for learning strategies and the digital 'bildung' of pupils" (Krumsvik 2007a, b). In this Krumsvik underpins teachers' double role when they are to focus on education and instruction with ICT, and to perform as role models when teaching ICT within the subjects. This complex approach towards digital competence differs from what Krumsvik call "everyday digital competence for everyday digital literacy approaches" (Krumsvik, 2008, p 283). The framework he introduces is partly influenced by the TPACK framework by Mishra and Koehler when emphasising that teachers incorporate subject, pedagogy and digital competence in a seamless way. This way we might also see a link to what constitutes "digital pedagogies", as elaborated by Prestige.

As demonstrated, there are several approaches on what constitutes teachers competence in order to teach with and through Information and Communication Technology (ICT). What these methods seem to have in common is that digital competent teachers are expected to embrace various skills covering teaching skills, ICT skills and subject-related skills. As for the technology, teachers as described above are to have overcome barriers related to mastering the technology itself; these teachers are able handle diverse technological artefacts with self-efficacy and without stress related to thinking that technology would not work. Instead ICT is used seamlessly within their didactical work.

Not all teachers posit such skills, and teachers face at least two sets of barriers in order to practice them (Prestige, 2012). First order barriers include access to ICT, professional development on teaching with ICT and digital resources. Many of these barriers are met in Norway and elsewhere, even if some remain unsolved. For example basic ICT equipment and broadband facilities are met within schools and HEIs in Norway (Egeberg, Gudmundsdóttir, Hatlevik, Ottestad, Skaug & Tømte, 2011; Tømte, Kårstein & Olsen, 2013), and similar situations are reported in USA[3], Australia[4] and in the United Kingdom[5]. However, training teachers in teaching with digital resources remains unsolved, as will be demonstrated in the present paper.

Second order barriers are considered more complex as they concentrate on teachers' beliefs (Prestige, 20012) and self-efficacy (Bandura, 2007; Jamieson-Proctor, Finger & Albion, 2010) towards how ICT may interfere in their classroom practices as ways of teaching with and through digital technologies. Prestige found a relationship between ICT competence,

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[3] The National Technology Plan in America (U.S. Department of Education, 2006).
[4] The Digital Education Revolution 2008-2011, Department of Education, Employment and Workplace Realtions (DEEWR, 2009).
[5] Every Child Matters programme of change, Department of Children Schools and Families, (DCSF, 2009).

confidence and practice; teachers who expressed greater personal competency with ICT where more confident to use ICT in the classroom. However, their ICT practices where not necessarily corresponding with digital pedagogies in the sense of a constructivist student-centred approach (Prestige, 2012). Following this, the author identified four categories of ICT practices, which related to various dimensions of beliefs on towards the possibilities of using ICT for educational purposes were identified. One of these categories of practice was "Digital pedagogies". In this, the student was considered as "an active creator and user of information within learning dynamic supporting collaborative investigation of real life happenings within multidisciplinary global contexts" (ibid pp. 453). This way, the categories can also be interpreted along a scale of teachers´ pedagogical efforts to   make students active producers of digital content (Jenkins, 2007).

Levels of ICT use in terms of teachers' involvement of students/ pupils as producers of digital content as part of the learning process, is also discussed by Hammond and colleagues (Hammond, Reynolds & Ingram, 2011). In their study, they distinguish between three levels of students teachers ICT use; 1) Routine users; with limited opportunities for pupils for hands on experiences with ICT, manly using the interactive whiteboard in teacher centred activities. 2) Extended users were those student-teachers that gave pupils greater opportunities for hands on experiences. 3) Innovative users were student-teachers who motivated pupils at affective and behavioural levels (ibid). Their findings might echo various practices from the teacher staff, even if this is not taken into consideration by the authors.

3. Methodology

3.1 Context

Various levels of barriers and competences for teacher staff to teach through and with ICT will serve as a point of departure in this paper.

The five basic skills of curriculum in the Knowledge Promotion Scheme are obligatory subjects in the teacher education curricula. All program plans for teacher education describes the basic skills, but the organization and awareness of these vary between institutions.

All of the teacher education institutions offer both paths in of this elementary teacher education. Campus-based student organization dominates, but we also find diverse organisation of online studies.

Our aim is to explore how these HEIs handle what constitutes digital competence and practice digital pedagogies in their teacher education programs, and how student-teachers are being educated for digital competence in their teacher-educational programs/ at these teacher education institutions.

3.2 Objective of the study and research questions

With this in mind, the key issues for the present paper would be to explore what could be the first and second order barriers in the teacher education institutions; to which extent teacher staff within the education institutions are trained to enhance competence and professional expertise to use technology in their own didactic work. These actions might correspond with teacher education institutions' visions and strategies on what constitutes digital pedagogies as framed within local curricula. With this in mind, our research question can be framed as follows;

1) What constitutes digital competence/digital pedagogies within the teacher education institutions?
2) What are the approaches for teacher education institutions in order to educate teacher staff to teach with and through ICT?
3) How are student-teachers being prepared to teach digital competence to future students?

The study has a qualitative approach with interviews and document studies. Most interviews for teacher education stakeholders/ managers were conducted by telephone. In addition, we visited three teacher education institutions where face-to-face interviews were conducted with academic staff and staff working with ICT and learning in teacher education. Telephone interviews to teacher education stakeholders were carried out from January to March 2013 and visits to teacher education institutions took place in March and April 2013.

3.3 Interviews

Telephone interviews were completed with department heads, program managers and program coordinators at institutions offering elementary and secondary school teacher education programs. We interviewed 19 of the 21 institutions. The aim was to include all, but two of the HEIs reported difficulties finding time for completion of the interviews. Each interview was summarized in a memorandum, which subsequently was fact-checked by the informants. The interviews were semi-structured. Informants were submitted subject of the interview in advance. This provided the basis for comparison between institutions. The themes of the interview comprised issues such as organization and technology infrastructure, teacher trainers´ competence and possibilities to develop ICT skills for teaching, teachers´ approaches towards teaching with and though ICT and the relationship between teacher institutions and partner schools. We also conducted follow-up interviews during visits to three educational institutions offering teacher education.

The institutions were selected in order to grasp some of the diversity in teacher education institutions. The sample includes diversity in size, organization and geographical localization. Through face-to-face interviews, we got more in-depth understanding of key issues related to what it takes to teach with and through ICT. A key point in the selection of this group of informants was to produce a representative sample of teachers and/or teachers who work with themes specifically related to ICT and learning. We emphasized teaching in two subjects; namely mathematics and Norwegian, as these subjects are mandatory in both differentiated educational pathways (1-7 and 5-10). At the institutional visits, we conducted interviews either in groups or individually. Choice of format depended on the informants' own schedule. Informants at the educational institutions were also sent themes for interview ahead and they read through and fact-checked summaries of the interviews afterwards.

3.4 Document Study

We also performed a document study of curricula and course level for elementary school teacher education. As mentioned, 21 (including Sami) institutions offer elementary teacher education. This means that we have gone through 42 curricula and local frameworks relating to the subjects in the two teacher education programs.

Limitations of the research

Finings from the study are based on documentanalysis and interviews with managers and teacher staff within teacher education institutions. The study does not involve student-teachers' voices and their perspectives on the issues. To hear student-teachers reporting on these issues might contribute to nuance the present picture of the situation on digital literacy training wihtin the HEIs.

4. Findings and discussion

4.1 Organisation of teacher education

In this section both first- and second order barriers are being explored. We start by looking at first order barriers, such as the technological equipment situation; followed by routines for maintaining teacher staff proficiency towards teaching with and through ICT.

The supply of technological equipment for teaching with ICT are considered good by the HEIs. Still, some reports a need to be better equipped with digital whiteboards/Smartboards, along with training of the educational use of such in schools. Expertise built up by students and teacher staff often happens in close collaboration with partner schools.

Some teacher education institutions have their own roomfacilites for teacher education. Østfold University College, for example, holds a separate practice rooms for student teachers. The room is equipped with digital whiteboards and other technology that can be used in teaching, and with cameras so they can film their own practice. A similar room is being planned at Vestfold University College; and at The University of Tromsø student-teachers may use similar facilities.

Some teacher education programs also have their own studios for teacher staff where they can record lectures and create learning resources and podcast. Such facilities are available in part by the University of Nordland and the University of Stavanger.

A very few teacher education institutions also set explicit expectation that students must have their own laptop computer in order to carry out the studies.

Many teacher education institutions also have their own academic environments with a special focus on ICT and learning. Such resources appear to have a positive effect on teacher training institutions. By providing training, access to various digital equipment and in some cases also studios, the academic staff maintain their professional development and the development of good teaching where ICT is an integral part of a larger whole. Some of these communities are part of teacher education programs, while others function as standalone devices that all academic departments at institutions will benefit. Some of these environments also offer Master degree in Education, ICT and learning. Other teacher training institutions have developed their own expertice on ICT and learning in relation to general teacher education and academic staff from these communities is by several teacher training now heavily involved in the differentiated teacher training programs (1-7 and 5-10).

Based on this, first order barriers in terms of technology equipment and infrastrucures supporting the ICT dimension are largely met within most teacher education institutions, even if some artifacts, such as interacitve whiteboards/ Smartboards are still desired at some of them. However, first order barriers might also include how institutions maintain staff with proficiencies towards teaching with ICT. The next section elaborates on that.

4.2 Teacher staff and ICT

In 2011, a research group that follows the implemetation of the new differentiatied teacher education program, reported that digital skills were not particularly systematically taken care of within teacher training institutions (Følgegruppen, 2011, p 64). Our study points in the same direction, although the institutions report that they have had seminars, courses and other events focusing on internal training when it comes to the importance of teaching digital skills of academic staff. Nonetheless, it seems that in most cases this has to be somewhat arbitrary and not subject to regular routines for capacity building of staff. But there are exceptions; one of the HEI works with its own competence plan for academic staff and students includes digital competence. Another HEI has earmarked funds for training of academic staff associated with the new differentiatied teacher educations pathways (1-7 and 5-10). Moreover, one HEI report compulsory ICT courses for teachers, while one more offers courses in media education for its academic staff. Meanwhile other reports that teachers have their own means of professional updating, as they possibly can use to elevate their digital competence, without it being a requirement. In these cases the ICT dimension is somewhat just being random safeguarded.

It can be difficult to get academic staff to want to undertake training in digital tools. In such cases owe academic staff at the time shortcoming and does not value added in adopting ICT in their own teaching. One must be "a certain digital level", before one can see such situation, one of the informants. This is explained by that if you use too long time to master the most basic skills in technology, you will probably not have the energy to see the didactic possibilities also located in the technology itself. A certain level of skill and therefore a certain degree of confidence or sense of mastery is therefore necessary for academic staff adopt the technology in their own teaching practice and still this would not necessarily result in teachers' beliefs in digital pedagogies. This should strictly speaking be a factor for management to grasp, that is, to all academic staff to come to "a certain digital level." However, the reality proves to be more complex. Many teacher who experience academic staff lack basic digital competence also report that they have few incentives to academic staff to get started. The management of one teacher education institution reports difficulties to conduct training among academic staff, and the few participate in the courses that are set up.

4.3 Teaching and learning with ICT

Teacher education institutions demonstrate several approaches to how ICT is used didactically. Moreover, teacher education programs also vary in terms of the extent to which they have an awareness that they have a responsibility to develop students' digital competence. Furthermore, much of the work of implementing ICT in teacher training seems to depend on individual teachers. The scale of using ICT for didactical purposes, as desribed by Prestige and Krumsvik are identified in our study. An interesting observation is that academic staff utilizing ICT teaching says that students are motivated to be taught in this way and by this they are motivated to teach using digital tools; "it provides several methodological opportunities and strengthen professional understanding", as one of the teaches states.

4.4 Interaction with teacher education and partner schools

The interaction between teacher education institutions and partner schools is supported by learning managements systems (LMS). In our study we have learned that many schools are still too poor equipped, and even when the equipment is in place, teacher trainers at partner schools lack relevant ICT competence. Moreover, when teacher education programs train their students to use free educational software, student teachers might risk to come to partner schools with strong firewalls that prevent the download of such software. This prevent student teachers from practicing teaching with digital tools in when in practice. Although most teacher education programs formally require the practice schools that they should be concerned with ICT and able to provide relevant ICT equipment and expertise, many admit that it is difficult to comply with such requirements. Few reports to have good procedures to capture practice schools that proves not perform well.

4.5 National and local frameworks

According to the National Qualifications Framework, the new curricula for primary teacher education has been based on the requirement that all studies should specify learning outcome for students by 2012. While previous plans for teacher education has often had the teaching that object, the new plans describes students' learning outcomes with special emphasis on basic skills. As mentionned, through the Knowledge Promotion Reform, digital competence was introduced as one of the five basic skills of children and young people acquire through education. In the national guidelines for the differentiated teacher education pathways and curricula, the ICT dimension is related to a variety of subjects and discussed in a more specific and detailed way than in previous curricula for teacher training. A consistent finding is that program and curricula for the two educational pathways, largely refers to national guidelines - and that most specify digital competence at the same level as in the natinal curricula. There are relatively few examples of independent statements related to the ICT dimension - about what a good teacher education is, what kind of teachers one will train and what training will qualify. For both teacher education pathways within the differentiated teacher education programs, it seems all to be areas where there is a need for further development.

5. Conclusion

Our study shows that teacher education institutions are concerned with digital competence and educational use of ICT in teaching, although most of the HEIs lack a clear understanding and vision on what this means for the teacher staff and student-teachers and for the teacher education program as described by local curricula and frameworks. Moreover, only at a few teacher education institutions digital competence is clearly rooted within the management. The so-called "enthusiasts" among teaching staff have contributed to some of teacher education has come a long way in educating future teachers in the professional digital literacy. It is in this group of teachers that we find examples of "digital pedagogies" as described by Prestige (2012). But such a situation is vulnerable as it depends single persons efforts. In our study we have heard examples that confirm the existence of all aspects practicing teaching by ICT, as previously referred to by Prestige [6] and others. As long as not

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[6] 1) Foundational ICT-practices; 2) developing ICT-practices; 3) skill-based ICT practices and 4) digital pedagogies.

all academic staff in teacher education is identified as performing digital pedagogies, it will affect the students' ability to acquire holistic educational approach toward the use of ICT for educational purposes. When student teachers are largely at the mercy of "enthusiasts" to learn about ICT and the use of digital tools in the teaching, the education at best somewhat arbitrary in terms of the extent to which students are prepared to even teach using ICT in their own teaching profession, as stated by Krumsvik (2006). HEIs that posit academic environments with a special focus on ICT and learning are key drivers in the effort to get academic staff to work with ICT in their teaching practices, but such environments have no mandate to all teachers. A certain level of skill and therefore a certain degree of confidence or sense of mastery is required for academic staff to adopt the technology in their own teaching practice, in terms of digital pedagogies. This failed to happen from the management side at most teacher education institutions in our study. The introduction of mandatory submissions, (compulsory assignments in order to take the exam), are examples of how digital competence can be addressed through teacher training. This is however a risk that digital competence in the worst case, are highlighted as a only tool dimension rather than included in a more comprehensive educational approach (Hetland & Solum, 2008). In such cases, the mandatory submissions with ICT risk getting a rest pillow or an ICT-alibi for teacher education. Conversely, we have also seen that the mandatory submissions including of ICT can be integrated into more comprehensive learning.

Smoketh explains the weak implementation of teachers´ adoption of ICT for pedagogical purposes by insights from socio-cultural theory; teachers' adoptions are to be seen in relation to complex cultural factors and the regulatory frameworks and policies of national education systems (Smoketh, 2008). Our findings correspond with this, as we have withnessed that teachers' motivations towards digital pedagogy are influenced by HEIs awareness as articulated from the management side and their emphasis on elaboration national and local curricula. As long as an holistic approach lacks from the institutional and the management side, one cannot expect teachers that are not familiar with or with little self-efficacy and beliefs in teaching with and thorugh technology, to practice digital pedagogies. Our study has demonstrated that HEIs would have to have clear visions and strategies that includes the entire teacher staff if digital pedagogies is to become a teaching pracice that all student teachers are beeing exposed to.

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Section 2

Teaching and assessing with ICT in the classroom

Virtual Museums, Cultural Heritage Education and 21st Century skills

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Abstract
A wide variety of Virtual Museums (VMs) exist, which are different not only as to the contents, but also as to structure, objectives, implementation techniques, presentation methods, as well as interaction approaches. Nowadays the educational potential of VMs is widely acknowledged, although their actual use for educational purposes is still very limited (at least in formal educational contexts). This is what emerges from a survey conducted by the authors among Italian teachers and students, showing that the adoption of VMs in schools is still infrequent and not fully integrated in the standard educational practice. In the paper, after defining the concept of VMs and giving the results of a survey conducted by the authors witnessing the limited use of these tools in formal educational contexts, a reflection is conducted on their educational potential: VMs, besides addressing cultural heritage education, can often contribute to enhance some of the "transversal" 21st Century skills, referred to as "social, cultural skills and citizenship", as well as communication, collaboration, digital literacy and creativity.

1. Introduction

This paper deals with the role that Virtual Museums (VMs) can play in education, with a specific attention to formal education, that is interventions carried out in schools and other formal educational settings with the support of teachers and/or facilitators.

In particular, it aims at discussing the impact of VMs not only on cultural heritage education: actually the paper, while referring to the educational use of VMs, highlights that teaching and learning in the field of arts and cultural heritage, being deeply intertwined and strongly linked to other disciplines (Van der Leeuw-Roord, 2004), also entails the development of other transversal skills (Billing, 2007), that are widely recognized as "underpinning and informing" the learning processes, irrespectively of the different subject matters.

Considering the intrinsic educational potential of VMs (Twining, 2005; Ott & Pozzi, 2008) and taking into account the relevant educational opportunities given by the adoption of ICT-based innovative learning approaches (Ott & Pozzi, 2011), this paper discusses the educational use of VMs.

In the following the concept of 'VM' is defined, and some examples of existing VMs are provided; then, drawing on a survey conducted by the authors with both teachers and students, data are reported on the actual use of VMs in schools; ultimately the authors argue that VMs should be considered not only for their capacity to support awareness raising in the field of cultural heritage itself, but also they can contribute to the development of some relevant 21st Century skills, that are key to live (and be lively actors) of the Knowledge Society

2. Virtual Museums: what are they?

The concept of VMs is not new (Antinucci, 2006), but only recently the term has become popular and widespread. According to a still "in progress" definition elaborated by the V-MUST-net (Virtual MUSeums Transnational NETwork)[1] the thematic Network of Excellence (NoE) financed under the 7th Framework Programme, "a Virtual Museum is a digital creation organized on a permanent or temporal basis in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits, in a digital way, the tangible and intangible heritage of humanity and its environment. It uses various forms of interactivity and immersion, for the purpose of education, research, enjoyment and enhancement of visitor experience" (Farouk & Pescarin, 2013).

From a technical perspective, the term VM may cover various types of digital creations, ranging from repositories of multimedia contents, to virtual reality and 3D reconstructions, etc. They need a dedicated space to be accessed: either a dedicated physical space inside a traditional museum or visitor center (Forte et al., 2003), or a cyberspace (visual presentations accessible via Internet, content distributed on DVDs, etc.).

Independently of the technical implementation, VMs are applications oriented to knowledge raising and learning.

2.1 Examples of VMs

As already mentioned, many different types of VMs exist, focusing on various topics, adopting different approaches as far as presentation and description of the contents, and – last

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[1] http://v-must.net/

but not least - using different implementation techniques and various technologies. In the following some examples of existing VMs are provided; the aim of this section is not to be exhaustive at all, but simply to give the reader a clearer idea of the kinds of artefacts that may be labelled as 'VMs'.

An example of a virtual museum showing existing cultural heritage artefacts in their present form, is the 'CENOBIUM'[2] (Cultural Electronic Network Online: Binding up Interoperably Usable Multimedia), a web-based application for the study and the presentation of the Romanesque cloister capitals from the Mediterranean region (specifically from Monreale, Aosta, Cefalù). Images, texts and 3D models regarding these cloisters can be explored and compared in an integrated, manner (Figure 1).

Figure 1. Images from the CENOBIUM VM

One of the main values for education is that this VM presents monuments that are far from each other and thus allows direct comparisons and juxtapositions, which would be otherwise impossible. Differently, the VM of 'the Santiago de Compostela Cathedral'[3], is a reconstructed environment: the user interacts with a three-dimensional model of the Cathedral, where s/he can explore the main building elements and stylistic details (Figure 2).

Figure 2. A 3D reconstruction of the Cathedral in Santiago de Compostela

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[2] This project was developed by ISTI-CNR and Kunsthistorische Institut in Florence. Available at: http://cenobium.isti.cnr.it/index.php
[3] The VM is due to Universidade da Coruña E.T.S. de Ingenieros de Caminos, Canales y Puertos. Available at: http://videalab.udc.es/en/3dv_cathedral

It is an installation based on a multi-touch system, where the user interacts directly with the three-dimensional virtual model of the Cathedral (zooming, panning, rotating and sectioning it in any plane and in real time); at the same time s/he can also access information about the elements of the basilica.

Another example of VM is the 'The Ancient Agora of Athens'[4] VM, which brings to light the main features of the ancient Athens Agora, an area which, in ancient Greece, was the main place for political gatherings and commercial transactions, the locus of the administration and justice and ultimately a religious and intellectual centre. This VM is the result of the accurate and scientifically documented reconstruction of the places and related life made by the scientists of the Foundation of the Hellenic World, who have thus created an original digital documentation of the political and cultural life of the Athenian Democracy. The virtual representation urges the visitors on a journey of discovery: they can explore the accurate virtual representation selecting their course during their visit to the virtual world. They can examine the architectural details of the buildings and the landscape from many different perspectives and, by taking part in virtual interactive activities, they can also live experiences and explore the arts and the everyday life in a period ranging from the 5th century BC to the 3rd century AD. For instance in one of the possible tours, namely the: "Interactive tour" the Ancient Agora of Athens can be visited, through jumps in time, in three different important moments: Classical Agora (approx. 400 BC), Hellenistic Period (approx. 150 BC) and Roman Agora (approx. 150 AD). This virtual collection also includes objects and other elements of the living environment of that period and original music so to give an overall view of the life in those times. As shown in Figure 3 living bodies are represented in their original habits and documented features.

Figure 3. The Ancient Agora VM

Highly innovative technologies are employed in the most recent VMs, allowing different types of fruition/interactions besides the simple "vision". This is the case, for instance, of Etruscanning[5], a virtual reality (VR) installation dedicated to the digital reconstruction of the famous Regolini Galassi Etruscan tomb in Cerveteri, which was discovered intact in 1836. Inside the VR installation, the extraordinary objects of the mortuary equipment - today

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[4] The Museum was developed in 2006 by the Foundation Of The Hellenic World. Info are available at: http://project.athens-agora.gr/index.php?lang_id=en
[5] Etruscanning 3D is an European project (Culture 2007 framework). It is due to the Collaboration among: Allard Pierson Museum - University of Amsterdam; CNR-ITABC; Visual Dimension bvba; National Museum for Antiquities in Leiden; Gallo-Roman Museum in Tongeren; Musei Vaticani; Museo Nazionale Etrusco di Villa Giulia; CNR ISCIMA.

preserved at the Etruscan-Gregorian section in the Vatican Museums - have been re-contextualized (see Figure 4).
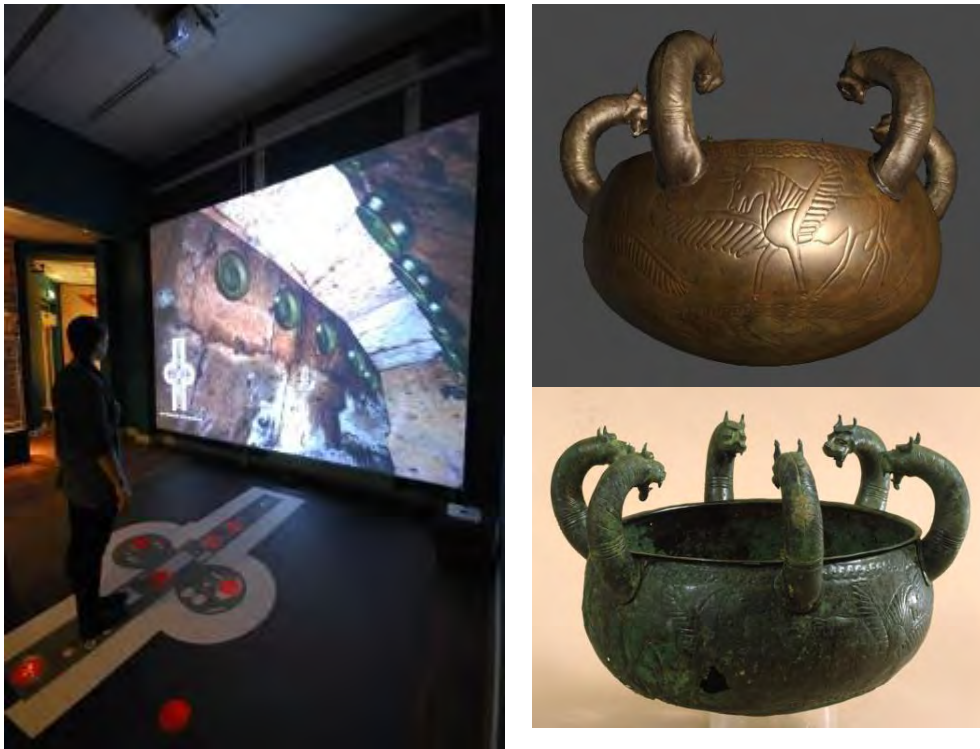
Figure 4. Installation of the Etruscanning pilot (left) and an example of reconstructed vs. original pottery (right)

The tomb, acquired by laser scanner, has been reconstructed, as it probably could be in Etruscan age (half of the VII century BC), just after being closed. Nevertheless, the most innovative element of the application is the paradigm of interaction based on the use of natural interfaces, that means that the user moves inside the 3D space just through her/his body movements, as represented in Figure 4. The public has the possibility to explore the virtual tomb, to get near the artefacts, to listen to narrative contents from the voices of the prestigious Etruscan personages buried inside to which such precious objects were dedicated. All this is possible moving in the space in front of the projection, in the simplest and natural way. The user walks on a real map of the grave, attached on the floor, on which some "hotspots" are indicated. While changing her/his position from one hotspot to another, s/he moves in the virtual space, going deeper in the tomb, close to the objects and make storytelling emerge.

3. Virtual Museum: a survey on actual use in schools

In 2012, during a scientific event called "Festival della Scienza" (Science Exhibition) taking place every year in Genoa-Italy, the authors set up an exhibit where a number of selected VMs was shown to teachers and students, with the support of an Interactive Whiteboard (a technology relatively spread in Italian schools). Objective of the authors' exhibit was to stimulate the interest of schools around the educational use of VMs.

In this context, in order to better estimate the current level of knowledge and awareness of teachers and students about the concept of VM, as well as their perception and actual use, a questionnaire was distributed to 372 students and 29 teachers of upper secondary schools.

As to the actual use of VMs in schools, the results of the questionnaire show that 19 out of 29 teachers had never used a VM, 5 teachers had used them sporadically, 2 very rarely; only 2 teachers declared they had used VMs often, as shown in Figure 5.
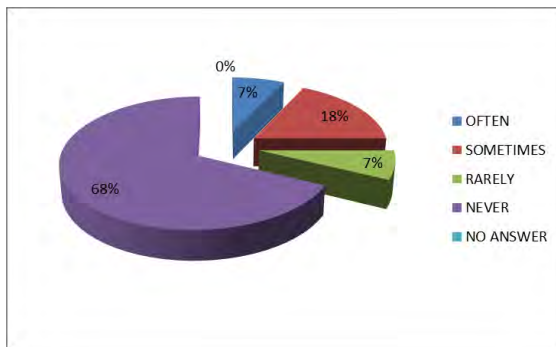
Figure 5. Teachers' use of VMs
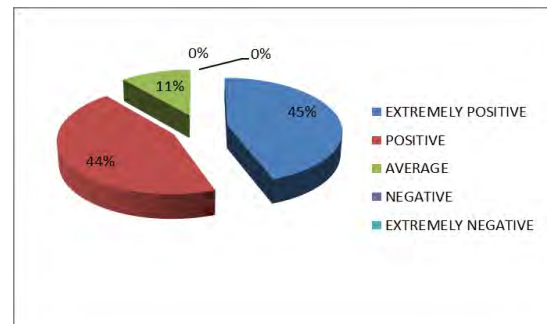
Figure 6. Teachers' opinions on the educational potential of VMs

Besides, as reported in Figure 6, the majority of teachers who had previously experienced the use of VMs in their classes, gave a positive evaluation of their effectiveness for educational purposes (the judgment was "extremely positive" for 4 of them ,"positive" for other 4 teachers, and "average" for the last teacher involved in the sample).

As to students, 248 out of 372 (67%) declared that they never used a VM at school, 72 (19%) stated rarely, 33 (9%) sometimes and only 6 out of 372 (2%) affirmed that they had used them frequently (Figure 7).
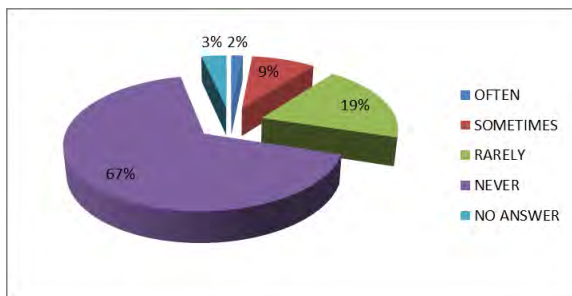
Figure 7. Educational use of VMS by students
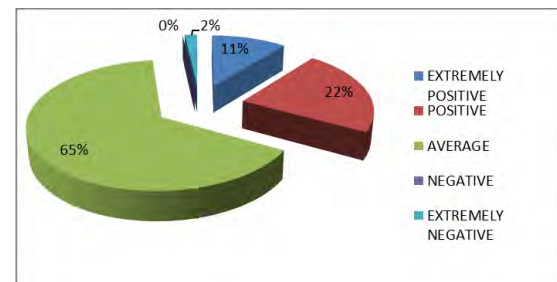
Figure 8. Students' opinions on the educational value of VMs

The students who had claimed some experience with VMs at school (111), gave the following evaluation: none reported a negative feedback, but 2 evaluated it "extremely" negative, 73 (65%) defined it as "average", 12 (11%) felt it was extremely positive and 25 (22%) just positive (Figure 8).

All in all, the data collected during the survey reveal that the level of use of VMs in Italian schools is still pretty low, although both students and teachers think they are (potentially) powerful tools.

4. The role of Virtual Museums in contemporary education

The limited use of VMs in the Italian schools revealed by the survey, can probably be ascribed to a number of reasons, among which the lack of information and appropriate training from the teachers' side, as well as the complex technological requirements of some applications with respect to the standard hardware available in most Italian schools.

In addition, one should also consider the fact that VMs are mostly felt as tools oriented to enhance learning "exclusively" in the field of cultural heritage.

Conversely, VMs can be used to foster other transversal skills that are nowadays considered key for the knowledge society. This should be considered as an added value, given that their use could foster not only knowledge and competences related to the specific domain (i.e. arts and cultural heritage), but also the development of 'higher order' skills.

In order to understand what these skills are, in the following section the 21st century skills are firstly defined and then in the subsequent section a focus is done on what skills can be potentially addressed by VMs.

4.1 21st Century skills: what are they?

Different definitions and classifications have been proposed so far, with the aim of defining the so - called 21st century skills. Redecker et al. (2011) in the JRC report of the EU Commission, propose to look at the matter from the perspective of three general categories: 1) Personal skills (initiative, resilience, responsibility, risk taking, creativity), 2) Social skills (team-, networking, empathy, compassion, co-constructing), 3) Learning skills (managing, organizing, metacognitive skills, failing forward).

Furthermore, ICT literacy and competence are considered important by other authors (e.g. Dede, 2010) and in particular "the ability to rapidly filter huge amounts of incoming data, extracting information valuable for decision making" and "the ability to separate signal from noise in a potentially overwhelming flood of incoming data", the so-called "information problem solving" skill. As underlined by Kickmeier-Rust & Dietrich (2012), the difficulty of finding a unique shared definition probably arises from "the unclear, probably vague, and highly informal nature of these 21st century skills". As a matter of fact, the concept is "an overarching term for many kinds of meta abilities, soft skills, communication and collaboration skills, of attitudes, self-awareness, strengths in non-linear thinking, and innovative problem solving, as well as the ability to reflect about one's own thinking and being".

In this light, some organizations have developed structured frameworks for defining the 21st century skills: this means not only that they have identified and listed a set of skills, but that they have also organized them into conceptual frameworks. In a paper by the University of Twente (Voogt et al., 2010), for example, a thorough list of the skills is proposed, which includes skills that had been previously mentioned in other six existing frameworks (namely: P21[6], ENGAUGE[7], ATCS[8], ISTE[9], OECD[10], CASE[11]).

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[6] P21- Partnership for 21st Century Skills (2011). Framework for 21st Century Learning. (USA). Availabe at: http://p21.org/storage/documents/1.__p21_framework_2-pager.pdf
[7] Engauge 21st Century Skills Literacy in the Digital Age (Meteri/NCREL 2003). (USA). Availabe at: http://pict.sdsu.edu/engauge21st.pdf
[8] ATCS (2010) "Draft White Paper 1 - Defining 21st century skills" Binkley M., Erstad O., Herman J., Raizen S., Ripley M., Rumble M. (Australia). Availabe at: http://atc21s.org/wp-content/uploads/2011/11/1-Defining-21st-Century-Skills.pdf
[9] ISTE ET, NETS and 21st Century Skills. Availabe at: http://isteemergingtech.wordpress.com/about-21st-century-skills-and-emerging-technologies/
[10] OECD – Organization for Economic Cooperation and Development. (2005). The definition and selection of key competencies: Executive summary. Paris, France: OECD. Availabe at: http://www.oecd.org/dataoecd/47/61/35070367.pdf
[11] Gordon, J., Halsz, G., Krawczyk, M., Leney, T. et al. (2009). Key competences in Europe. Opening doors for lifelong learners across the school curriculum and teacher education. Warsaw, Center for Social and Economic Research on behalf of CASE Network. Availabe at: http://ec.europa.eu/education/more-information/doc/keyreport_en.pdf

The overall list of the skills proposed by Voogt et al. (2010) is reported in Table 1, which also gives an idea of the "frequency" of each skill in the six frameworks (skills mentioned in all frameworks, skills mentioned in most frameworks, skills mentioned in few frameworks, skills mentioned in only one of the framework).

Mentioned in *all* frameworks	Mentioned in *most* frameworks (i.e., P21, EnGauge, ATCS and NETS/ISTE)	Mentioned in a *few* frameworks	Mentioned only in *one* framework
- Collaboration - Communication - ICT literacy - Social and/or cultural skills; citizenship	- Creativity - Critical thinking - Problem solving - Develop quality products / Productivity (except in ATCS)	- Learning to learn (ATCS, EU) - Self-direction (P21, En Gauge, OECD) - Planning (En Gauge, OECD) - Flexibility and adaptability (P21, EnGauge) Core Subjects: - Mathematics; communication in mother tongue; science (EU, P21, ATCS); - History and arts (P21 and ATCS)	- Risk taking (En Gauge) - Manage and solve conflicts (OECD) - Sense of initiative and entrepreneurship (EU) - Interdisciplinary themes (P21) - Core Subjects: economics; geography; government and civics (P21)

Table 1. List of the 21st Century skills according to Voogt et al (2010)

4.2 What 21st Century skills can be addressed by means of VMs?

As said above, VMs are digital artefacts that exploit ICT potential to address social/cultural skills by sustaining awareness and knowledge raising in the field of heritage, arts and history, and these skills are mentioned in at least two of the frameworks considered by Voogt et al. (2010) (see Table 1).

This had been also acknowledged by the EU Commission in 1995 that had also recognized the importance of cultural heritage education, by maintaining that: "Recalling and understanding the past is essential in order to judge the present. Knowledge of history (including scientific and technological history) and geography has a dual function as a guide in time and space, which is essential to everyone if they are to come to terms with their roots, develop a sense of belonging and to understand others". Later on, Whitby (2005) while surveying extension, features and aims of the arts curricula in EU, had also found that, already a decade ago, arts education was considered an important aspect of contemporary education all across Europe. Besides, other research studies (Bamford & Wimmer, 2012; Sharp & Le Métais, 2000; Whitby, 2005) have highlighted the pressure for curriculum development in the arts, to include the study of new media (including film, photography and digital arts) and to enable pupils to use ICT as part of the learning process.

Thus, VMs can be regarded as learning/teaching tools addressing address a field (namely cultural heritage education), which is considered highly relevant in in contemporary education.

Besides, VMs, being digital artefacts, can contribute to enhance ICT literacy, which is also widely considered one of the core 21st Century skills (see Table 1); this is true if we accept that the concept of "ICT literacy" extends up to the boundaries of "ICT competence" and therefore to the concept of "ability to properly use and make the most of digital artefacts" (Olimpo, 2008).

Thus VMs, by their own nature, address at least two of the 21st Century skills mentioned in the examined frameworks (Voogt et al, 2010) (see Figure 9).

Figure 9. 21st Century skills and VMs

Nevertheless, VMs can also be used (and this largely depends also on *how* they are employed), to sustain other relevant 21st Century skills.

Certainly creativity is one of these, as underlined by Ján Figel (Commissioner responsible for Education, Training, Culture and Youth in 2009) who, while acknowledging that "the role of arts education in forming the competences for young people for life in the 21st century has been widely recognized at the European level" also affirms that "The European Commission [...] acknowledges the value of arts education in developing creativity" (EACEA, 2009). Furthermore, another study by the Commission (KEA, 2009) maintains that: "Art and culture have the ability to stimulate people's imagination and creativity in schools, in colleges and universities and in lifelong learning" and suggests that arts education should be also aimed at supporting creativity development by defining that: "Creativity in learning is about fostering flexibility, openness for the new, the ability to adapt or to see new ways of doings things and the courage to face the unexpected. Imagination, divergent thinking and intuition need to be considered as important characteristics of progressive arts education by schools, universities and further education providers". In this line, Taggart et al. in 2004 while examining the arts curricula in EU countries, had already found that cultural education in the member States had "a new interesting focus on creativity (often in relation to its importance in innovation) and in relation to both individual identity and promoting intercultural understanding".

From the above mentioned studies, it emerges that, together with creativity, at least other three key 21st Century skills can be fostered by means of digital artefacts, such as VMs, namely: communication, collaboration and interdisciplinarity.

The rationale behind Figure 10 is well expressed by Whitby (2005), who include among the expected outcomes of arts education (which, in their view, should adopt a genuinely social approach) the development of "personal and social/cultural skills such as confidence and self-esteem, individual expression" but also of "teamwork, intercultural understanding and cultural participation".
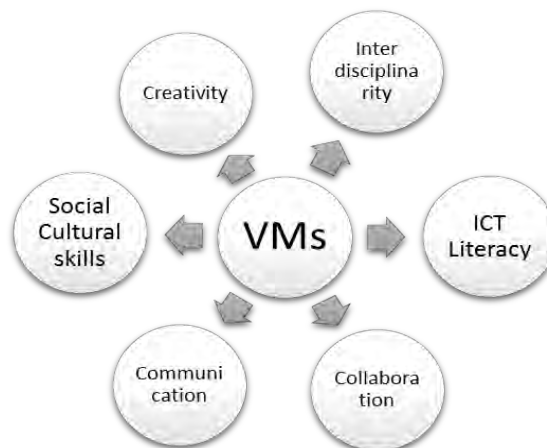
Figure 10. Positioning VMs among the 21st Century skills

These concepts have also been reinforced by the Council of Europe, who launched a Framework Convention on the value of cultural heritage for society (Council of Europe, 2005); in this Convention, it is established that art education should contribute to fulfill the need for European countries to: "preserve cultural resources, promote cultural identity, respect diversity and encourage inter-cultural dialogue".

As a matter of fact, in all these documents collaboration, communication, sharing, exchanging and dialogue are keywords that are meant to inform future and present cultural heritage education. The role and relevance of VMs to this end is self-evident, and could be nurtured by the research already carried out in the field of Technology Enhanced Learning and in particular of online collaborative learning (Ott & Pozzi, 2008).

The importance of interdisciplinarity is also acknowledged by EU, so that in Article 13 of the above mentioned Convention (see Table 2), while discussing the role of cultural heritage and arts education, they recommend to "develop linkages between courses in different fields of study". From this perspective VMs, can help enhancing cross-disciplinary studies.

Article 13 – Cultural heritage and knowledge
The Parties undertake to:
a)facilitate the inclusion of the cultural heritage dimension at all levels of education, not necessarily as a subject of study in its own right, but as a fertile source for studies in other subjects;
b) strengthen the link between cultural heritage education and vocational training;
c)encourage interdisciplinary research on cultural heritage, heritage communities, the environment and their inter-relationship;
d)encourage continuous professional training and the exchange of knowledge and skills, both within and outside the educational system

Table 2. Article 13 of the Council of Europe-Framework Convention on the Value of Cultural Heritage for Society

5. Conclusions

In this paper the educational potential of VMs has been discussed, by putting forward the idea that when using VMs in classrooms, coherently with the overall mission of 21st century education, a wider spectrum of learning objectives can be addressed in addition to those that are considered "standard" in the field of cultural heritage education.

Of course this doesn't happen 'automatically', which means that it is not the use of technology that *per se* guarantees the development of certain skills, but whenever teachers design the learning activities properly and adopt suitable educational methods, VMs can represent an important asset to the development of some of these 21st century skills.

Besides, VM developers should carefully design the educational affordances of their tools, by embedding functionalities (such as learning analytics, data mining, turn over options…) able to foster the adoption of advanced educational methodologies and techniques (e.g.: personalized, active and discovery learning, collaborative learning, etc.). These affordances should be considered as integral part of VMs, and should be taken into account from the very beginning of the design process, so to transform the learner's "virtual visit" into an effective "learning experience".

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Laboratory based didactics and cooperative strategies for a feeding study report

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Abstract

In 2010, proposed by the headmistress and with her project support, two important training initiatives were implemented in Bussero (Milano, Italy) school: a group of teachers of our Institute would have participated in a training about methodologies so called of "cooperative learning" while, in parallel, a special training on the use of new technologies to support didactics was carried out, starting at the same time a pilot experience in ten classrooms.

The practical experience here proposed was born as an interlacement between the adoption in the classrooms of the two above mentioned training course for the teachers, resulting in a multimedia narrative entirely prepared by the students, within the "class 2.0" project of the secondary school, by using the skills of cooperative learning in the different steps of the project.

This activity takes inspiration from the visit of our class to an important interactive exhibition on food and feeding. From here, the project has been designed as a series of steps, all based on the sharing of information and cooperative construction of a path where every student includes his own experiences into the final results. The resulting product is perceived by the participant as their own project, and is characterized by the valorisation of the best skills of every student.

This project has been awarded a special mention form Politecnico di Milano (Policultura) between the winning projects.

Keywords

Multimedia narrative, cooperative didactics, feeding atelier, learning docimology, conscious consumption

1. Introduction section stating the experience

The role of the school headmaster within an advanced school system is complex and articulated.

In the Italian context, the school headmaster is the legal representative of the School under his management, and he's the guarantor in front of the Law for the respect of all the procedures and norms.

Moreover, he's the final responsible for the results achieved by its students, and therefore of the relevant learning and valuation processes.

The goal of the experience we are describing now is to demonstrate how the school headmaster could be fundamental for the establishment of innovative processes within its school.

Sometime the pedagogic intuition can come from the headmaster himself and from its team of collaborators, sometime from a team of teachers especially active. But in any case, without the support of the school management, such intuitions are in danger of remaining limited and not widespread within the school organization.

The school manager (and in the Italian reality is the headmaster) has the power to authorize innovation, allocate funding, structural and organizational resources and authorize purchasing; moreover he can promote and valorise the process innovation with the families of students and within the teachers.

In 2010, new technologies were spreading within the Italian school, but the main strategy was to use them in computer laboratory rooms, separated from the classroom.

The head mistress of Bussero (Milan, Italy), having an university background in science of education, started to perceive the danger of this approach, in particular the risk of marginalization of the use of the new technologies within the general learning process.

For this reason, it was suggested to all the teachers a robust season of training on cooperative methodologies, as a basis for giving the media a new meaning in the teaching process, and in particular in connecting the new technologies with the personal experiences of the students and the different pilot projects in this area.

Our teacher proposed the project of introducing a study on feeding in a second class of a secondary school, having as a starting point a significative experience such as the visit to the interactive exhibition "Parla come Mangi (Speak as you Eat)", proposed by the Pontificio Istituto Missioni Estere institution. As a result, an integrated didactical methodology was born.

The methodology is quite straightforward: the students records the most significative experiences by using their cameras. By using the methodology of the augmented- alternative communication, each of them fixes his own experience.

The first elaboration is then sent by e mail to the teacher.

The next steps of the project alternate different phases made of individual work, cooperative team work and moments of discussion and collective re elaboration of the results.

Each different phase requires access to different technologies and hardware. Teacher evaluates the contribution of each student for the different steps, and has prepared the monitoring instruments that take into account both the acquisition of the different contents and the correct use of the requested technology.

The students are therefore stimulated to sharpen their skills both theoretical and on multimedia technologies, working together in an active and collaborative way. The conclusion of the activities is therefore perceived as their own result from each of them.

2. Experience report

After the visit to the food exhibition, a discussion group is created and in every mail prepared by the group, with no exception, it is identified a paragraph or a concept that deserves to became part of the shared experience.

Through a discussion phase, five major topics about feeding are identified. After this preliminary phase, the elaboration phase can begin.

1. Teams of students organized according to the cooperative learning strategies collects the shared phrases and "sew" them together to prepare a first articulated narrative on the five topics;
2. Every student receive by e mail this first draft and elaborate it according to different points of view, and proposes association with images, poems, rhymes to convert the draft into a creative product;
3. Working teams are created, each with a specific role that takes into consideration the specific skills of the students: the creative team, in charge of making the final product fun and unique; the poets, who must carefully search for the right words; the researchers, in charge of the technical details and the statistical analysis, the project editors, in charge of the final and professional release of the project.

Each team receives from the teachers clear instruction and precise targets.

Also in this phase, the classroom shares and discusses the different results as ready from the different teams.

Finally, also the final editing, the introduction and the conclusions paragraph are prepared as a team work from the classroom.

3. Observation and/or underlining

The teachers cooperate together and bring to the project an interdisciplinary contribution on each step of the activities. The final result is a coherent and cohesive document; each student describes it as his own and is proud that the best part of himself has been included in the project and represents himself so clearly. The duration of this project was about one month, three hours per week and three afternoon sessions of two hours each.

The teachers have created a coherent monitoring and ranking tool, not only to be used for the final document but also in each and every step of the project, monitoring the contribution of every student and the relevant understanding and use of the different technologies. This experience, therefore, has also a significative meaning in the field of docimology, for the performances evaluation of students who uses new technologies for their studies.

4. Findings and discussion

The product resulting from this experience is important, but even more important is the working process. The level of awareness and the sharing of experiences during all the project has been so intense that every student had the opportunity to experience in public the presentation of the multimedia results of the project. The methodology has became part of the classroom know how and methodology, and has been used spontaneously for other projects with different subjects. The students have created a virtual group to use the same methodology for their own projects, outside the school.

5. Conclusion

It is our opinion that this experience demonstrates how the cooperative methodologies, if used together with a team of teachers working in an interdisciplinary and synergistic approach, could find a natural way of application in ateliers that use new media and new technologies.

This project highlights how an open methodology, creative, with a real 2.0 approach finds a fertile substrate in the energies that are proper of the preadolescence period.

Finally, if the school headmaster really believes in cooperative methodologies and use them personally, he can be involved by the teachers in focusing the objectives, finding resources, time and the way to valorise outside the school the results of the projects, so becoming him an actor of the innovation process.

This methodology is now consolidated in our school, improving the skills o a greater number of teachers (in 2 years time, the class involved in the innovation process have increased of 50%, totalling 38% of the total classes).

In the classroom where the new technologies are integral part of the learning process, the valuation process monitors both the acquisition of specific contents and the general learning of multimedia technologies.
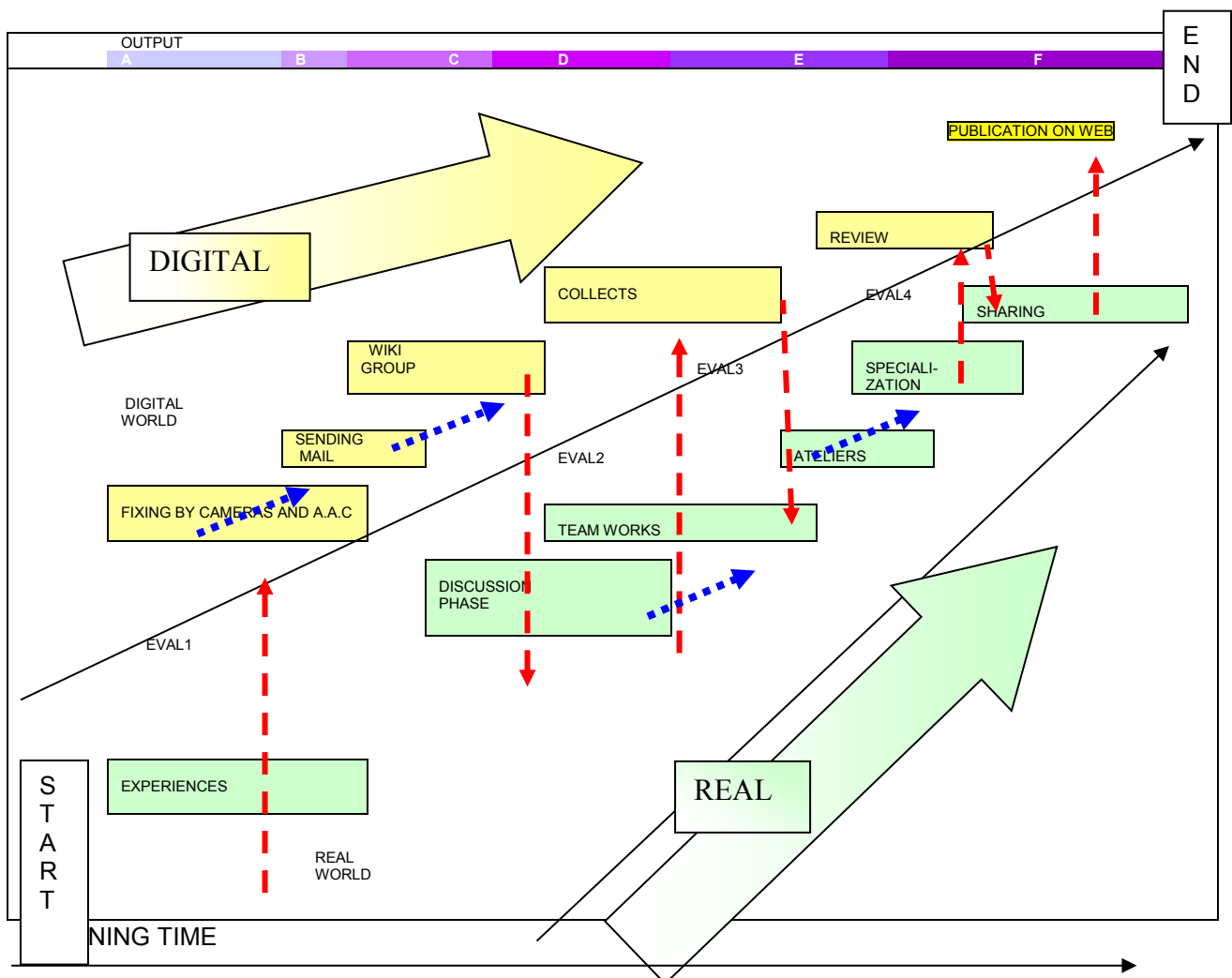
Figure 1. Basic ideas of the METHODOLOGY

KNOWLEDGE OF CONTENTS

LEARNING EVALUATION			PRODUCION PHASES (OUTPUT)	
1	Knowledge of contents and sending by e mail		A	Photo Gallery
2	Knowledge of contents + imagines editing		B	Narrative text raw
3	Deepening personal content + Analysis of the quantitative data		C	Shared text
			D	Text organized
4	Personal contribution and critical content + compliance with the formal rules		E	Multimedia product characterized
			F	Multimedia storytelling

Table 1. Evaluation student's performances   **Table 2.** Production phases and output

Displayed quotations

Carl Rogers is best known for his contributions to therapy non-directive.

The most complete statement of his theory is in Client-centred Therapy (1951). Rogers describe the healthy person. His term is "fully-functioning," and involves the following qualities:

1. Openness to experience. It is the accurate perception of one's experiences in the world, including one's feelings
2. Existential living. This is living in the here-and-now, with .
3. Experiential freedom. Rogers says that the fully-functioning person acknowledges that feeling of freedom, and takes responsibility for his choices.
4. Creativity. If a person feels free and responsible, she'll act accordingly, and participate in employment of the world.

In the Education field, a non – directive method allows a classroom to grow up through autonomous strategies and with the support of the teacher, which is a guide for the students and a "coach" for each of them.

Chiara Giaccardi (2012) shows new paradigms to "Re think reality in the digital era". The dimensions under discussion are "online" and "offline", analogical and digital. Not exclusive worlds from which we must select one: reality is anyway one. "Native-digital" and "immigrant-digital" must learn how to use the convergence of the two spheres, recreating own relationships.

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Rimapping the educational spaces. The 'emergence' of embodied education and digital epistemology. A school experience.

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Abstract
Paper presents a reflection on cognitive space, to develop a post-electric methodology to innovate learning and teaching introducing a 'tactile' use of physical and digital spaces.

Keywords
electric pedagogy; embodied learning; active knowledge; performing media; tactile space.

1. Introduction and theoretical framework

In the framework of an action-research called 'Digital space makes school. Learning and education at web 3.0 time', that has the support of Docebo srl to developing its Learning Management System for school, we open a 'school situated observatory' to reflect on the 'emergence' of a perception based and 'tactile' epistemology (Merleau-Ponty, 1945) and of *thousand plateaus* and rhizome concepts (Deleuze & Guattari, 1980). Together with these two 'emerging' theorical architectures we introduce a cognitive science framework to focus on *embodied intelligence* (Pfeifer & Bongard, 2007) as basic and complex neuro-phenomenological direction on learning and e-learning process. So body and space became two very significant concepts to rethink and to re-map any educational action and phenomenon. It means: body and space with their digital extensions that open to a different, because deeper and non-linear, conception of identity, experience and cognition.

According to new robotics and neuro-science we indicates connection between body and cognition: this is theorical background related to phenomenological perspective to rethink and to project the educational space, in a deep and complex (multidimensional) pedagogical sense. So, embodied identity is a concept that 'emerges' from every educational (and digital) spaces, to develop embodied intelligence and embodied learning concepts. So we reflect on different and interconnected ways to 'make school' today (Rivoltella, 2012), to recognize, suggest and develop a post-electric *learning* (*by doing*) methodology, based on body and its situatedness and performing capability, located into «the architecture of connectivity» (de Kerckhove, 2001).

The way we think educational space ask us to join and integrate physical with digital space because the 'real' problem, the real pedagogical problem, is how experience a tactile methodology and epistemology in school context and how extend it to a web based Learning Management System. This problem has its ancient origin in Plato's 'mith of the cave'. And so we move research involving school educating community to reflect on strong relationship between identity, knowledge and technology. Therefore we (need) back to *art as experience* (Dewey, 1934) because, to base an (inter)active pedagogical practice and to project and to make a new digital space as cognitive environment, we have to remind that «The roots of every experience are found in the interaction of a live creature with its environment» (Dewey, 1934, p. 218). In fact, our research and reflection is focused on live creature and mutual interaction with its environment that represents the way of being: performing and acting. It's why we ask to AltroEquipe – a multidisciplinary team working on post-modern dance live-scene based on interactive environment – to let students and teachers experience an embodied education, based on tactile and non-linear (rhizomatic and antigravitational) environment as a cognitive space and as an observatory useful for Research and Develop team of Docebo to create their new Learning Management System: an interactive and cognitive space, focused on digital and mobile learning.

2. *Research design*

Our reseach - 'Digital space makes school. Learning and education at web 3.0 time' - is a 'site specific' experience that choose school contest to study how is possible:
- to innovate learning and teaching introducing a 'tactile' use of physical and digital spaces;
- how to link classroom space with web and web-based resources and tools;
- how to use a cooperative learning tools to improve informal and non-formal learning, in school context too;

- the aesthetical dimension of education and of knowledge, extended to digital media and technologies

to create and to make:
- an interactive, responsive, multiagent, 'cognitive space', integrating learning and e-learning practices;
- a new Docebo Learning Management System called 'Docebo school' based on tactile method and performing and embodied methodologies;
- school 'community of practice'

through:
- focus group and seminary session with teachers; web based vocational retraining for teachers; web based experimental and interactive school activities;
- the tactile and performing (e)-learning space based on live-scene performance 'rolling anti-gravitational system' by AltroEquipe.

3. From perception and movement to an active mobile learning.

We refer to *primacy of perception* of Merleau-Ponty (1947-1961) to introduce the importance of embodied identity making experience of (perceived) 'world' as basic concept for a more dynamic vision of learning process that want to permanently undermine the model of transmission of knowledge, especially thinking on more 'partecipactive' school community which is able to inhabit new media context too. What we propose is a 'widespread' system of education that recognize and contribute to re-map geography of education. In fact, if we want introduce in school context a digital extension of classroom, first of all it's because we want to test the practicability of an active pedagogy linking body and mind sphere, and which interconnects physical spaces with digital ones. These links and interconnections are generated by perception capability that we recognize both the body and the space. Interactive and responsive body and environment are condition to actualize an 'educational scene' where each participant is envolved in a concrete and, at same time, symbolic activity: construction of Self and construction of knowledge.

In line with phenomenological framework, we introduce from Merleau-Ponty (1945) category of perception to think construction of Self and knowledge process, to underline the function of body and body origin of cognition, and so to direct our research towards a new conception of space, of mind, of existence. This new conception considers space, mind and existence as emergencies of relationship between the real and the imaginary, *the visible and the invisible* (Merleau-Ponty, 1964) because «Truth does not 'inhabit' only 'the inner man', or more accurately, there is no inner man, man is in the world, and only in the world does he know himself» (Merleau-Ponty, 1964, p. XI). If man is in the world, we mean that man and his body explore world by a kinetic process of tactile and haptic nature. Movement become a central category to think and re-think human being and its way to touch and to be touched in experiencing the world. Perceive the world is exploring it with the movement: thanks to sensory and motor system of body, extended by technologies too – so-called psychotechnologies (de Kerckhove, 1996), perception is an active and live (real time) experience that combines and joins concrete and abstract, external and inner, plans of behaviour.

If we want to study electric technologies and digital culture and their connection with education and learning, it's because phenomenology approach is the way to return to an embodied and actualized conception of identity and knowledge, and of embodied and

actualized education and learning. This approach conceives behaviour and environment in a very linked interconnection, so movement is what emerges from an engaged activity that includes perceiving, knowing and creating 'reality'. So reality, to be known, needs to be actualized and to be explored through its tri-dimensional. As de Kerckhove (1996) says about 3-D virtual design, «Virtual reality allows you to physically enter the products of your own imagination» (p. 89). So, from pedagogical and educational point of view, shaping is at the same time exploring and physically entering what is around or inside you. In this sense, electric technologies and web based environment are to be considered and used as embodied strategy of education and learning. A strategy we need for the necessary innovation of all educational context and activity, if we want to make practical the paradigm of active pedagogy, *between* web and physical environment. Because we need to overcome the Cartesian paradigm and its dual conception of reality. «All knowledge is sustained by a 'ground' of postulates and finally by our communication with the world as primary embodiment of rationality» (Merleau-Ponty, 1964, p. XXI). With 'digital space makes school' research, we propose that digital culture and technologies of (e)-learning extend this 'embodiment of rationality', developing an embodied methodology to support interactive learning and pedagogy of action, located in a responsive environment.

In line with Merleau-Ponty's phenomenology, 'subject' and 'object' meet together because subject gives meanings to things, thanks to sensation and (private, local and present and not universal) context of perception: objective theory of reality disappears to let phenomenological perspective be the inter-subjective roots of knowledge and being. Point of view is point of being too: living creatures need to connect to their ambience and these kind of necessary relationships is 'living' and express a return to present process. Process of being is a complex phenomenon situated in real time because it actualizes, by perception and movement, every experience. Perception and movement are a kind of action qualified as interaction, body based, merging from body and physical nature process.

So it's important for digital space shaped for 'making school' to remember that «Living systems are units of interaction; they exist in an ambience. From a purely biological point of view they cannot be understood independently of that part of ambience with which they interact» (Maturana & Varela, 1972, p. 9). Beginning from biological phenomenon of life, we intend to build an ambience where every living system can interact, grow and produce cognition. We want to use digital epistemology – which has roots in phenomenological epistemology – to make every domain of interaction as a cognitive domain, shaping it as a circular and open access architecture.

Just because we talk about digital world – and digital in etymological sense of 'digitus': finger in Latin - we consider body and its cognition as 'main character' of our 'drama'. What we want to emphasize about learning and e-learning spaces, is that it's necessary to develop cognitive (and multisensorial) function of environment beginning from interaction up to responsiveness and situatedness. Learning is conceived each time as e-learning process or a process of electric – or enactive (Varela et alia, 1991; Berthoz, 2009) - nature. Physical and digital space is at same time a cognitive space if we change and use nonlinear geometry and reticular geography to design and to develop it as a domain of interactions: in process.

4. New pedagogical epistemologies and topologies: from rhizome to the web

In order to develop a *creative cognition* theory (Varela et alia, 1991) and its educational practices – grounded in active pedagogy and digital epistemology – we think it's necessary to integrate new tools for education and learning, especially for school context, thinking that action is an 'emergence' of perception and that action is a response situated in a live (or

'living' and actualized) process. For knowledge contains affected and affecting body act of creation.

If action is oriented by perception, topologies and aesthetics of educational space become an important matter. Design and shaping educational as cognitive space needs a special attention to morphology of the places, their capability to host interactions and any domain of interactions. So rhizome (Deleuze & Guattari, 1980) remembers the architecture of intelligence (de Kerckhove, 2001) and suggests a new topology of knowledge and of being. This topology is generated from a deep changing in thought model that opens to the 'arborescent and nomad model' and introduces bi-dimensional to three-dimensional. What Merleau-Ponty called movement, to mean the action emerging from perception based interaction with environment, Deleuze and Guattari (1980) called drawing, to mean action of creation emerging from exploration and from 'power' to open a road. Nomad space is open space, you can across without predicted direction because you can move from a point to an other, tracing new trajectory and actualizing rhizome network. Rhizome and its complex roots system shatters binary in one direction logic, together with linear unity of knowledge: «The rhizome itself assumes very diverse forms, from ramified surface extension in all directions to concretion into bulbs and tubers. […] The rhizome includes the best and the worst» (Deleuze & Guattari, 1980, p. 7). Rhizome is concept (of places, spaces, identity, reality) that changes the 'order of discourse' by principle of multiplicity and by non linear, lateral and circular connections. Pedagogical thinking and educational action can change themselves in a rhizomorphic topology if they work on 'surplus value of code' and on becoming strata process. Together with drawing, to 'do rizhome' become generative concept for whom want to embody and actualize digital epistemology finding it in network and web oriented social spaces (of interactions and interconnections). 'Strata' introduce multilayer geography we assume as basic idea for new Docebo Learning Management System and overall for e-learning space. In fact, rizhome gives a plastic morphing to educational process based on relationships emerging from different oriented interconnections. And «An assemblage is precisely this increase in the dimensions of a multiplicity that necessarily changes in nature as it expands its connections. There are no points or positions in a rhizome, such as those found in a structure, tree, or root. There are only lines» (Deleuze & Guattari, 1980, p. 8). Lines that are lines of flight, no one direction 'transformational multiplicities'.

For, introducing Learning and e-learning technologies at school, does mean that we consider each technologies as 'technologies of the Self' (Foucault, 1988). Introducing 'technologies of the Self' concept helps us to focus on connection between the way to do something and the way to think it, and to underline both on body and mind effect of using technologies, in fact we can say that «The way people act or react is linked to a way of thinking, and of course thinking is related to tradition» (Foucault, 1988, p. 14). So, every act contains and carries a specific theory and technology of knowledge, and knowledge itself is a 'product' of an epistemology and cognition, embodied in practical and technical instruments and habits. In this sense, we ask school to reflect and change its practices introducing a tactile and multilayer epistemology based on digital and web based technologies. We assume that «A book itself is a little machine; what is the relation (also measurable) of this literary machine to a war machine, love machine, revolutionary machine, etc.—and an abstract machine that sweeps them along?» (Deleuze & Guattari, 1980, p, 4). Machine is always an abstract machine, a 'cognitive machine', we can say. Beginning from book, and before that writing and orality, 'machine' contains technical and cognitive dimensions of action, because to act is not neutral but expression and 'emergence' of an environment, that produces knowledge and knowledge of the self. Action, knowledge and technology are interconnected and part of multilayer system concepted by Deleuze and Guattari thanks to generative rizhome concept. So rizhome became generative concept for it is space of nomad thought, the 'origin' to 'make

place' to nomad epistemology and topology. Movement is conceived as nomadic action, moving in all direction and linking one point to an other, going through and actualizing the architecture of 'thousand of plateaus'. Rizhome network constitutes a (deep) space where you can act in other direction and 'order' that is not the horizontal one but multiple directional components (or data). Continuity between perception and action, let action stop to be a progression (where you know yet the final destination) to start to exist just in multiple interactions system. Space and its architecture is very important to let interaction to actualize itself all the way: because is not limited and not preexisting space.

According to Deleuze and Guattari concept of space, we can assume a practical and theorical structure to design and build a space – physical or digital - as a 'twittering machine' (Klee, 1922): because «birds sings to mark its territory» and their refrain «triumph over gravity», setting a 'milieus and rhythms'. «The notion of the milieu is not unitary: not only does the living thing continually pass from one milieu to another, but the milieus pass into one another, they are essentially communicating» (Deluze & Guattari, 1980, p. 313). As suggested by their translator, «In French, milieu means "surroundings," "medium" (as in chemistry), and "middle." In the philosophy of Deleuze and Guattari, "milieu" should be read as a technical term combining all three meanings» (Massumi, 1987 in: Deleuze & Guattari, 1980, p. XVII). By combining three concepts of 'place' we obtain all the strata composing 'reality' and us, and we see process based topology. This kind of 'transcoding' and 'nomad' topology, *milieu*, suggests to mix sounds, images, interior and inside gestures and motions, to re-think and re-make educational and learning space too. Pedagogical consequences of *milieu* and transcoding process (between different milieus) go up to e-learning practice and consider web and digital media as 'territory' where, more directely, you can experience mobile interconnection between a layer, a code, a milieu, and the other. So, trought a territory that doesn't pre-existes but takes shaping and branching in real-time with actualizing exploring and drawing of subject, learning and e-learning process find their mobile quality and legitimize it. According to nomadology, learning is recognize as a mobile process qualified by sensitive and motion functions and by territory they draw.

This is epistemological 'landscape' to see that drawing became a special kind of movement and of action, we assume as an other concept to use, in nomadic sense, to design and to make web based Docebo Learning Management System for school context.

5. Embodied intelligence in a cognitive space. Toward a new educational space design

If we consider education as a machine, as physical and technological device, every learning action needs a greater biological and anthropological awareness to conceive human being intelligence and its extension in technology. According to Matura and Varela (1972; 1992) point of view, we have to assume human being as a living system and think that «living systems are machine» (Maturana & Varela, 1987). So we have to underline «materiality of living beings and knowledge» to see material and aesthetic aspects of a dynamics in which we recognize 'growth and form' (Thompson, 1961).

In our specific context of research, educational design involves both growth and form, body and cognition, to develop web based and physical school system able to connect different spaces, using and moving in a multilayer 'actual architecture', open to transformation. So, if education is a machine oriented and actualizing morphologic and cognitive mutation, we have to design an 'adaptive' learning and e-learning space where action is 'expression' of embodied intelligence and intelligence an 'emergence' of relational behaviour. Ongoing in relational and 'ecological' view, we propose «a way of seeing

cognition not as representation of the world 'out there', but rather as an ongoing bringing forth of a world through the process of living it self» (Matura & Varela, 1987, p. 11).

'Tactile' (or digital) epistemology meets (and mix) together with cognitive science to introduce, in a stronger way, the embodiment turn and multiagent systems philosophy, to scaffold educational process with computing and interfacing technologies (Pfeifer & Bongard, 2007). In this theorical framework, our 'site specific' research can improve and experiment a new educational practice that move between real and virtual reality, knowing that human being, as living being, has its cognition (Matura & Varela, 1972) about self and about environment it lives in. Cognition has its roots in body and in multisensory and expresses it self by acting. For that, learning is conceived as interactive and responsive action to move toward an embodied education, and e-learning technologies can support and extend this kind of action and of education. So, digital space and especially the web and the Internet can offer a multiple layer environment where everyone does experience of Self and the world: not in reflective method (that means binary logic) but multiple and non-linear direction (that includes fractal and generative data computing).

That's our pedagogical challenge: to concept, to design and to use a new interactive and responsive educational space performing generative learning process and system, where mobility become 'mobiligence' and digital technology supports mobile learning through movement, nomadic exploration and draw. Because body is matter of intelligence and they change if there's a communication that links and that feeds their becoming process. And because in this space there's no possibility for repetition or representation: beginning from data and code, based on binary language, living being, as it self, acts in real time actualizing and crossing and transforming data and code in a fluxus of trancode and metadata.

Situated into active pedagogy, what we want to design is an 'autopoietic machine' that can emerge from a live-scene called 'anti-gravitational rotate system' based on Altro Equipe work and study (Carpenzano & Latour, 2003) used as an 'observatory': a cognitive domain of interactions, both bounded and infinite (Matura & Varela, 1972) to describe and re-describe the self and the world, in autonomous and every time 'different' (because embodied, situated and actualized) way. We are in process to design the live-scene where every concept of our digital and nomad epistemology takes form. For, arts, as technology, give us a territory of growth and form; arts, like technology, is territory of creation, and education can be considered a form of art (of creation). The art of living being. In process: with refrain.

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Technology at School: Special Event or Everyday Practice?

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Abstract
Introducing technology into school can be done in two different ways: as an everyday practice or as a break into the school's routine, a special event "disrupting" the normal course of events. Both ways make sense: while a full integration of technology into the classroom is an explicit goal of all school systems around the world that no doubt will take place as a result of technology diffusion processes, special technology-based projects generate enthusiasm and push forward innovation, paving the ground for future changes. The paper introduces three case-studies: two of technology as "special event" at school, and one of technology embedded into everyday practice. The final discussion will highlight pros and cons of both approaches.

Keywords
Computer-assisted instruction, Innovative technology, Everyday technology, Case-study, Evaluation

1. Introduction

Introducing technology into school, to support learning processes, can be done in different ways. This paper outlines the need for making a sharp distinction between the experimentation of innovative projects vs. using technology to support everyday practices.

Innovative programs are a break in the school's routine. They have a number of distinctive features (e.g. time and resources required, scheduling, organization, …) that clearly separate them from the traditional curricular activities. They are typically perceived by teachers and students, and also by families, as new, glamorous, exciting and for these reasons they generate engagement, motivation, and participation. This involvement can be the trigger for the achievement of substantial educational benefits, even curricular ones. The problem is that innovative programs are like a "stroke of lightning": once the experience is over, the school gets back to its normal routine and permanent changes are difficult to obtain. In addition, the amount of resources required (especially time) make it difficult if not impossible to extend these special activities to all the subjects and for all the students.

Routine use of technology, instead, is undoubtedly less shiny, independent from what the specific technology is (tablet, interactive white boards, 3D worlds…). They do not generate sharp excitement, but little by little they modify the way students learn, teachers teach, knowledge is built, skills are acquired. They can be embedded in all school's activities, supporting all the subjects, every day; in essence, they represent a long-term, permanent change.

While acknowledging the value of "bursts of innovation" at school, the paper advocates that more effort, (and research funding schemes) should be devoted to changing the everyday practice of teaching/learning at school, rather than emphasizing almost exclusively what is new and glamorous but hardly replicable.

The paper discusses the issue at the light of examples from the author's experience with designing, implementing and deploying highly innovative formats (that have involved so far more than 30,000 students from 20 different countries), and also from the careful monitoring of hundreds of ICT-based experiences in Italian schools, where technology is used every day, in the teachers' normal practice. The affordances of both approaches are discussed.

2. Case-study 1: MUVEs for Education

From 2002 to 2009, HOC-LAB designed, implemented and deployed educational experiences based on Multi-Users Virtual Environments (figures 1 and 2).
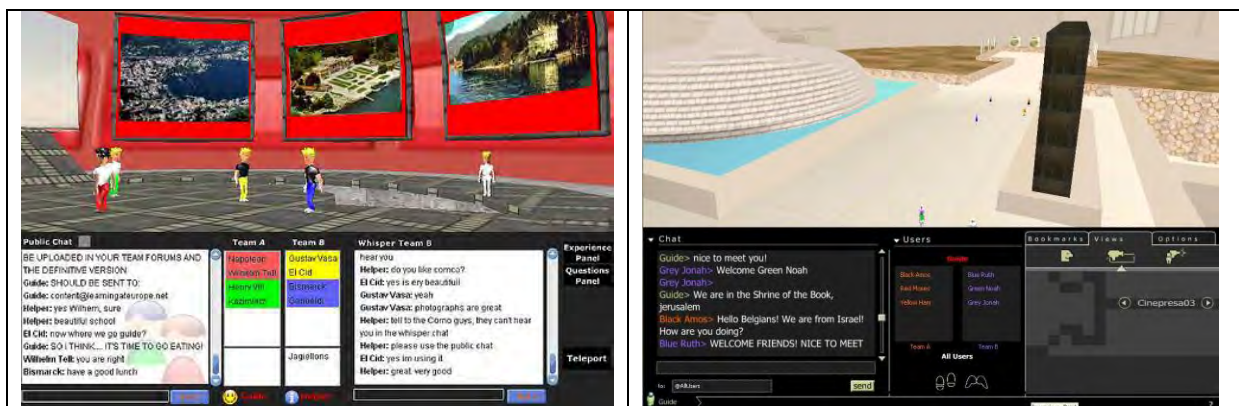
Figures 1 and 2. Multi-User Virtual Environments for education.

Five different programs were developed:

- Virtual Leonardo: in cooperation with the Science and Technology museum of Milan, about Leonardo's virtual machines. The ancestor of all the following programs, it was an open environment where visitors could virtually meet and explore the museum together.
- See (Shrine Educational Experience): in cooperation with the Israel Museum of Jerusalem, about the Dead Sea Scrolls and related religious, sociological, historical issues. More than 1,400 junior and high-school students from Israel and three European countries were involved.
- Stori@Lombardia: in cooperation with the regional government of Lombardy (Italy), about medieval history. More than 1,000 junior and high-school students were involved.
- Learning@Europe: sponsored by Accenture Foundations (as part of the Accenture Corporate Citizenship investment program) and executed in cooperation with Fondazione Italiana Accenture, about the birth of national identities in Europe. More than 6,000 students from 18 European countries and the USA (West Point Academy) were involved. It was the largest of all the programs.
- Learning@SocialSport: in cooperation with Fondazione Italiana Accenture, the Italian Olympic Committee and other partners, about the ethical, psychological and sociological issues related to sport at agonistic level. More than 500 young athletes from Italian sport clubs were involved.
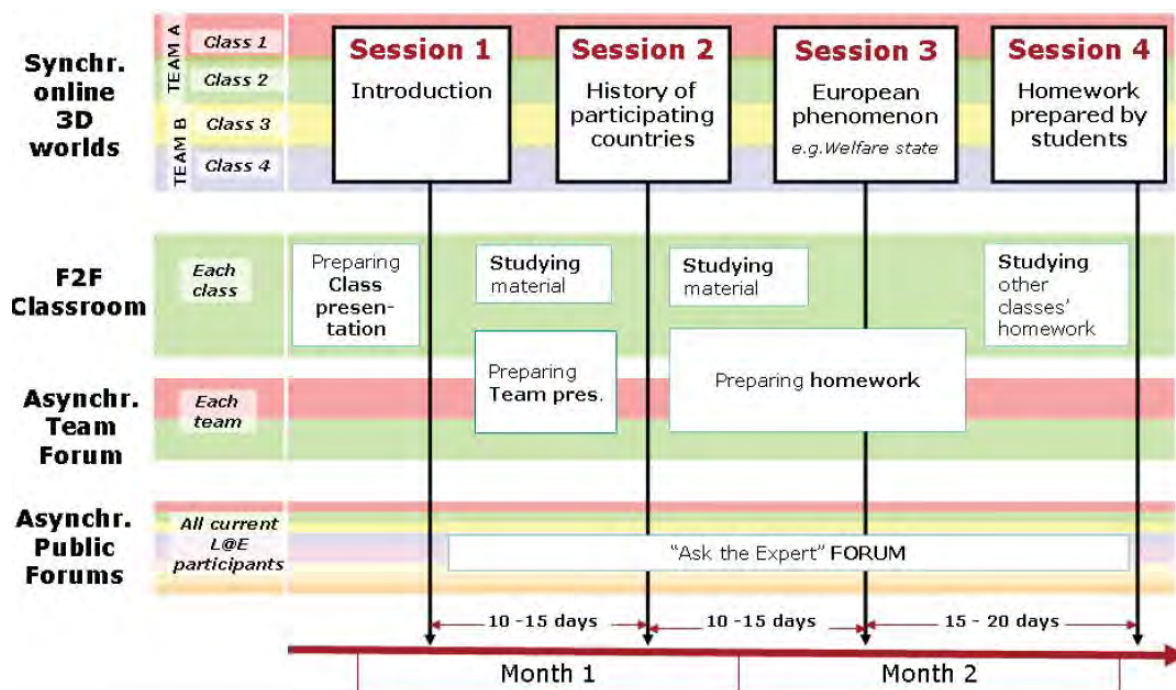
Figure 3. The storyboard of a Learning@Europe's educational experience, blending online and off-line activities.

Except Virtual Leonardo, all the other programs were structured as educational experiences, with a storyboard involving both online and off-line, ICT-based and "traditional" activities (Figure 3). Experiences would involve whole classes, not individual students nor a selection of voluntary students within a school. Each participating class would undergo an experience spanning two months approximately. The "heart" of the experience were 4 meetings in a virtual environment that fuelled excitement and motivation. Between one

meeting and another, students would study non-trivial background materials (about history. sociology… according to the program), perform assignments, cooperate, interact with experts etc. An overarching competition was an additional, very relevant, trigger for participation (Di Blas, Paolini, 2013; Di Blas et al., 2012; Di Blas et al., 2009).

2.1 Evaluation

All the programs were monitored every year through a number of means, including surveys to teachers (at every step of the experience), surveys to students (at the beginning and at the end of the experience), reports by the online guides who tutored the students during the meetings in the virtual worlds, reports about how interaction was going in the forums (again by the online guides), focus groups with selected teachers at the end of every school year, etc. The data have been widely published before: the interested reader can refer to (Di Blas et al, 2012; Di Blas et al., 2008). In addition, the final report plus the raw data about the most advanced of the programs, Learning@Europe, can be found in the project's website: www.learningateurope.net.

Results were quite consistent over the years and showed that students did achieve substantial educational benefits, both curricular (e.g. enhanced understanding of historical processes) and extra-curricular (development of tolerance towards other cultures). Data also say that students' motivation got enhanced, both within the frame of the "special activity" and beyond, towards school in general. Let us see some comments. A middle school teacher said in a focus group: "Teaching the Dead Sea Scrolls seemed an absurd idea at the beginning [because of its complexity for eight-graders], but the kids got eager to study the community of Qumran. […]. At the final State exam, everybody wanted to talk about the Dead Sea Scrolls". A Polish teacher said: "The majority of students are more motivated at school. They get higher marks in History, English and Information Technology". A student said: "I thought that history was boring to study, but now I don't think so! Studying with the computer is really great!" Eventually, a French teacher pointed out benefits related to inclusion: "The motivation was great, especially the curiosity for other cultures. All students, even the weak ones, were involved in the event [...]. They discovered they were useful for the session and later on they felt more motivated and integrated in the class."

Anecdotes suggest that the novelty of the activity (as we said – a break into the school's routine) favoured a re-shuffling of roles and the surfacing of new unexpected talents as well as the rescuing of disaffected students. An interesting anecdote was reported by an Italian teacher, in year 2006, regarding a young foreign student in her class, who was not very proficient in any school subject but was very skilled with technology and was thus selected to play the ability games, while his mates had full command on the chat. During an online session, he was by chance left alone in front of the PC when the online tutor asked a cultural quiz. To his own surprise, he answered correctly. This little success highly motivated him: he started studying the background material of the project, and his motivation for school activities did not fade even after the end of the project (Di Blas, Poggi, 2008, p. 99).

3. Case-study 2: Digital Storytelling

In 2006, HOC-LAB launched a digital storytelling initiative for schools: PoliCultura (www.policultura.it). Since then, more than 26,000 students aged between 4 and 18 have taken part in it. Like for the MUVEs based programs, participation is open to classes, not to

individual students. Taking part in PoliCultura means creating an interactive multimedia story composed of audio, images and texts (figure 4).
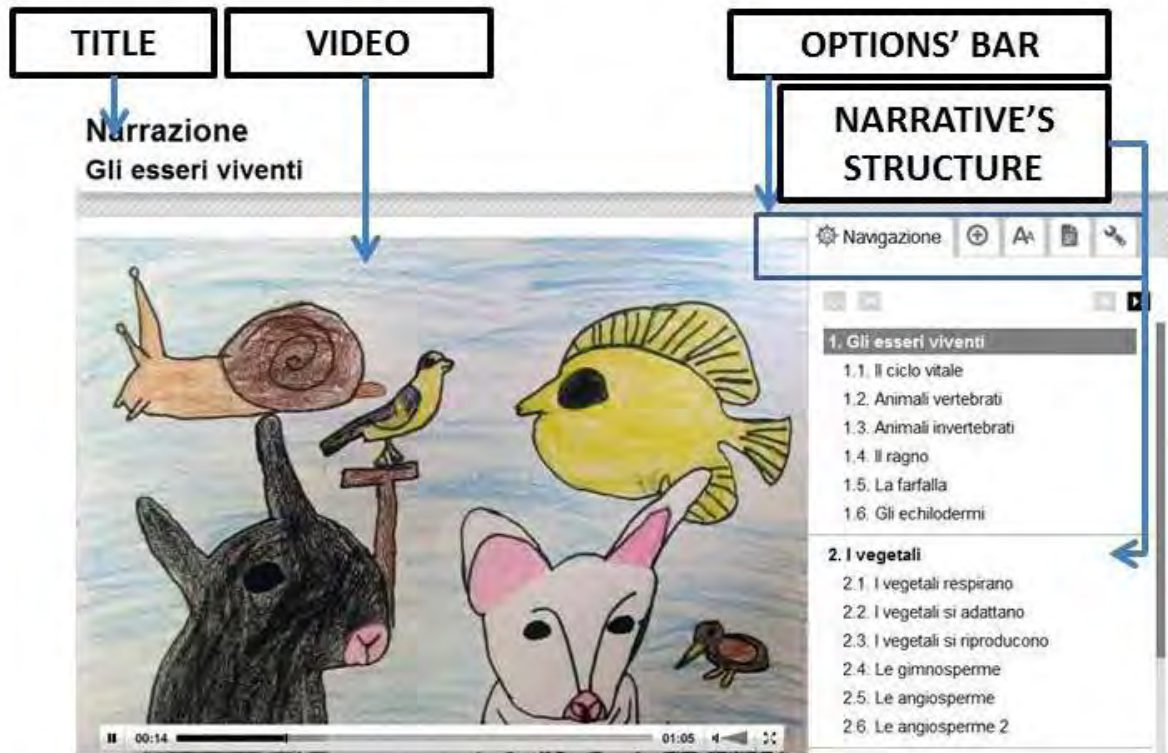
Figure 4. The interface of a multimedia story by a primary school class.

Stories can be about any topic: the local territory, a school subject (English, math, physics…), a school outing (e.g. a visit to a museum), a project, etc. The stories' length ranges between 15 to 30 minutes. Many activities are implied: search for materials (documents, images, presentations…), organization of the various "chapters and sub-chapters" of the story, writing of the texts, editing of the images and possibly scanning of drawings by the students (especially at pre-school and primary school levels), recording of audios, etc. (figures 5, 6 and 7). The whole process of creating a story takes two months approximately, making PoliCultura another example of "technology as a special event".
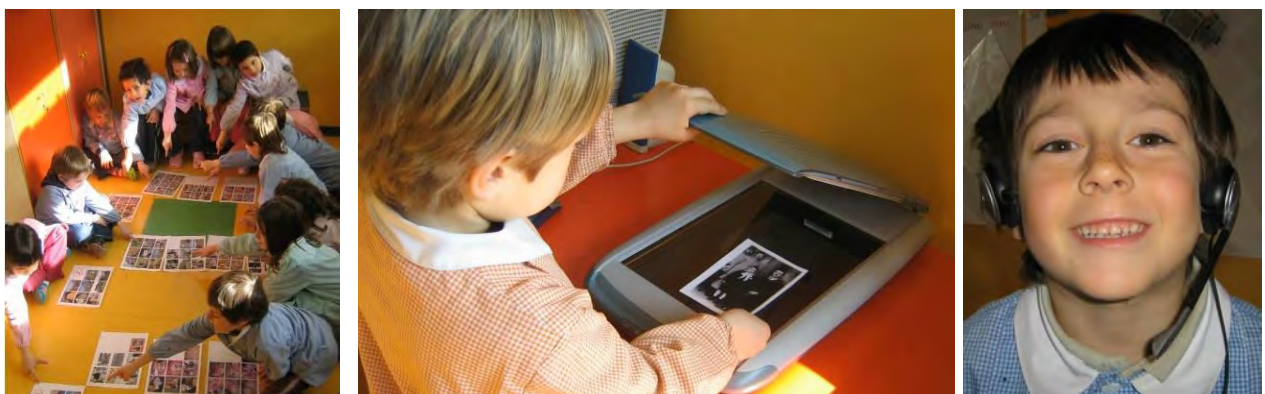
Figures 5, 6 and 7. A pre-school class preparing a multimedia story: organization of the materials, scanning of pictures, recording of audio.

3.1 Evaluation

The impact of PoliCultura has been monitored since the first edition by means of surveys to teachers, in-depth Skype interviews to a selection of teachers and focus groups at the end of each school year. Data have been widely published, for example in (Di Blas, Ferrari, 2013; Di Blas, Paolini, 2013). For the sake of this paper, we can recall here that benefits of various kinds are generated: for example, increased understanding of the subject dealt with, improved capacity of working in group, enhanced communication skills, improved relation within the class and between the class and the teachers, involvement and motivation. All these benefits are not new, in the sense that they were generated by participation to the MUVEs programs too. What is new in this case is media literacy: PoliCultura pushes, or rather, compels students (and teachers) to acquire media literacy skills. They have to design and create a multimedia story blending together texts, audio (sometimes music), images, pictures, drawings etc. Moreover, the story is interactive so they also have to pay attention to the fact that fruition will not be linear, as it is in essays, books etc. Most of the teachers acknowledge (mainly after the process is completed) that their students acquire skills for communication with multimedia.

4. Case-study 3: Interactive White Boards at School

The third and last case-study is an example of technology integration into everyday practice. In Sondrio (Northern Italy), a whole primary school campus adopted the Interactive White Boards from year 2006. There was one IWB per class, and all teachers were to use them. Teachers underwent a light training on the basics about how to operate them but no training on how to embed them into their educational activities, so they self-trained, experimenting and sharing their experiences among themselves. In year 2010-11, a monitoring activity was conducted by HOC-LAB researchers in order to understand how IWBs were begin used and with what effect; 42 teachers were involved. The monitoring tools were daily short reports by the teachers and weekly interviews to each teacher (via Skype), by the researchers. All the data related to an experience were distilled into an "experience schema", for further analysis and sharing. On the whole, data about 253 experiences were gathered, covering *all curricular subjects*.

4.1 Evaluation

The full research is reported in (Di Blas, Paolini, 2012); for the sake of this paper, we can recall the main outcomes here. Some experiences were quite innovative, others were more traditional, but overall it can be said that all the teachers were successful in introducing technology in the classroom. Experiences, in general, were educationally quite effective. In most cases the quality of learning (as attested by school grades) was good. Even difficult students became more involved and proficient. Technology did not seem to be "efficient"(in the sense of saving time, for example) but rather "effective": kids were engaged by the interaction with the IWB, therefore spent more time handling the subject matter and therefore learnt better. This positive effect was particularly evident in the case of less-proficient kids, who through technology could find new motivations for being at school and taking part into the school activities. Most of the experiences were not glamorous, in the sense that they would hardly be published on a scientific paper, and, even less, that they would draw attention from the media. Still, they were effective and could be very good examples for other teachers.

What is notable is that although at different levels of complexity, all teachers of the campus were able to integrate the IWBs within the classroom. They all said that the IWB had replaced the traditional board, which was still there in the classroom but almost never used. The new technological means, the IWB, had been fully integrated.

5. Discussion and conclusions

Technology as a special event vs. full integration of technology in everyday practice: what are the pros and cons? As anticipated in the introduction, we think that both are necessary; technology as a special event pushes innovation forward, breaks the routine, favors a healthy reshuffling of roles and generates a wave of enthusiasm that lasts beyond the boundaries of the experience. On the other hand, technology as everyday practice is a necessity: it is no more time to wonder whether to introduce it, but *how* to introduce it.

Technology should not be confined to special experimentation but, as the Sondrio school shows, it should be slowly but firmly introduced into everyday practice; otherwise, there is no enduring impact. The comparison is with a school outing: if a class is taken to visit a museum but without any specific preparation nor follow-up, the visit becomes almost useless: a "special event", unrelated to what students do and learn at school.

Instead, students have to acquire what most school system around the world call "media literacy": a series of communication competencies, including the ability to access**,** analyze**,** evaluate**,** and communicate information in a variety of forms and through the variety of media that characterize our modern era (http://namle.net/publications/media-literacy-definitions/). The "special event" project may serve as trigger to learn skills that by now should be considered basic competences, like writing or reading: how to edit images, how to record audios, how to write for an interactive application…. These competences should then be used in everyday (still technology-based) school practice. Technology as special events and technology as everyday practice are thus seen as interrelated and mutually affecting each other in a positive way.

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Technology and Group Work: Inclusion or Diversification of Talents?

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Abstract
Group work was popular at school before technology became important and it became a typical strategy when ICT was introduced. But what does really happen inside the groups, as students work together? Who does what? Who is learning what? In what sense can we call the learning process "inclusive"? This paper addresses the issue on the ground of the empirical evidence accumulated by Learning4All (www.l4allportal.it), a three-years, government-funded project. 274 educational experiences were closely scrutinized, through interviews and direct observation of materials. Additional data will come from an extensive survey about inclusion administered both online and on site to 258 teachers. Results show that heterogeneous group work is the preferred solution, but it runs the risk of generating different benefits when some students are given lesser roles while the best do the most difficult jobs. It works well for generating motivation and participation rather than curricular benefits, same for all. Homogenous group work, instead, emerges as a viable strategy to push all the students to improve all their performances.

1. Introduction

Group work was popular at school before technology became important and it became a typical strategy when ICT was introduced. Technology is often perceived as something "difficult", requiring group effort, cooperation and sharing of skills. In addition, group work with ICT is also perceived as favoring "soft" inclusion, i.e. the integration in the learning process of students with diverse needs.

But what does really happen inside the groups, as students work together? Who does what? Who is learning what? In what sense can we call the learning process "inclusive"?

Teachers and evaluators alike tend to evaluate the impact of an ICT-based activity considering the average results. They typically report that participation was enthusiastic, students were motivated and diverse talents were put at work. All this is indisputably positive, but a number of crucial details are underestimated: how were the groups created? Were they heterogeneous (mixing up talents and levels of performance) or homogenous? What were the students' roles? What was learnt and by whom? A real-life example may clarify the issue: in a junior high-school, involved in a digital storytelling project (PoliCultura; Di Blas, Paolini, 2013) the teacher was quite satisfied with the outcomes of the experience. She said that all her students were enthusiast: everyone had been given a role, even the ones who usually did not perform well. Then she clarified that one of these student had been given the role of checking the work's schedule. He would move among the groups, taking notes about their progresses and whether they were keeping the deadlines. This is fine in a sense, but can a teacher be really content with just this result? Can it be claimed that everyone benefited from the experience in the same way? I.e., the students who wrote texts, edited images and those who had been given lesser roles?

To answer these questions, a closer look is needed. This paper addresses the issue on the ground of the empirical evidence accumulated by Learning4All (www.l4allportal.it), a three-years, government-funded, project. 274 educational experiences were closely scrutinized, through interviews and direct observation of materials. Additional data will come from an extensive survey about inclusion administered both online and on site to 258 teachers. The results of the survey are presented in details elsewhere (Di Blas, Ferrari, 2013).

It is very important to warn the reader that *this research deals with "soft" inclusion, i.e. it does not take into account disability*, which would require a specialist approach. Instead, it focuses on "difficult" children: immigrants, students from a poor (in sociological, cultural, economic terms) background, poorly motivated students, students with mild learning difficulties, as well as excellent students who may get marginalized since they are… too good, etc.

2. Methodology

This research is mainly framed within the Learning4All (L4ALL) project, a three-years government-funded project that ended in 2012 (Ferrari et alii, 2012). L4ALL aimed at investigating the impact of technology in formal education through a number of interviews to teachers on the job, of all school grades. Teachers were interviewed remotely via Skype both at the beginning and the end of their ICT-based activity. All the materials (audio files, interviews' transcripts, schemas with the features extracted from the interviews, outcomes of the activity, etc.) were gathered in a highly innovative exploratory portal (www.l4allportale.it). At the moment of writing (April 2013) 274 full educational experiences based on ICT are accessible in the portal, and more are being gathered. Thanks to a rich system of facets (i.e. search parameters – more than 60) and advanced Human-Computer

Interaction mechanisms, the portal can support sophisticated research activities by scholars, teachers and educational authorities.
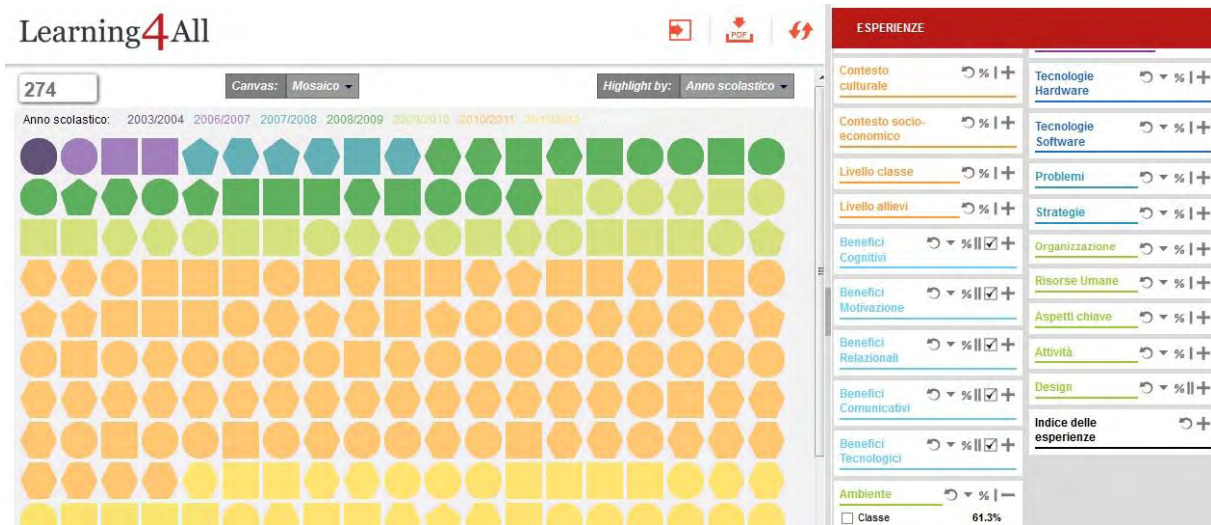
Figure 1. The Learning4All portal, gathering materials about ICT-based experiences at school (l4allportale.polimi.it).

The research presented in this paper exploits the L4ALL portal's affordances to investigate the following research questions:
1. Is there any relation between inclusion and group work?
2. How are experiences dealing with inclusion through group work characterized?
3. What are the differences between two relevant group work organization, namely heterogeneous and homogenous groups?

In order to corroborate the results, data will be also borrowed from a survey about inclusion, group work and ICT that was conducted in summer 2012, with 258 teachers (Di Blas, Ferrari, 2013). The survey consisted of 10 multiple-choice questions with free comments for each question.

The participants to both L4ALL and the survey were teachers on the job, from all school grades: from pre-school to high-school. All of them were engaged in some ICT-based activity, so they can be considered – with respect to the average teachers – "innovators" or "early adopters" of technology (Rogers, 1999). They were recruited either through regional educational authorities (the Italian: "Uffici Scolastici Regionali") or since they were participants to one of HOC-LAB's initiatives for schools (see hoc.elet.polimi.it).

As regards the number of participants: 265 teachers were interviewed in the frame of the L4ALL project while 258 teachers responded to the survey. As regards L4ALL, it is more convenient to make reference to the educational experiences – which are 274 – than to the teachers, for two reasons: first, more than one teacher may have taken part to an experience and second one teacher may have been interviewed in relation to more than one experience. Figure 1 shows the distribution of the survey's respondents in terms of school level, figure 2 shows the experiences' distribution again in terms of school level.
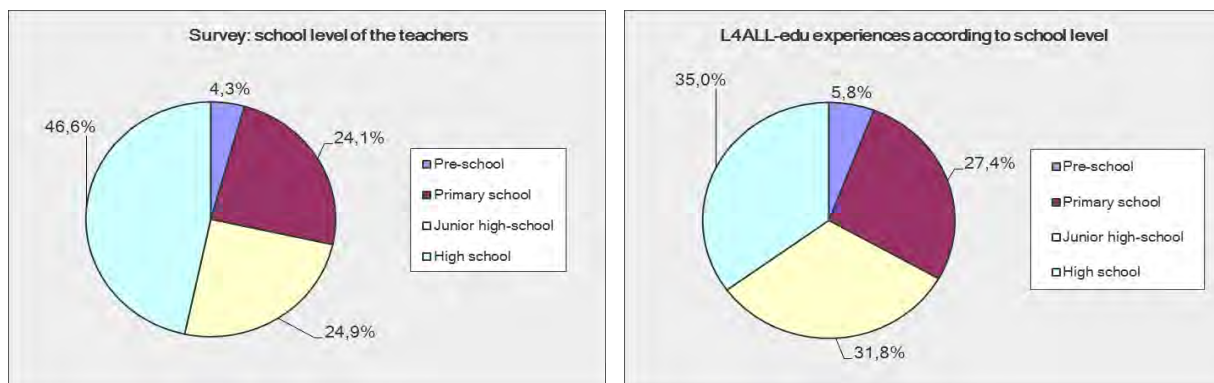
Figures 2 and 3. On the left, the survey's respondents' school levels (258 respondents); on the right, the L4ALL educational experiences (274) according to the school level.

In L4ALL, teachers were interviewed at the beginning and at the end of a specific experience with ICT at school. The first interview was about their expectations and the second about the results; both interviews were semi-structured in the sense that the interviewer had a list of topics to investigate (e.g. the context of the experience: the kind of school, the profile of the class…) and a set of suggestions on how to elicit good answers. Interviews were then transcribed and analyzed by researchers who filled in three schemas, where the main features of the experience were extracted and put in order: the expectations schema, the results schema and the comparison schema (a critical analysis of the main similarities and differences between what the teacher had expected and what she actually had gotten). Eventually, a description of the experience was prepared, for other teachers to take inspiration from, for researchers to analyze, etc. A detailed description of all these tools can be found in (Ferrari et alii, 2012); the schemas and additional tools (e.g. the interviewer' tips) are all available in the project's website (www.learningforall.it).

The survey included 10 questions; for each question, space for free comments was provided. The questions were: (1) do you think you know what inclusion is?; (2) do you think it is more important to include the best or the least performing students?; (3) what do you do in practice? (you manage to include both, or just the best/least performing…); (4) How do you organize group work? (homogenous, heterogeneous groups; students organize themselves); (5) what do students do within the groups? (everyone tries all the activities; each student does what she can do best only); (6) do you give personalized goals to the students?; (7) do you plan personalized paths for each student?; (8) can you define what inclusion is?; (9) do you think you have answered coherently to this survey?; (10) now (i.e. after taking this survey) do you think you know what inclusion is?. The results of the survey are presented in details elsewhere (Di Blas, Ferrari, 2013).

3. Data analysis

As mentioned above, the analysis was conducted using the L4ALL portal, gathering materials about 274 experiences with ICT at school. These data will be corroborated by the results of a survey to 258 teachers.

3.1 Question 1: is there any relation between inclusion and group work?

To address the first research question (whether there is any relation between group work and inclusion), the value "inclusion" is selected within the facet "key feature"; looking now at the facet "organization", it can immediately be seen that group work as organization (in all its variants: homogenous, heterogeneous, with students sharing the same skills, with students having different skills…) goes up; a closer look shows that heterogeneous group work emerges as the dominant strategy (fig. 4).
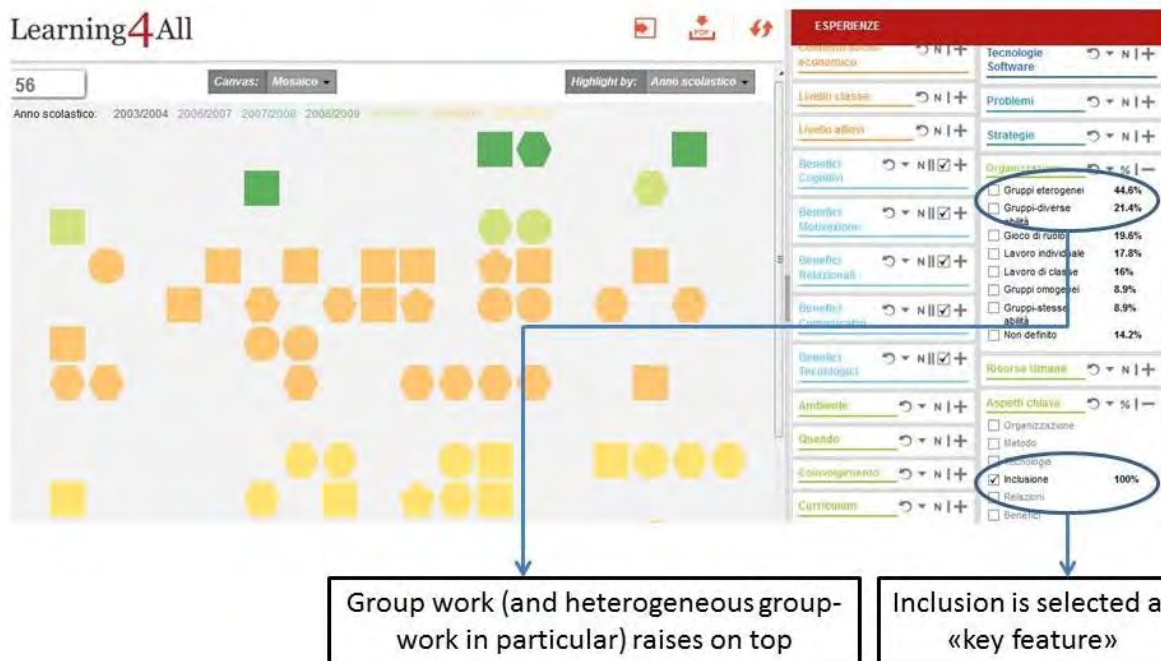
Figure 4. L4All portal: if "inclusion" is selected as key feature, all the values of group work go up in the "organization" facet with respect to the initial values of the whole data set.

3.2 Question 2: How are experiences dealing with inclusion through group work characterized?

In order to answer question 2, all kinds of organizations that focus on group work (homogenous group work, heterogeneous group work, group work where students have the same skills, group work where students have different skills) are selected within the facet "organization". Eventually, "disability" is excluded from the facet "problems", since the focus of the research is on "soft" inclusion, as explained above. All these selections lead to the creation of a subset (S1), characterized by having "inclusion" as prominent feature (but excluding disability as a problem) and group work (in all possible forms) as organization strategy. 28 experiences populate S1. Now, *S1 is compared to S0* (the initial set – the "universe") to see which facet values experience a significant change. In the tables that follow, only the facets and the values where significant differences occurred are reported, also due to lack of space. The interested reader can see all the possible values of the facets accessing the portal at www.l4allportale.polimi.it.

School level		Subset S1	All (S0)
	Junior High school	50% ↑	35%
	Primary school	32,1% ↑	27,3%
	High school	10,7% ↓	31,7%
	Pre-school	7,1% ↑	5,8%

Table 1. School level: comparison between subset S1 and S0

As regards the school level, there are many interesting things to note. First of all, we can see that inclusion issues start surfacing at primary school level, where precise learning goals are given, while at pre-school they are poorly felt. The second observation is that inclusion and group work "get together" at junior high school especially, while at high school they dramatically decrease. One reason may be that group work as organization is more likely to be adopted at lower levels of education.

Cultural context		Subset S1	All (S0)
	Low	35,7% ↑	19,7%
	Average	21,4% ↓	38,6%

Table 2. Cultural context: comparison between subset S1 and S0

Socio/economic context		Subset S1	All (S0)
	Low	35,7% ↑	18,2%
	Average	28,5% ↓	44,8%

Table 3. Socio/economic context: comparison between subset S1 and S0

As regards the **cultural and socio/economic context**, it can be seen that inclusion and group work tend to be more present in low-profile situations.

Level of the class		Subset S1	All (S0)
	Very good	14,2% ↓	20,4%
	Low	10,7% ↑	7,6%

Table 4. Socio/economic context: comparison between subset S1 and S0

As regards the level of the class (i.e. the *average* proficiency of the students), there is no surprise: the percentage of "very good" classes gets lower in S1, while the percentage of "low" classes increases. This means that when a class is very good inclusion issues are not….issues. We may wonder whether, in this case, these children are missing the opportunity of working in groups: do students in "very good" classes ever work in group? To find the answer, we can get back to S0 (the initial set), select "very good" in the facet "level of the class" and create a temporary subset. Let us now check what happens to group work in the facet "organization" within this temporary subset. It turns out that very good classes do use group work as organization, with the difference that the value of groups with students having the same capabilities goes up (from 8% in S0 to 16% here) and conversely the value of groups with students having different capabilities goes down (from 13,8% in S0 to 7,1% here).

Students' homogeneity		Subset S1	All (S0)
	Heterogeneous	25% ↓	43,7%
	Highly heterogeneous	35,7% ↑	17,8%

Table 5. Students' homogeneity in terms of performance: comparison between subset S1 and S0

As regards the students' homogeneity in terms of performance, it can be noted that group work to face inclusion increases in the case of highly heterogeneous students, while it falls down in the case of acceptably heterogeneous students. This data may look strange at first sight and needs further investigation; the explanation could be that a heterogeneous class is felt by teachers as a "standard" situation, thus requiring no special intervention, while a "highly heterogeneous" class is perceived as needy and group work is seen by most of the teachers as a good solution to include all the students.

Cognitive benefits		Subset S1	All (S0)
	Understand/memorize	57,1% ↑	48,5%
	Problem solving	14,2% ↑	10,9%

Table 6. Cognitive benefits: comparison between subset S1 and S0

As regards the achievement of cognitive benefits, it can be noted that benefits related to understanding and memorization as well as problem-solving capabilities go up. The reason may be that students in a group are more responsible in first person of finding/organizing the content and also of solving issues to accomplish the tasks they are given.

Motivational benefits		Subset S1	All (S0)
	Participation	72,4% ↑	29,5%
	Self-esteem	25%	21,5%

Table 7. Motivational benefits: comparison between subset S1 and S0

As regards motivational benefits, "participation" skyrockets from 29,5% to 72,4%; also self-esteem goes up. This is one of the most notable results of the analysis.

Relational benefits		Subset S1	All (S0)
	Cooperation/sharing	39,2% ↑	32,4%
	Autonomy	32,1% ↑	25,1%

Table 8. Relational benefits: comparison between subset S1 and S0

As regards relational benefits: cooperation and autonomy increase, as it may be expected when group work is at stake.

Communication benefits		Subset S1	All (S0)
	Comm. skills	25% ↑	21,8%
	Creation of digital content	24,7% ↑	14,2%

Table 9. Communication benefits: comparison between subset S1 and S0

As regards communication benefits, data show that communication skills in general and more specifically the capacity of creating digital content increase. The reason is that S1 is also

characterized by the format "PoliCultura" (42,8% in S1 vs. 21,9% in "all"), where students are asked to create a digital storytelling application and therefore do have to develop this kind of competence. Apart from PoliCultura, group work usually go with "creating something together" so this data is not surprising.

Hardware used	Subset S1	All (S0)
LIM	50% ↑	40,1%
Notebook	46,4% ↑	34,6%
PC	28,5% ↓	47,4%

Table 10. Hardware used: comparison between subset S1 and S0

As regards the hardware used, LIM and notebooks go up while the "traditional" PC (which in S0 is first in line) goes down. This data is quite surprising and would need further investigation.

Software used	Subset S1	All (S0)
Authoring	53,5% ↑	30,2%
Pictures	50% ↑	27%
Audio	42,8% ↑	29,1%
Video	42,8% ↑	27,7%
Presentation	32,1% ↑	29,5%
Production tools	32,1% ↑	26,2%
Web	32,1% ↑	24,4%
Search engines	25% ↑	18,9%
Social net.	21,4% ↑	12%

Table 11. Software used: comparison between subset S1 and S0

As regards the software used, we can see that all SW that supports the production and sharing of digital content go up; the reason again is that S1 is characterized by the format "PoliCultura" (42,8% in S1 vs. 21,9% in "all"), where students are asked to create a digital storytelling application.

Inclusion problems	Subset S1	All (S0)
Immigration	50%	20,4%
Children with learning diff. (certified)	42,8%	16%
Children with learning diff.	21,4%	11,3%

Table 12. Inclusion problems: comparison between subset S1 and S0

As regards inclusion problems, the reader must pay attention to the fact that S1 was generated excluding "disabilities" from this very facet. So it is clear that all the other values, since one member of the group has been excluded, show higher percentages. We therefore reported in table 11 the values only in which a very significant change was noticed, i.e. "immigration", "children with certified learning difficulties" and "children with more generic learning difficulties". The high gap between the values in S0 and S1 indicate that group work is the preferred organization for inclusion in all these cases.

Inclusion strategies		Subset S1	All (S0)
	Peer to peer education	46,4%	31,7%
	Involvement of the class	25%	19,7%
	Team building	17,8%	14,9%

Table 13. Inclusion strategies: comparison between subset S1 and S0

As regards **strategies** for inclusion, peer-to-peer education, involvement of the class and team building go up. Peer-to-peer education in particular is related to heterogeneous group work, which we have seen is the most popular form of group organization.

Human resources		Subset S1	All (S0)
	More than 1 teacher	71,4% ↑	56,2%

Table 14. Human resources: comparison between subset S1 and S0

As regards human resources, the only notable thing is that teachers tend to cooperate: the value of "more than teacher" in fact goes steadily up.

Activities		Subset S1	All (S0)
	Dig.-creation	67,8% ↑	49,6%
	Trad.-creation	50% ↑	23,3%
	Trad.-collaboration	39,2% ↑	31,7%
	Dig.-collaboration	21,4% ↓	30,6%
	Reading	17,8% ↓	24,8%
	Role-playing	3,5 ↓	10,9%

Table 15. Activities: comparison between subset S1 and S0

As regards the activities, the changes in the values sketch a scene of collaborative work where the creation of both digital and traditional content goes up and traditional collaboration goes up too. Apparently, students work in the classroom mainly: the facet "where" (not reported in this paper, for lack of space) says that "work within the class" amounts to 61,3% in S0 and goes up to 67,8% in S1.

Design		Subset S1	All (S0)
	Semi-structured	46,4% ↑	28,4%

Table 16. Design: comparison between subset S1 and S0

Eventually, as regards the design of the experience, it may be noted that "semi-structured" design increases a lot; experiences with group work imply a higher degree of flexibility than normal activities and the teacher must be ready to "re-design" them.

One last observation: the value "undefined" goes down in all the facets: maybe because teachers have clearer ideas in mind when it comes to face inclusion issues. Table 17 summarizes all the findings.

SUMMARY OF RESULTS

- Junior High schools and primary schools are those most active in "inclusion and group work".
- Inclusion and group work tend to be more present in low-profile (in cultural and socio-economic terms) situations and with low-performing classes.
- Group work to face inclusion increases in the case of classes with highly heterogeneous students(in terms of performances).
- *The main benefits that are the motivational and relational ones: "participation" skyrockets, "sharing" and "autonomy" also increase.*
- The use of both hardware and software increase; a strange outcome that would need further exploration is that the "traditional" PC goes down while LIM and notebooks go up.
- As regards the inclusion problems dealt with, immigration and children with learning difficulties seem to be the cases in which group work is felt as a good strategy.
- As may be expected, all activities related to "creating something together" (a typical goal for group work –confirmed by the increase in all SW tools for creating digital content) go up.
- It's typical to have more than one teacher involved in the activity.
- Eventually, experiences dealing with these issues seem to be half-planned and open to changes (the "design" is semi-structured).
- General remark: "indefiniteness" increases in all facets: this means that teachers have much clearer ideas when they tackle these issues.

Table 17. the most relevant features of the experiences where soft inclusion go with group work

3.3 Question 3: What are the differences between heterogeneous and homogenous groups?

To address the third research question (whether the different kinds of groups have an impact on inclusion), further subsets are created:

- S2: by further selecting "heterogeneous groups" within S1 (S2=17 experiences).
- S3: by further selecting "homogenous groups" within S1 (S3=4 experiences).

Since these sub-sets are too small for a quantitative analysis, a qualitative analysis on the experiences' materials is performed. First the abstracts are read and then the attached materials, which basically are: (1) expectations: audio of the interview; (2) expectations: interview's transcript; (3) expectations: features extraction schema; (4) results: audio of the interview; (5) results: interview's transcript; (6) results: features extraction schema, (7) comparison [between expectation and results] schema and eventually (8) detailed description of the educational experience. Some experiences may have additional materials like for example the experience's output (a website, a presentation…).

S2 (heterogeneous group work) amounts to 17 experiences. They are mainly from junior high school (7), with primary school immediately following (6) and then high-school (2) and pre-school (2). In all 17 experiences, heterogeneous group work goes with differentiated tasks, i.e., not all the students try all the activities. The reason why is that in this way all the students feel involved and feel the common result as their own. A teacher (primary school level) reports:

> "One of my student is really poorly proficient; therefore, he took care of the drawings. It was an easier task, of course, but it fitted him quite well. There are other students who have behavioral problems. In this kind of work [i.e. digital storytelling] they are quieter, since they feel more involved and motivated; thus, they do not keep going around disturbing their classmates. It is easier for them to follow the rules!"

In this respect, data from the survey are quite surprising (at least, at first sight): while almost 50% (47,9%) of the teachers declare they make all students try all possible activities within groups, on the other hand (when answering another question) a much larger percentage (74,9%) declare that they favor each student's own talent, letting her do what she prefers. Of course there is a slight contradiction between what teachers "think" (or think they should think) and what they do in practice. Their answers show that in practice, it is much easier to assign different tasks according to the students' different skills.

Eventually, it can be noted that teachers do not show awareness of the fact that in this way they are actually making the student gain different benefits: they seem to be content with the fact that they all feel "involved". In other words, they do not fully reflect on the relation between organization (heterogeneous group work) and benefits (which benefits are gained and by which students).

S3 (**homogeneous group work**) amounts to 4 experiences. Two from primary school, one from junior high school and one from high-school. In all cases, the teachers created groups where the best worked with the best and the least performing with their peers. The experience from the junior high-school is particularly relevant: the goal of the activity was to have the students get acquainted with some software tools for math and geometry. The teacher created homogenous groups since "the most proficient students are less stimulated if they have to take care of the less proficient ones, while if I put together two very good students, they will look for new solutions, or find a more effective way to accomplish the task they are given".

Data from the survey, especially in the free comments, confirm that homogenous group work, while of course not adopted by the majority, is seen as a viable solution by some teachers (figure 5). One teacher declared:

"I've worked a lot with heterogeneous group work, but recently, to my own students' great surprise, I started using homogeneous group work. I thought that in this way those who have more difficulties would be pushed to do more and to develop some strategy to reach the goal. And so it happened! Results were quite encouraging."

4. Findings and discussion

Let us now summarize the results, in order to answer our starting questions:
1. Is there any relation between inclusion and group work?
2. How are experiences dealing with inclusion through group work characterized?
3. What are the differences between two relevant group work organization, namely heterogeneous and homogenous groups?

As regards question 1, we can say that there is a relation between inclusion and group work. First of all, group work is seen by most of the teachers as "the" strategy to overcome inclusion problems: when "inclusion" is selected as key feature in the L4ALL portal, all kinds of group works in the facet "organization" go up. More specifically, heterogeneous group work emerges as the dominant strategy. Experiences characterized by heterogeneous group work largely outnumber the other organization forms. In the survey, when asked how they organize groups, most of the teachers (76,8%) declare that they preferably organize heterogeneous groups, i.e. mixing up students with different performances. A minority (8%) go for homogenous groups, while others (15,2%) say they let students organize themselves, according to their preferences (figure 5).
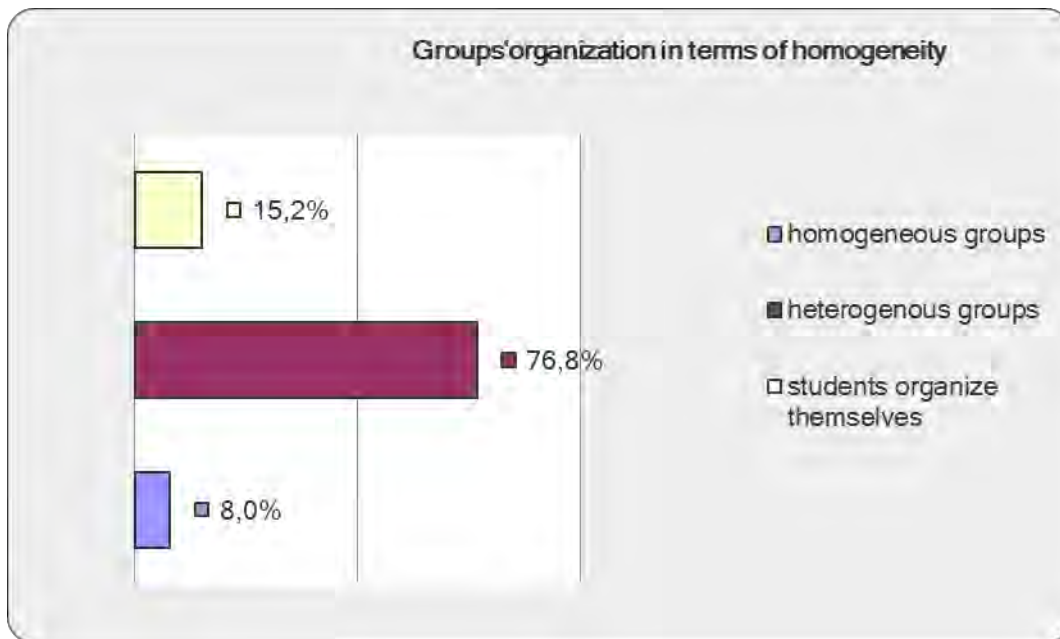
Figure 5. From the survey: how teachers organize group work (254 respondents to the survey – 4 skipped questions).

As regards question 2 ("How are experiences dealing with inclusion through group work characterized?"), the most notable remark is that heterogeneous groups are good for raising motivation, improving relations and enhancing the students' own talents, rather than developing curricular benefits. Free comments to the survey confirm this data: "When in the group I see that someone is better at storytelling while someone else is better at drawing, I let them do what they do best"; "Inside a group, it is rewarding for the students to contribute with what they can do best".

As regards question 3 ("What are the differences between two relevant group work organizations, namely heterogeneous and homogenous groups?"), the analysis of the subsets' materials lead to the following results: that in the case of heterogeneous group work, there are some hints that while undoubtedly students feel involved and are satisfied by the result of their efforts, in truth they end up accomplishing different tasks and thus achieving different benefits (learning to write texts for multimedia vs. keeping the class schedule or uploading files). Heterogeneous group work seems to foster a diversification of talents; this phenomenon is emphasized by ICT, that brings about the need for new, untypical skills. Are "diversified talents" an opportunity or a ghetto? In the sense that, in the end, someone will be very good at communicating with multimedia while someone else will be good at managing files. An example from our set is quite stunning in this sense:

> "In a group there were 3 students. One is autistic: do not imagine an amorphous boy, sitting quietly in a corner: he's the best in class, he scores the highest marks. In the group, the other two were not as good as him and in the end he was the one who found all the materials, who wrote the texts… the laziest one instead was like – ok, I'm gonna let this big wave take me around" (Exp. 10_039).

Heterogeneous group work seems to foster benefits like increased motivation, proactivity, involvement… rather than curricular benefits. Here are some interesting quotes about increased motivation:

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"Some parents tell me: my sons and daughters cannot wait to come to school, when they wake up in the morning. It has never happened before. Since this activity [multimedia narrative] began, they can't wait to go to school" (Exp 10_311; primary school).

"One day, there was a students' meeting: students are allowed to skip classes in these occasions. But I said: 'is there anyone who want to come with me and finish the work [a digital storytelling]?' And, to my surprise, they all came, without exceptions!" (Exp 10_505; high-school).

It is interesting to note that homogenous group work is emerging as an effective strategy for inclusion. "High-flyers" students act as a trigger for each other while low-performing students, deprived of the support by the best ones, are forced to push harder to achieve their goals. This idea is partially known literature, where it has been pointed out that heterogeneous group work may be beneficial for the low performing students but not (always) for the best. For example, Hooper and Hannafin (1991) found that low-ability students interacted more and completed instruction more efficiently in heterogeneous than in homogeneous groups, but high-ability students completed instructions more efficiently in homogeneous than in heterogeneous groups. In other words, low-ability students benefit more from being paired up with a high-ability student, but the high-ability students do not learn as much when they are paired up with a weaker student. In addition, Lou et alii found that small group learning had differential effects for students at different relative ability levels. Although the mean effect sizes were positive for all ability levels, group learning was more effective for lower ability learners than for medium ability learners. Some of our experiences are in line with these findings:

"…the good student is less stimulated if he has to help the lazy one. If two good students are put together instead, they try to solve the situation faster or to find solutions other than the most obvious ones. This is my experience" (Exp 10_303, junior high-school)

But we have found some hints that even low performing students when put to work together can stimulate each other. A teacher said:

"The risk with putting together the 'laggards', the most passive students, with the best ones, is that they just wait and see what the best are doing. They do not take the initiative. Therefore I put together little groups of homogenous students and then I try to push them: why did you fail in the test? Try to find out together the solution. Or: try to do this task. And actually they try harder" (Exp 10_305, high school).

"I put together a dyslexic boy with an immigrant, in hope that they could stimulate each other. During the activity, the dyslexic boy helped the ROM boy, who could not speak Italian well. It worked well, and moreover, a friendship was born! Their parents even asked that they could be in the same class when moving to junior high-school". (Exp 10_006; primary school).

This research has two main limitations. First of all, the sample: all the data come from teachers who cannot be defined as "average", since they are all taking part in some special project and they have had the "courage" of adopting technology in their daily routine. The normal, or even the laggard teachers, are not represented in our study. The second limitation

lies in the numbers: when trying to make a fine-grained analysis to investigate the relation between the different kinds of group work and the experiences' outcomes, numbers were definitely too low to support a quantitative analysis. Still, qualitative data were already quite relevant to shed light on the issue; we hope to confirm them when more experiences will be gathered in the portal.

5. Conclusions

Our study shows that there is a relation between group work and inclusion and that what kind of relation is there between different organization forms (heterogeneous vs. homogenous groups) is definitely worth exploring. Our first findings show that heterogeneous group work is the preferred solution; but while it is very good at generating motivational and relational benefits, it runs the risk of diversifying the achievement of the all other benefits among the students. On the other hand, while less popular, homogenous groups are emerging as a viable strategy to push all the students to improve all their performances. We therefore think that there is ground for challenging the idea that heterogeneous groups always work better and are more "inclusive".

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Primary teachers' professional development in Portugal. The contribution of ICT and Problem-based learning

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Abstract
Rapid technological development and the burgeoning of technology in different social contexts have placed demands on teachers to master a number of skills that allow them to make educational use of Information and Communication Technology (ICT) in their practices and that enable students with new, stimulating and up-to-date learning experiences. In this context, Problem Based Learning (PBL) emerges as a methodology for teacher training that may allow teachers to, on one hand, integrate ICT tools into their classes and, on the other, to develop skills related to problem solving. The present study presents an experiment in training primary school teachers on ICT through PBL. For this, an ICT training programme based on PBL was designed, implemented and evaluated, with the objective of promoting the development of teachers' skills associated with problem-solving and decision-making and improving students' creativity and critical thinking. This article will present, firstly, the context of the programme and its global objectives. Next, the planning, contents, timetable and some digital resources built for the programme will be set out. Finally, we will outline an assessment, taking into consideration the teachers' degree of satisfaction and achievement in this training proposal.

1. Introduction

In Portugal, just a few years ago, primary schools had very few resources that used modern technology. The blackboard and textbooks were a teacher's only educational support. The few video-tape or audio players were often broken or obsolete. There were some programs intended to develop the use of computers in the classrooms but these did not have much impact on primary education.

Since 2007, the Technological Plan for Education, implemented by the Portuguese government, has provided interactive whiteboards, ICT labs, wireless internet access for schools, facilitated access to personal laptops for students and promoted teachers' professional development on ICT.

Research has shown that teacher training is an essential component in the success of ICT for educational purposes. For this reason and because ICT features prominently in our society and in our schools, the area of continuing teacher training in ICT has undergone major development, which is reflected in the increasing opportunities for training.

Nevertheless, different studies indicate that the focus of these training opportunities is more related to the teachers' technical skills and less to the educational use of technology in learning situations. It is important that, beyond their knowledge of what to do, teachers know how to use the information properly in the resolution of pedagogical problems and unexpected learning situations.

The present study aims to design, implement and evaluate a program with problem-based learning, using ICT to promote the development of problem-solving skills, decision-making and creative and critical thinking.

2. Theoretical framework

In Portugal, primary teacher training comprises an initial training course and continuous training programs during practice (Morgado & Leite, 2012). The initial training course consists of a three-year bachelor and a two-year master degree. Most of these courses include ICT subjects in their syllabuses. Accordingly to Fartura et al. (2011), these subjects are taught more in the first years of the courses and content tends to focus on the development of ICT skills in future teachers. The methodology and content of ICT subjects in the initial training courses for primary teachers vary from one course to another. However, programs feature both teacher-centred and student-centred methodologies. Content is designed to integrate ICT practical skills and ICT practices into educational contexts.

Since 1990 we have, in our country, a formal system of professional development for teachers, involving several universities and superior education institutions, associated with teachers' career progression (Formosinho, 2009). There are several certificated training centres that offer training courses for teachers in different areas. In the case of ICT training courses, until 2008 many offered ICT training skills focusing on the use of technology. Implementation of the Technological Plan for Education brought about an increase in teacher training programmes centred on using ICT in educational contexts, specific to each teaching level. Unfortunately, these training courses have since been cancelled due to the government's lack of money. Nevertheless, teachers claim the need for more training opportunities in educational use of ICT in learning situations to allow them to use all the technology they have in their classrooms.

Problem-based learning is a pedagogical methodology that was used for the first time by Howard Barrows in the mid-1960s in the Medical course at the University of MacMaster, in Canada (Delisle, 2000). The basis of PBL, however, is usually associated with the progressive

movement started by Jonh Dewey in 1916, in which students' interests and previous knowledge are the basis for learning. Students have an active role in the learning process and the teacher is the guide who promotes the connection between knowledge and the real world. PBL has since spread all over the world in medicine and other areas and levels of education. According to Lambros (2002, p. viii) "PBL is becoming well established as a valuable addition to traditional teaching methods". Delisle (2000) presents a four-step structure for the PBL process. Firstly, the teacher selects/develops the problem and the motivational context. Secondly, the students name the problem and identify the theme, facts known, learning questions and decide the plan of action. The third step is the execution of the plan of action. The fourth stage is evaluation. Lambros (2002) states that PBL creates opportunities in the classroom that traditional approaches simply do not, as students determine the content that they require to solve the problem, what resources to use and develop their abilities to synthesize information. Learning becomes a relevant process in which students are aware of their learning needs.

3. Methodology

To achieve this study's goals, a training programme entitled "Problem Based Learning with ICT in primary schools" was developed, and certified by the Scientific and Pedagogical Council for Continuous Teacher Training[1] in Portugal.

The specific goals of the training programme were the following:

- To design, implement and evaluate a programme with problem-based learning, according to the structure presented by Delisle (2000), using ICT;
- To elaborate, implement and evaluate learning sequences with PBL, using ICT;
- To develop digital materials to support the learning process with PBL;
- To create a community of practice between teachers that promotes sharing of experiences and materials.

To this end, the training programme was structured as a five-step model: analysis, design, organization, implementation and assessment.

3.1 Analysis of the initial context

The present study is part of a doctoral investigation taking place at the Psychology and Science Education Faculty in the University of Coimbra in Portugal. One of the investigators is also a primary school teacher and has been developing projects on ICT in Lousã.

The prevailing context in Portuguese schools at the moment of design and implementation of the training programme was a very prosperous environment for the educational system. ICT tools were being implemented in schools all over the country and governments, school leaders and teachers were very enthusiastic about promoting the use of ICT tools in education for the global purpose of improving the educational system.

From analysis of the initial context we were able to establish the following premises:

- Schools are equipped with interactive whiteboards, personal laptops and computers and internet connections;
- Teachers are motivated to learn about how to use ICT learning situations;
- School leaders are willing to promote and facilitate implementation of teacher training programmes;

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[1] Conselho Científico-Pedagógico de Formação Contínua de Professores

- Teacher training centres are willing to promote and facilitate teacher training programs implementation;
- Teachers need the credits assigned by teacher training programmes to progress in their careers.

3.2 Design of the training programme

The training programme was conceived in a workshop design, in a b-learning system, with a twentyfive-hour component in the classroom and another twentyfive-hour component in the form of primary school classroom activities and autonomous work using the Moodle platform.

During the training programme teachers should be able to:

1. organize learning activities with PBL, using various resources, according to the steps defined by Delisle;
2. use different learning tools, with special emphasis on ICT tools, considering the goals for each activity;
3. work as a team in the organization of the learning activities;
4. critically analyze their practices, using criteria based on research and experience;
5. objectively identify and describe strong points and aspects to improve in their own practices, according to the training programme and individual goals;
6. use technological tools such as: interactive whiteboard, computer or laptop, printer, multimedia projectors, etc;
7. use various kinds of software in the classroom depending on their usefulness: word processor, spread sheet, multimedia creator, interactive whiteboard software, games, and educational sites;
8. use different forms of online communication, using the Moodle platform and email, bearing in mind the rules for online communication and security;
9. select online information necessary to training program development, using search engines or specific web pages, bearing in mind the rules for online communication and security;
10. distinguish different forms of publication on the web, according to their function, such as: blogs, sites and social networks;
11. publish information on the web using blogs, sites, social networks, bearing in mind the rules for online communication and security;
12. consider advantages of and constraints in using ICT in the learning process for students and for teachers;
13. evaluate the potential of using ICT with PBL, in the learning process, according to the Portuguese primary schools' programmes.

Several types of content were defined, taking in consideration the main points about ICT in education. Thus, six topics were considered essential for teachers to discuss in order to understand and make a critical judgement of ICT use in classrooms: challenges for schools in the 21th century and teachers' roles; problem-based learning principles and practices; Learning Management Systems – Moodle; ICT tools in education; social networks and communities of practice on the web for educators and teachers; copyright on the web.

The training programme was organized so that teachers could manage classroom sessions and autonomous work. The classroom sessions were organized in the PBL methodology. The learning strategies were thought to be as diversified as possible, stressing active and student-centred activities such as debate and group work. Some aspects of tutoring were also

considered in the planning. Autonomous work will consist of small individual or small group tasks, organization and implementation of PBL activities in the classroom and online forum.

Figure 1 shows a proposal for classroom sessions and autonomous work given to teachers at the beginning of the training programme.

Classroom sessions (25hours)

1	2	3	4	5	6	7	8
Project presentation	Presentation about digital portfolios	Activity presentation by participants	Activity presentation by participants	Activity presentation by participants	Activity presentation by participants	Activity presentation by participants	Portfolios presentation by participants
Debate about school challenges	Lesson planning about Interactive White Boards using PBL	Lesson planning about computers using PBL	Debate about social networks and online learning communities. Lesson planning about online software using PBL	Lesson planning about internet security using PBL	Considerations about author rights on the web. Lesson planning about online publication using PBL	Portfolios presentation by participants	Evaluation
Considerations about PBL							
3h	3h	3h	3h30min	3h	3h30min	3h	3h

1	2	3	4	5	6	7	8
Diagnosis evaluation (online survey)	Lesson planning about Interactive White Boards using PBL	Lesson planning about computers using PBL	Lesson planning about online software using PBL	Lesson planning about internet security using PBL	Lesson planning about online publication using PBL	Portfolio development	Final reflection on the training program
Considerations about Moodle	Activity implementation in the classrooms.	Activity implementation in the classrooms.	Activity implementation in the classrooms.	Activity implementation in the classrooms.	Activity implementation in the classrooms.		
Small tasks using Moodle about PBL			Portfolio development	Portfolio development	Portfolio development		
3h	3h30min	3h	3h30min	3h30min	4h	3h	1h

Autonomous work (proposal) (25hours)

Figure 1. Training programme plan for classroom sessions and autonomous work.

In educational contexts, resources are understood to include any material that can be used by the teacher to work with students or to facilitate the learning process. The resources used in this training programme were selected or created with different purposes: to introduce a subject, motivate the students, help to clarify concepts, present different examples, or help the students to synthesize the information. We created a Learning Management System page for the training program using Moodle. Figure 2 shows the home page for this training program.

Figure 2. Moodle platform home page for the training programme

3.3 Organization of the training programme

The training program was implemented in partnership with a Certificated Teacher Training Centre[2] in Coimbra and with a group of schools from Lousã[3]. The training program was advertised on the Teacher Training Centre website and emails were sent to the associated schools and teachers registered in the centres.

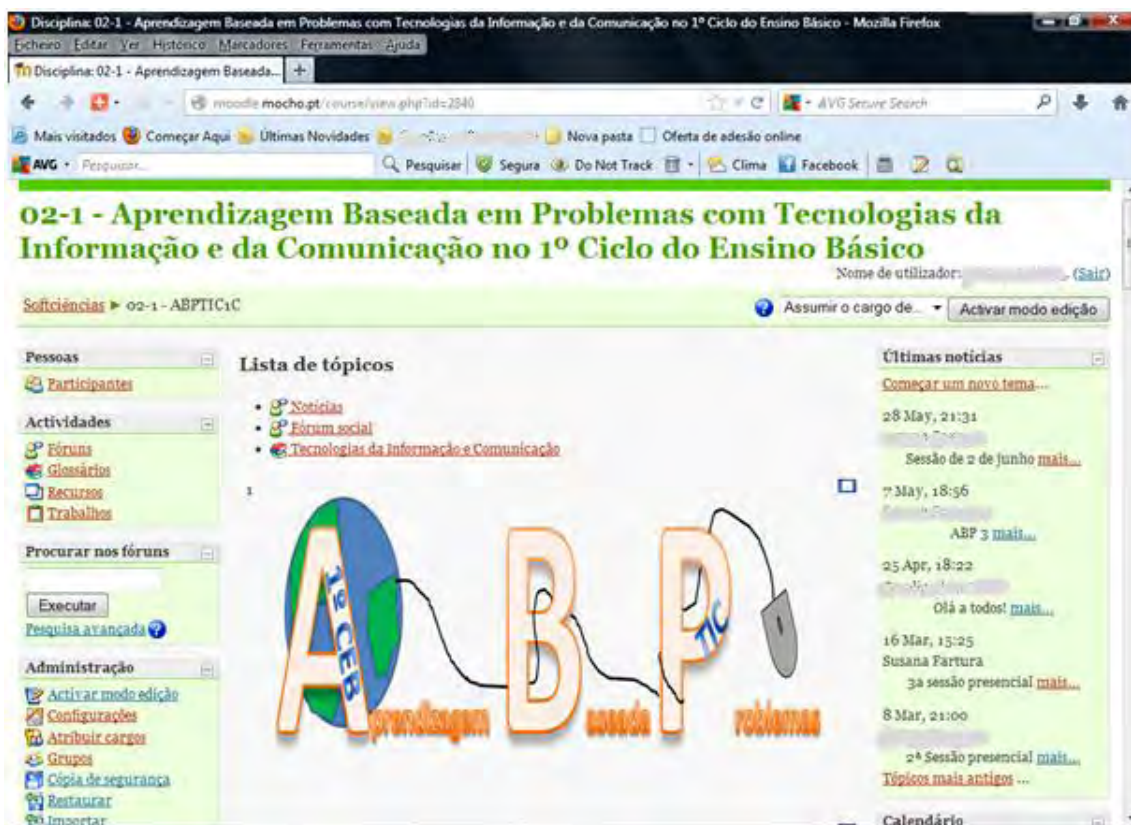Registrations were held online and teachers were selected according to the following criteria: 1st - primary teachers from Agrupamento de Escolas da Lousã (partners); 2nd - primary teachers from other groups of schools associated with Nova Ágora – CFAE according to order of registration; 3rd - other teachers according to order of registration.

In order to succeed in this training programme, teachers must have basic knowledge of computer work and email. Experience in social networks or learning platforms is not essential but will help teachers in using Moodle.

3.4 Implementation of the training programme

Although eighteen teachers were initially registered to participate, only thirteen completed the training program. The participant teachers were all female aged between thirty six and fifty five. This group represents three different groups of schools in the Coimbra region and a total of seven different primary schools.

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[2] Nova Ágora – Centro de Formação de Associações de Escolas
[3] Agrupamento de Escolas da Lousã.

The training programme was implemented between March and July 2012, according to the following timetable.

Session	Date	Schedule	duration
1	03/03	9h-12h	3h
2	10/03	9h-12h	3h
3	17/03	9h-12h	3h
4	21/04	9h-12h30	3h30
5	05/05	9h-12h	3h
6	19/05	9h-12h30	3h30
7	02/06	9h-12h	3h
8	09/06	9h-12h	3h

Table 1. Training programme timetable.

The sessions took place in a school ICT lab with an interactive whiteboard and one computer with internet connection for every student.

3.5 Assessment of the training programme

The assessment of the training program was considered in four phases.

The first phase was before the beginning of the training programme, in order to diagnose participants' needs and determine participants input profile. For this first moment of assessment it was applied an online survey using Moodle platform.

The second phase took place during the training programme and its main purpose was to assess teachers' reactions to the programme and their learning progress. For this several instruments were used, such as: direct observation grids; self-evaluation grids; analysis of participants reflections (structured grid); and analysis of PBL activity plans (structured grid).

The third phase of assessment was implemented immediately after the training programme concluded. Two components were evaluated in this phase: participants' evaluation and training programme evaluation. The purposes of this assessment phase were to appraise teachers work, teachers' opinions about the programme and the quality and effectiveness of the training programme. For this, an online survey was held and teachers reflections were analyzed.

For evaluation of participants, three components were considered: involvement, small tasks during classes and portfolio. The results of participants' evaluation were presented on a scale of 1 to 10, as set out by the Scientific and Pedagogical Council for Continuous Education in Portugal.

The fourth phase of assessment will take place nine months after the training programme ends (in April 2013). The purpose for this assessment phase is to judge the training programme's impact on teachers' practices and it will include an online survey.

4. Data analysis

The online survey applied at the beginning of the training programme using the Google Drive application showed that most of the teachers had a computer (15/16) and internet connection (12/16). Every teacher had already done continuous training programmes on ICT

with a generalist focus (14/16). Only two participated on training programmes specifically designed for primary school teachers. Most teachers use the computer to perform multiple tasks (13/16) and only two say that they rarely use the computer. Only one teacher says she does not use the computer to prepare her classes. All teachers use the internet. Most teachers use the internet in several places (13/16) and three use it only at home. All teachers use email, to communicate with other teachers (15/16), with friends (15/16) and with head teachers (12/16). Only four of them use email with students. As to use of computers in the classroom, most teachers used the computer at least once a week during the last school year. Only three teachers say they did not use the computer at all. The most common software used by teachers in their classrooms is word processor (11/16) and digital text books (9/16). Teachers also say they use internet in their classes. They say that the biggest obstacle to the implementation of ICT in the classrooms is the lack of hardware and appropriate software and the lack of an ICT expert in the schools to help teachers solve technical problems.

The second phase of assessment took place during the training programme. Teachers' reactions and comments to the programme were registered and each trainer kept a diary. Teachers' reflections were analyzed in categories of satisfaction, motivation and difficulties in activity implementation. Some teachers mentioned that it was difficult for students to ask the questions as problems to be solved. Some teachers also had difficulties using ICT tools such as interactive whiteboards and *Magalhães*[4] laptops. Some teachers found it difficult to integrate the PBL into their teaching methods.

The third phase of assessment considered two components: participant evaluation and training programme evaluation. Participant evaluation was divided into: involvement (15%), small tasks during classes (35%) and portfolio (50%). Table 2 presents the results for each teacher in each evaluation category and the global average.

Teachers	Involvement (15%) (1-15)	Tasks (35 %) (1-35)	Portfolio (50%) (1-50)	Total (%)	Final grade
1	15	25	50	90	9,0
2	10	25	40	75	7,5
3	15	25	50	90	9,0
4	15	25	50	90	9,0
5	10	25	35	70	7,0
6	15	35	45	95	9,5
7	10	25	40	75	7,5
8	10	25	35	70	7,0
9	10	25	35	70	7,0
10	10	25	50	85	8,5
11	10	25	40	75	7,5
12	15	25	50	90	9,0
13	15	25	50	90	9,0
				Average	**8,192**

Table 2. Teachers' final evaluation and global average for the training programme.

[4] *Magalhães* is the name of the personal laptop distributed by the Portuguese government under the Technological Plan for Education for primary school students.

At the end of the training programme teachers were asked to answer a survey to evaluate the training programme. Table 3 shows the results of this survey.

Categories	Average
1. Structure: sequence of the programme topics	3,923
2. Structure: time for each programme topics	3,846
3. Balance between expectations and contents	3,384
4. Transparency in the development of the programme	4,230
5. Communication skills	4,154
6. Methodology: theory and practice	4
7. Teaching materials	3,461
8. Applicability of the topics discussed during the programme	4,230
9. Self-evaluation	4,384
10. Contribution to classroom practice improvement	4,230
11. Contribution to personal development	4
12. Opportunity and modernity of the topics	4,462
13. Training programme publicity	3,769
14. Support and contact from the training centre	4,077
15. Documental support	3,769
16. Quality of facilities and technical means	3,308
17. Schedule of the training programme	4,077
18. Timetable	4,083
19. Evaluation	4,154
20. Global evaluation of the training programme	4,308

Table 3. Evaluation of the training programme by participants *via* an online survey.

Relating to *Applicability of the topics discussed during the programme*, teachers believe that these were consistent with everyday classroom practice and primary school curricula. The uses of the *Magalhães* laptop and internet security are the topics that most interested students. Teachers think that a training programme devoted to interactive whiteboards is necessary and they believe more support is needed in using ICT tools. Teachers state that the training programme was useful to the development of new practices/methodologies, more appropriate for primary school pupils. Some teachers also considered the topics significant because they could use them in different areas and at different levels.

On the *Contribution to classroom practices improvement* category, teachers said that the programme allowed them to use new methodologies, to acquire useful knowledge for classroom practice and to be aware of innovative and creative methodologies. Most teachers believe that this kind of methodology contributes to an improvement and innovation in classroom practices because it promotes knowledge in new areas, students' analytical and decision-making skills and the development of collaborative work.

Another topic teachers were asked about was the *Contribution of the training programme to their personal development*. Teachers reported that the training programme was important to their personal development because the topics were relevant to daily school life and the use of technology is becoming more important in classroom practices. They also outlined the good relationships between trainers and trainees. Teachers also highlighted the importance of contact with new materials, documents and websites to the development of classroom activities with children. Several teachers also outlined the importance of sharing ideas and experiences. They all agreed that the training programme had allowed them to develop their ICT skills and certain web2.0 tools, important to the classroom practices.

5. Findings and discussion

As we believe PBL methodology can promote problem-solving and critical thinking skills, we understand the strengths and weaknesses of the present study.

Firstly, the programme was implemented in a very particular context, in which teachers, directors and community leaders are very involved in promoting educational technology. The replication of the programme is essential to understanding its fragilities.

Secondly, the resources used in the training programme were constructed while it was being implemented, and according to the participants' needs. They therefore need to be evaluated externally and applied in other contexts to permit conclusions about their utility and efficacy.

Thirdly, one of the teachers' main difficulties in implementing activities using ICT is that technical problems need immediate resolution during classes. Teachers need support in implementing their activities from a person who is available on the spot and qualified to help deal with these problems.

Fourthly, one of the programme's objectives was to create an online learning community. This objective was fulfilled during the programme, but afterwards the interactions stopped. An increase in online interactions and the promotion of a learning community development should be considered in any future implementation.

6. Conclusions

This study aimed to describe a training programme for primary teachers using PBL and ICT. Although we cannot draw conclusions about the advantages of PBL methodology in the professional development of primary teachers in ICT, results suggest that, thanks to the implementation of this training programme, teachers worked with PBL and ICT in their classrooms with their students. For this, we believe that it was a positive experience for trainers and trainees and, above all, for pupils.

However, for many of these teachers it was their first contact with PBL and there were some constraints on PBL implementation in the classroom. Despite this, in the context of this training programme teachers used an active methodology, planned activities for ICT use in the primary classrooms and developed contents using the PBL structure. Teachers also worked in groups during classroom sessions and shared school-related experiences with other teachers. In conclusion, we believe that PBL and ICT are two powerful resources for teachers in promoting critical and creative thinking and decision making in their students and allowing an effective and up-to-date learning process. Consequently, more training programmes are needed to enable teachers to feel comfortable and confident in their teaching skills using PBL and ICT.

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How to Improve Quality in Media Education? A Tool for Teachers and Teacher Educators of Italian Primary Schools

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Abstract

The dissemination of good practices in Media Literacy Education (MLE) requires a rigorous definition of their characteristics, including criteria and indicators to measure the quality of related activities. In the present contribution, a systematic framework of criteria and indicators for good practices of MLE in Italian primary schools is presented and discussed. It has been developed through semi-structured interviews with scholars in the field and experienced teachers. Its function is to support teacher training or as a grid for monitoring, evaluating, and self-evaluating teachers' work in teaching about the media.

1. Introduction

In the field of media education, as well as in other areas of schooling and life-long learning, there has been much talk about "good practices" for about twenty years now (Coffield & Edward, 2009). Usually these are referred to with the explicit aim to improve the quality of educational processes by highlighting experiences that deserve to be taken as a model by practitioners. The subject of good practice, in combination with the issue of educational quality, has become a common topic in political discourse as well, and pedagogy has often drawn on it uncritically. On the other hand, the question of good practice is also linked to the evaluation of media education, which is maybe not a flagship of our field, being the subject of only few pioneering investigations, which – above all – have aimed at defining learning outcomes to be expected in students at the end of media education units as well as evidence to verify (and sometimes measure) these outcomes (Scrimshaw, 1992; Worsnop, 1996; Christ, 1997; Aglieri, 2005; Parola & Trinchero, 2006). This has led to the paradoxical situation that, in the field of media education, we talk about best practices, but often lack the criteria or precise benchmarks that would enable us to say which practices are actually good, and why.

In this paper, however, I would like to address the issue of quality in media education, with the aim to propose a systematic framework of criteria and indicators for assessing the quality of media education in the specific context of Italian primary schools.

2. Theoretical background

In a previous work (Felini, Criteri e indicatori di qualità per progetti di media education nella scuola. Come riconoscere le "best practice"?, 2010), I analyzed official resolutions of international organizations, documents prepared by research institutions and overviews compiled by scholars in the field of media education (UNESCO, 1982; Aufderheide, 1997; Masterman, 1997; European Centre for Media Literacy, 2005; French National Commission for UNESCO, 2007; European Association for Viewers Interests, 2008; The Aspen Institute Communications and Society Program, 2010; Bonomi Castelli, 2006). From this analysis I derived a long list of quality criteria as well as the following main findings: 1) a lack of appropriate tools for evaluating MLE projects; 2) the insight that media education can be better implemented in contexts of cooperation among people with different competence areas as well as in interdisciplinary or cross-curricular units; 3) the effectiveness of active, participatory and discovery-based teaching methods, such as group discussions or the creation of media products.

The highly abstract and general level of these texts, however, leads to suggest that they are very far from school reality. Obviously, documents issued by international organizations give priority to policy guidelines and related recommendations, but the gap between what is outlined in these texts and the concreteness of everyday media education is, in my view, also a clear sign of the inability to understand that the quality of MLE is equally, if not more, affected from the bottom up.

For this reason, the goals of my research were: 1) to reflect on the means of good practices in education, especially in media education; 2) to develop an integrated system of criteria and indicators to improve good practices of media education in Italian primary schools. The assumptions which led my work were the following:
1. the preference for the concept of "good practice", instead of "best practice", since quality in education must always be related to the concrete feasibility of the teaching

activities, and because my aim is not to rank teachers and schools, or to award them prizes;

2. the certainty that quality is not achievable through standardized procedures, as contexts, schools and classes differ widely;

3. the necessity to consider both scholars' research and practitioners' direct knowledge of real contexts in determining if a practice is good or not;

4. the risk of focusing on quality from the perspective of effectiveness only: quality in media education is shaped by a whole range of factors, including equality of opportunity and participation of all students in class;

5. the constant attention to the aim of my work, which is not assessing or ranking, but, most of all, providing a way for improving practitioners' skills through self-awareness and empowerment.

2. Methodology

The above-mentioned analysis of the international literature led me to compile a first draft of criteria and indicators of quality media education. This was submitted to two groups of experts: one composed of three scholars in media education at primary school level, the second of five primary school teachers with a long experience in media education, also as trainers or mentors of other teachers. The interviews were conducted individually between September 2011 and July 2012, through semi-structured protocols (Fontana & Frey, 1994). During the interviews, I showed the draft to the interviewees, gave them sufficient time to read it carefully, and asked them to respond to my questions on the structure of the framework, the groups of items, some items I considered as problematic, and the possible use of the list of criteria and indicators.

The synthesis of the information gained from the literature review and the suggestions gathered during the expert interviews were incorporated into a comprehensive proposal of quality criteria, which is presented below. This work of systematization is also based on both my theoretical knowledge and field experience of nearly fifteen years, including the co-ordination of the design and development of a MLE curriculum for primary schools (Ceretti, Felini, & Giannatelli, 2006).

A detailed description of the methodology I used, including the scripts of the interviews, will be published as a separate article (Felini, in press); other materials can also be accessed online: http://qualityMLE.wordpress.com.

3. Results: a framework of quality criteria for primary media education

As a result of the research outlined above, I present a systematic proposal of criteria and indicators for quality media education in Italian primary schools (see Table 1).

Formally, the features of good practice have been grouped according to five main criteria of quality (teaching methods, actors, organization, theoretical background, and originality), each of which is further refined by several sub-criteria (or areas of investigation) and corresponding sets of indicators. The terms "criteria" and "indicators" are used as proposed by Castoldi (1998); thus, "criteria" are the aspects of a given phenomenon (in this case media education activities) which define its value. Criteria may be found in different "areas of investigation". (The organization of a given educational activity, for instance, is a quality factor which we may consider in different areas: at school or class level, in terms of the use of

equipment or human resources, with regard to the degree of interconnection with other schools or institutions in the area, etc.). Finally, for each criterion and area, the framework suggests sets of "indicators", i.e., observable pieces of evidence defined in operational terms, which indicate if (and to what degree) the quality criteria are met.

At the content level, on the other hand, I would suggest five quality criteria, which can be applied to media education activities in Italian primary schools (see also Figure 1):

1. the adequacy and effectiveness of the teaching methods;
2. the competence and involvement of the actors in the MLE activity as well as the forms of support provided by the organization (e.g., the school);
3. the effectiveness, structuring and coherence of the project's organization;
4. the awareness of the underlying MLE theories as well as their appropriateness;
5. the originality of the MLE activity.

Figure 1. Criteria of quality for media education in Italian elementary schools

Considering each of these criteria and different areas of investigation, I developed a system of 35 quality indicators, on the value of which both the scholars and teachers interviewed have given their feedback. This system is presented in the following table.

Criteria of quality	Sub-criteria (areas of investigation)	Indicators
a) Teaching methods	Methods and techniques used in working with students	1. Inclusion of both media analysis (texts, language use, consumption behaviors etc.) and media production by students; 2. use of both individual and group work; 3. teacher's stimulation of critical reflection on what students discover or produce in class; 4. teacher's stimulation of discussions among students, giving everybody the possibility to form and express their opinions; 5. use of active and participatory methodologies, followed by reflection on the experience; 6. inclusion of different media products than those the children normally consume: in particular, products of relevant narrative, aesthetic, social, or historical quality.
b) Actors	Centrality of children	7. Educational design based on teachers' knowledge of children, their media experience and consumption as well as their socio-cultural context; 8. children's active and personal participation in the various activities.
	Teachers' training	9. Assessment of teachers' competence before their assignment to media education courses/units; 10. if needed, organization of specific teacher training courses before launch of a planned project of media education; 11. exchange with other teachers involved in activities of media education and peer-to-peer evaluation.
	School/family relationship	12. Sharing with families the meaning of media education for their children; 13. creation of forms of parental involvement to achieve the educational outcomes; 14. training for parents on family media management.
	Involvement of media professionals	15. Participation of media professionals in the design of media education projects; 16. meetings of students with media professionals.
c) Organization	Structuring of the media education course	17. Existence of a written syllabus stating all relevant information regarding the planned activity of media education; 18. interdisciplinary links between the unit of media education and students' other educational activities; 19. integration of the project within a school-wide media education plan, and its inclusion into the POF[1]; 20. assessment of students' learning; 21. teachers' self-evaluation of the course, based on the evidence collected and conducted individually or with colleagues.
	Use of equipment	22. Availability of technological equipment appropriate for the aims of the project; 23. use of equipment by the children themselves, as often as possible.

[1] POF (= *Piano dell'Offerta Formativa*) is a public document, annually updated, which contains the mission statement and the educational activities offered in each Italian school institute.

Criteria of quality	Sub-criteria (areas of investigation)	Indicators
	Documentation and dissemination of results	24. Continuous documentation of all activities (syllabus, diary of activities, videotaping of lessons, media products produced by the students etc.) and archival of these documents and all relevant information in a specific file/folder; 25. presentation of results to the school and/or town community; 26. participation in competitions; 27. presentation on the activity at conferences and/or teacher trainings.
d) Underlying theories of media and media education	Awareness of the goals of the activity	28. Clear formulation of the purpose and objectives to be achieved by students, both in terms of media-educative outcomes, outcomes linked to other disciplines, and outcomes related to key skills qualifications.
	Concept of media education	29. Existence of an explicit concept of the media and their role in contemporary society; 30. reference of the activity to explicit concepts of media education and media competence.
e) Originality	Originality of the activity of media education and its contents	31. Attention to current media reality and recent trends in the ever-changing media world.
	Originality of the media message produced by students during the activity	32. Originality of the language chosen by the students or of the creative solutions adopted in the message; 33. aesthetic value of the media message or of the creative solutions adopted in it; 34. communicative effectiveness of the message in view of the target audience.
	Originality of the teaching methods	35. Originality of the adopted teaching methods, especially in terms of their adaptation to the needs of the student group and its context.

Table 1. Systematic framework of criteria and indicators of quality for media education in Italian primary schools

4. Final considerations

This framework of quality indicators might be used in teacher training, since it has the advantage of providing a one-page only check list of indicators. This conciseness, however, is not bought at the cost of a broad perspective on media education at school; on the contrary, as recognized by some of the teachers interviewed, the framework allows to consider a wide range of aspects: organizational issues; the relationships among students, teachers, parents, and professionals; teachers' activities in the classroom as well as before and after class; the production of media messages by the children, the relationship between theory and practice, the links between media education and other disciplines, and so on. Therefore, this grid of indicators lends itself especially to teachers who have already had at least one experience of media education and, thus, can do a self-evaluation of their own work. This can be done either individually or within a "community of practice" (Wenger, 1998), as the framework can be used as an effective tool to guide both (self)reflective analysis and discussion, which again

can trigger – and this is the function of good practices as patterns of action – a process of improving media education by the practitioners themselves.

The added value of this tool, moreover, is that it signals the strengths and weaknesses of a media education project not based on just one individual's judgment, but – within a paradigm of inter-subjectivity – on the basis of the results gained through three levels of shared elaboration: the scientific literature that served as a basis for the first draft of criteria, the comments by the scholars, and the input based on the teachers' practical experience. The quality criteria presented here, thus, have value because they *were given value*, in a methodical, documented process.

Acknowledgements

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Needs analysis in classroom digitalization projects

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Abstract
In recent years a growing number of Italian schools have launched digitalization projects, integrating new technologies into their classrooms. Due to underfunding, these schools have accepted grants placing contractual restrictions on project features. The aim of this study was to analyse a number of digital classroom models with a view to identifying how and when needs analysis had been implemented and how this was related to outcomes in terms of problematic aspects, success factors and common/ad hoc project features. The research group conducted systematic observation of four macro-project models encompassing the design of 59 individual digital classrooms (31 primary schools, 20 middle schools and 8 high schools) currently being implemented in Northern Italian schools. Due to differences between the various projects and contexts, three alternative methods were used to collect data, namely project documents, interviews with teachers during project consultancy/review of the classroom environment and quantitative surveys. On the basis of the data analysis, we identified the following digitalization project models shaped by grant-imposed restrictions: *one-to-one models* (Penuel, 2006), *technology-driven models* and *ad hoc models freely designed by the teaching staff*. The results showed overall lack of involvement of the teaching staff, excessively technology-driven training, lack of training and lack of technical assistance to be amongst the critical aspects giving rise to uncertain outcomes. However, the most important factor contributing to classroom management issues was inadequate or inexistent needs analysis (Quaglino & Carrozzi, 1981).

Keywords
digital classroom, design, settings, needs analysis

1. Introduction

In recent years, a growing number of Italian schools have launched digitalization projects, integrating new technologies into their classrooms. Due to underfunding, these schools have accepted grants placing contractual restrictions on project features. The projects that we have analysed in this paper are: Cl@ssi 2.0, Web Generation, Ardesia Tech, Digital Piedmont; all of these were being implemented in Northern Italian schools.

There is a tendency for project leaders to acquire as many technological tools as possible for each classroom, based on the belief that this will significantly enhance the quality of the learning environment (Calvani, 1999). This tendency often goes hand in hand with interest in obtaining large-scale grant-funding, and with a lesser emphasis on needs analysis examining pupils' learning requirements and the need to re-design the classroom environment in line with the new teaching methodologies implemented (Garavaglia, Garzia, & Petti, 2012).

The aim of this study was to analyse a number of digital classroom models with a view to identifying how and when needs analysis had been implemented and how this was related to outcomes in terms of problematic aspects, success factors and common/ad hoc project features.

2. Methodology

The methodology consisted of systematic observation of four macro-project models encompassing the design of 59 individual digital classrooms (31 primary school, 20 middle school and 8 high school) currently being implemented in Northern Italian schools.

The macro-project models analysed were: Classes 2.0, Web Generation, Ardesia Tech and Digital Piedmont. Due to differences between the various projects and contexts, three alternative methods were used to collect data:

- project documents;
- interviews with teachers (Kanizsa, 1993) during project consultancy/review of the classroom environment;
- quantitative surveys (Mantovani, 1998).

3. Theoretical background

According to classical theory, needs analysis may be considered the first step in data collection (Quaglino& Carrozzi, 1981; McKillip, 1987): it is primarily a research activity aimed at gathering data and acquiring reliable information on the basis of which to proceed (or not) with the successive stages of any process (training, planning ...). Arielli (2003) states that «needs are the lack of a desirable state or the presence of a negative state/condition to be overcome». In this definition, needs are considered a sort of lack whose absence is due to an unsatisfactory mode of operating or a malfunction. In any context, action is key to transforming a current situation into a desirable one: procuring food, preparing it, protecting themselves from danger, etc. Needs vary with context: they may be individual or shared by a group; action undertaken to address needs should promote a process of re-motivation and be individualized and personalized as appropriate; actions that do not take these factors into account will contribute to the persistence of demotivation on the part of teachers and students.

From a systemic perspective on the other hand, need could be viewed as an imbalance (e.g. hunger, thirst), with satisfaction seen as an indicator of balance (i.e. satisfied needs). This is in line with the views of Piaget who defined need as the manifestation of a lack of balance

arising from a change in the individual or in the external context and action as a response to need that ends when balance has been restored between the new circumstance and the mental organization of the individual. (Piaget, 1967).

Piaget's view accommodates both the subjective and objective dimensions of need in line with a systemic approach in which needs are evaluated not only in light of personal values but also in terms of the objective characteristics of the overall system, avoiding interpretations and inferences and recognizing that not all solutions are good for all systems.

In the English-speaking world in particular, the metaphor of design is applied to any context in which there are problems to be solved. Problems are no more than a representation of a set of needs that must be satisfied in order to transform a current state into a desired end state (Munari, 1981). What is the desired state? If the teacher is encouraged to apply for a grant to acquire technology (computers, tablets, netbooks…), is this desired state reduced to technology acquisition? Solving the problem may require action at various levels of detail, involving different skills and different degrees of satisfaction of human needs. All of these make more complex the task of finding where the problem is, in a situation in which there is a perception of dissatisfaction. Understanding where you have to act is in fact a problem in itself (Arielli, 2003). Often in the projects that we assessed difficulty had been encountered in identifying needs, and in monitoring them; this situation helped to create a gap between the teachers' needs and the students' needs as identified by the teachers themselves.

4. Analysis of Grants

We analyzed the grant schemes in terms of 3 main features:
1. didactic model defined by grant;
2. training;
3. needs analysis.

In order to provide a systemic interpretation, we crossed these 3 main features with the four project models analysed.

Cl@ssi 2.0 is a ministerial project targeting all grades of schools. Successful applicants are awarded funding to buy technology for one classroom per school without the provision of training for teachers (the schools applying for a grant were required to state that staff were already skilled in technological teaching methods). The educational model is not defined by the body granting the funding, therefore the teachers in our study were free to choose the technologies they thought most appropriate for their class. Needs analysis was promoted by coaches (expert tutors nominated by the university with responsibility for monitoring the project) during the instructional design phase.

Web Generation, a project currently at the start-up phase, is targeting uptake by a significant number of secondary schools: successful grant applicants receive funding to acquire technology for use in classrooms. Here, too, the educational model is not defined by the grant provider, but may be freely chosen by the grant recipient. Training for teachers is provided, but different ways and schools are free to choose: in some cases training is offered by the education authority directly (e.g. through the University) and in this case the focus is on both technology and teaching methodology; in other cases training is offered by external training agencies (schools are free to choose who to commission with the training). Teachers may conduct needs analysis in order to compile the project submission form for the grant, but this is at the complete discretion of the teaching staff.

Ardesia Tech is a primary school project being piloted at the primary school of a small town near Florence that involves the implementation of technological equipment in three classes. There is a prescribed educational model of one-to-one computing, envisaging one

netbook per child (William, 2000) with the addition of advanced technological tools such as interactive tables. Teacher training is provided but the focus is exclusively on the technological aspect. Finally, needs analysis was not carried out: the teachers adopted the model proposed in the grant scheme.

Digital Piedmont, a project targeting different grades of school, prescribes the teaching model (one-to-one computing); in this case too, teacher training is provided with a focus on how to use the technology. Again, needs analysis is not provided for teachers because they are required to adopt the model envisaged by the grant scheme.

	Model defined by grant	Training	Need analysis
Cl@ssi 2.0	Free design	Not provided	Only if promoted by coach (in different ways)
Web Generation (in start-up phase)	Free design	Provided in different ways: - proposed by the education authority (focus on both technology and methodology); - free to choose	Teachers may conduct needs analysis in order to compile the project form for the grant submission
Ardesia Tech	Defined: one-to-one computing	Provided: focus on technology	Not present. Teachers adopt the model proposed by the grant
Digital Piedmont	Defined: one-to-one computing	Provided: focus on technology	Not present. Teachers adopt the model proposed by the grant

Table 1. Analysis of Grants

In summary, the analysis of four macro-project models in Northern Italian schools conducted by our research group identified the following range of possibilities:
1. Didactic Model
   a. "Free design" model (teachers are free to decide what to do and what technology to acquire)
   b. One-to-one computing (teachers are invited to adopt this model)
2. Training
   a. Provided and focused on how technology works
   b. Provided and focused on the school's choices
   c. Not provided
3. Needs analysis
   a. Teachers may conduct needs analysis (the grant form is based on a project proposal)
   b. Impossible (teachers must adopt the model defined by the grant)

On the basis of the results presented in Table 1 above, we identified the following digitalization project models shaped by grant-imposed restrictions: one-to-one models (Penuel, 2006), technology-driven models and ad hoc models freely designed by teaching staff.

Needs analysis, even when provided for at the grant application stage is never carried out in depth. The lack of needs analysis leads to technology-driven effects.

We identified some of the factors implicated in the failure to conduct needs analysis:
- lack of training in needs analysis processes for planning/design;

- lack of rigorous evaluation of quality as a project step: evaluation would naturally bring a focus on the match between project objectives and outcomes

A further distorting factor is the current economic recession, which makes securing grant-funding an objective in itself, as opposed to the solution of a problem / fulfilment of a need.

5. Steps involved in the needs analysis process

The training consultant Robyn Peterson (1992) suggested an approach to defining performance issues in organizations that seems may be used to analyze the context of the teachers involved in digitalization projects. The diagram shown at Figure 1 illustrates the total approach to examining human performance problems in a fully professional fashion. According to Peterson, it is possible to identify some of the causes of the perceived performance discrepancy that teachers aim to solve through the introduction of technology in the classroom. Many of these causes were reported by the teachers in our study who hoped that participation in the digitalization project would lead to improved outcomes. Unfortunately, only some of these causes may be addressed in this way, for example inappropriate, limited or poorly-maintained equipment. Other issues such as inadequate pay scales or benefits cannot be resolved by introducing technology (and in general are difficult to address in Italy as they are fixed by national wage agreements for the public sector). Similarly, within the current school system, participation in digitalization projects does not influence career path opportunities. Still other issues are unrelated to technology but may be addressed by other means; these include lack of experience, poorly-designed work areas, poor physical environment, peer pressure, lack of information or poor delegation. Finally, the issue of inadequate training is addressed in a variety of different ways across the projects discussed in this paper, but in most cases without effectively solving the problem given that the training provided generally lacks a focus on design and methodological aspects.
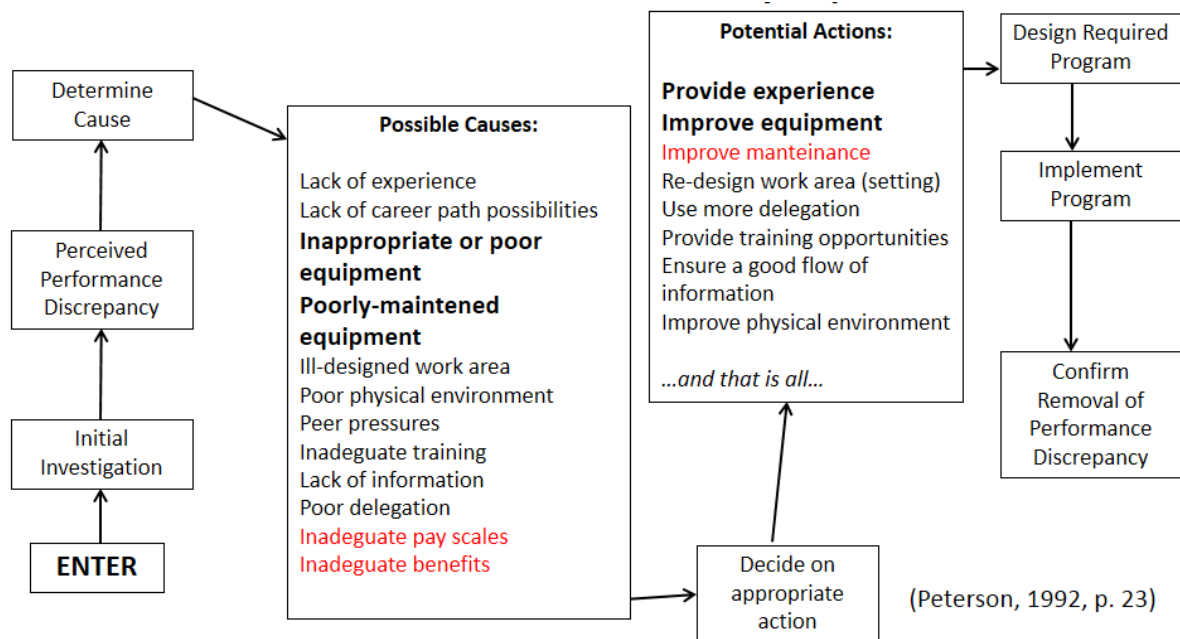

Figure 1. Basic ideas of the course "Educational Technology"

The implementation of a digital classroom project leads to gains in experience and improvements in equipment: these seem to be the main benefits to be obtained. This means that it is improbable that digitalization of the classroom with significantly alleviate the identified performance discrepancy recognized.

6. The short-circuit in the design model caused by grant restrictions.

The discrepancy just defined can also involve the inability to complete an ideal design process. In this paper, we draw on Munari's model of design (1981) to explain the mechanism underlying the failure to design satisfactory digital classroom projects. This model consists of three key steps: the Problem (P), Creativity (C) and the Solution (S). The sub-steps between the first two (from Problem to Creativity) comprise the Problem Description (DP), definition of Problem Elements (CP), Data Collection (DC) and finally Data Analysis (AD). Once the Problem has been defined in detail, the designer goes through the Creativity steps in the process and produces a first draft outline of a solution. This outline needs to be piloted and the first step in the testing process is to acquire technologies (MT). However, it is not possible for schools to complete this step because they generally do not have enough funding. In other words, a paradoxical and difficult to manage situation arises because the grant schemes do not provide for completion of the final sub-steps (experimentation SP, Model M and Validation) required to validate the optimum solution (S) to be applied by means of the grant. This may explain why many schools opt for solutions that do not match the issues flagged in their needs analyses.
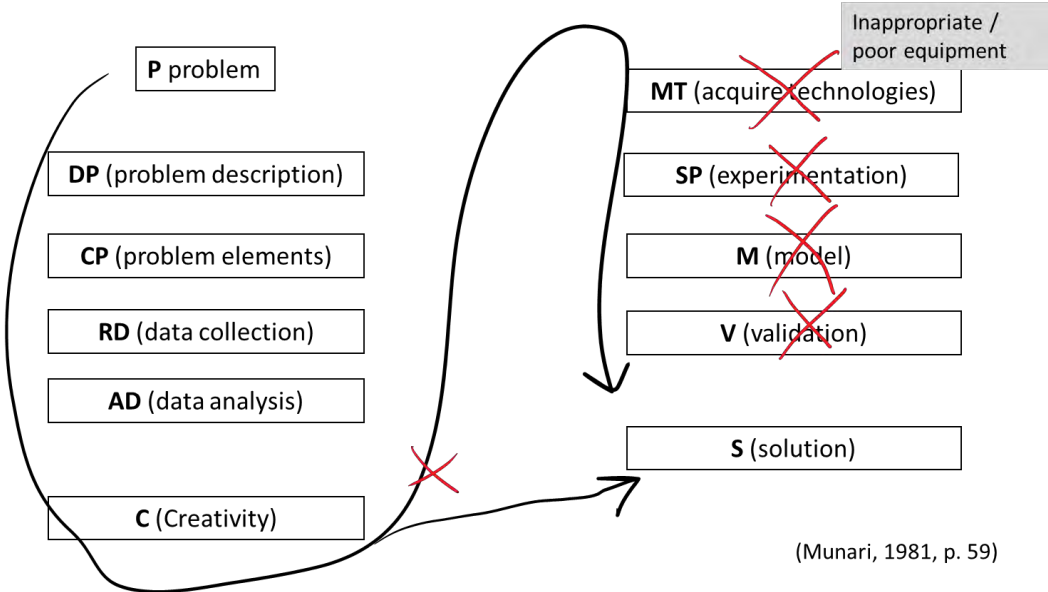
Figure 2. The short circuit in the design model caused by grant restrictions

## 7. The design approach used by teachers.

In order to gain insight into the processes teachers had followed to design their digital classroom projects, we conducted some interviews. Most of the teachers interviewed did not report having engaged in a step-by-step design process as recommended by Munari, but seemed more interested in acquiring technologies rather than in solving problems thanks to

in-depth analysis. It followed that their failure to conduct needs analysis at the outset had led to technology-driven effects. As outlined above, this tendency is related to a serious lack of funding leading schools to target grant-funding at all costs, as opposed to setting out to solve a problem based on a need.

Again, needs analysis was frequently not carried out due to lack of training focused on "needs analysis processes for project-planning": it emerged that there were very significant variations in the type of training previously attended by teachers, mostly determined by differences in personal interests. Lack of rigorous evaluation of quality as a project step also played a part, as previously mentioned, as evaluation would demand a match between the results and the objectives of the project, forcing teachers to bring a more timely focus to bear on needs analysis.

Our analysis identified two main approaches generally used by teachers: in the first, which we have termed *in-depth design*, teachers reported that they had aimed to improve the quality of their teaching through the acquisition of new technology, and to address some of the issues identified in the needs analysis. As mentioned before, this was the less common approach. It is represented in Figure 3.
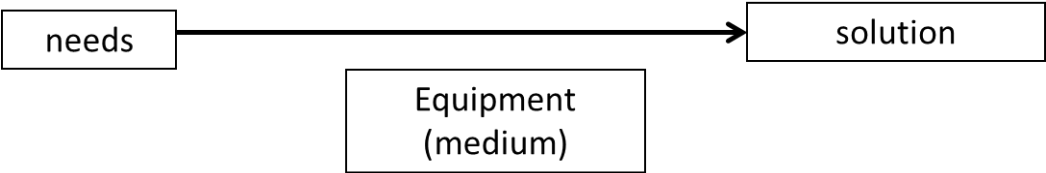
Figure 3. The "in-depth design" approach

Alternatively, in the second and more common approach defined here, termed *Instrumental*, teachers reported the need to improve the quality of their teaching through the acquisition of new technology, but only by virtue of the technical innovation and not on account of any improvement in methodology. In other words, if technology is the goal, the medium becomes the solution (figure 4).
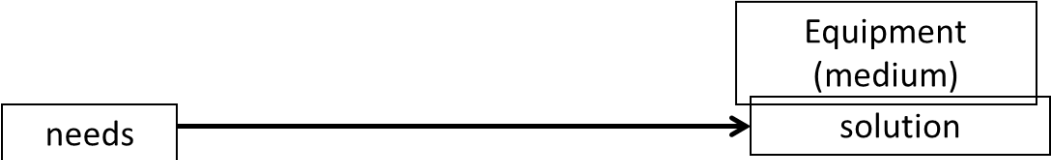
Figure 4. The instrumental approach. In this case, the acquisition of equipment becomes the solution.

8. Conclusion: some suggested feasible solutions

It's not easy to address the lack of design using needs analysis. The complexity of the problem is increased by a general lack of involvement of the teaching staff as a group, high turn-over of teaching staff and little real opportunity to re-design work areas. These aspects are critically influenced by an excessively bureaucratic system and lack of government funding, so teachers and school principals tend to overlook them and focus on more manageable issues.

Notwithstanding this complexity, our study suggested some feasible solutions that we recommend to schools planning to implement one or more digital classrooms. Our key recommendation is to focus on competences that teachers can realistically acquire: this means that it is necessary to take a benchmark measure of teachers' existing competencies at the

outset of the process.

A second recommendation is to choose general-level solutions that may be easily applied again in future years with other groups of students, i.e., specific solutions for specific students are to be discouraged..

In addition, it is fundamental to focus on "neutral" technology that allows use of a range of software and hardware devices: neutral technology is a device with multiple uses that is compatible with most standard files and applications. For example, if an e-reader that is incompatible with the most common open standard such as e-pub is chosen this will generate technical difficulties that will distract both students and teacherùs from a healthy focus on teaching and learning.

Finally, it is very important that everybody at the school views "digital literacy" as a key skill, otherwise the climate would be less than conducive to significant positive change arising from digitalization. .

These recommendations are to be viewed as a pragmatic guide to schools seeking to optimize their participation in digitalization projects that can help teachers and headmasters to carry out their own needs analysis process before defining the final project proposal. However, we would like also to suggest that grant-schemes be set up with preliminary needs analysis as a mandatory project phase. A further improvement would be to make a portion of the grant capital available in advance to allow the proposed solution to be pilot tested, with release of the remaining funding contingent on its successful validation.

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The Methodological Value of Collaborative Work in the Teaching-Learning Process: Explanatory Variables

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Abstract

In this paper we present data from a research study about teacher conceptions and practices as regards collaborative learning methodologies, in which they use ICT at Primary and Secondary schools (financed by the Spanish Ministry of Science and Innovation, Ref EDU2011-28071). The aim of the study was to learn of what teachers' conceptions are regarding these kinds of teaching methodologies, assessing their potential for learning. This is a survey study. We analyze the variables that influence the methodological value that teachers give to the collaborative learning (CL) in the teaching-learning process and the use of ICT resources and tools for CL. Our findings show that teachers hold a very positive view of collaborative learning methods and their impact on student achievement. We also see that they ascribe great potential to this type of activity for their own professional continued training and development. In spite of these expectations, teachers realize that their competence level regarding ICT tools is not very high with when it comes to applying these techniques and almost 50% of teachers use none of these resources.

1. Introduction

Current theories of learning recognize the importance of social relationships and interaction with others in the acquisition of knowledge; knowing how to work in a group in order to achieve common objectives emerges as a transversal learning skill at all levels of education; digital technologies are included in the process of expansion and generalization in educational systems, allowing for communication among students and teachers all over the world. These factors explain the fact that collaborative methodologies for learning with information and communication technology (ICTs) are gaining more and more impetus and prominence with regard to educational innovation.

The research tied to the contents of this article centres on analysing collaborative methods of learning through information and communication technology (ICT), considering teaching-learning techniques for students from 10 to 16 years of age, in the Spanish primary (third cycle) and secondary levels of education (I+D+I Project, funded by the Ministry of Science and Innovation, Ref. EDU2011-28071). The study was carried out in the state-run schools, within the context of the Ministry of Education's program Escuela (School) 2.0, specifically in its implementation in Castilla y León, where extensive integration of ICTs in curriculum development for these stages of education is being promoted.

The objectives of the research we now wish to highlight is oriented, firstly, towards learning about collaborative classroom experiences using the ICTs developed in schools (as learning strategies for students) as well as teachers' conceptions of this type of teaching method. Secondly, we will analyse collaborative work activities carried out by teachers with other teachers, whether in their own schools or at other schools, oriented towards professional development, studying the techniques that are generated with the use of different types of collaborative methods, along the lines followed by other researchers(Coll y Castelló, 2010; Camilli, López y Barceló, 2012, García, Buzón y Barragán, 2012, García, Gros y Noguera, 2010, Rebollo, Yang, 2010).

2. Theoretical framework

The value of a methodology based on collaborative learning lies in the fact that it leads to a joining together and sharing of efforts among the members of the group in such a way that, when the process is complete, the desired mutual and group objective produces an individual benefit for each and every one of the participants. Rosario (2008, 134) points out that among the benefits "with regards to knowledge, collaborative efforts allow for achieving objectives that are inherently richer in content, assuring quality and exactitude with respect to the ideas and solutions that are posed" besides "motiving students to generate knowledge own their own, since they see themselves as involved in the development of research where their input is highly valued and where they are not simply passive entities soaking up information".

Kumar (1996) identified the elements to be considered in designing and developing collaborative systems of learning- and applied them to his research studies (Brokenshire and Kumar, 2009; Kumar, Gress, Hadwin and Winne, 2010), including controlling interaction, areas of learning, learning tasks, designing collaborative environments, roles in the collaborative environment, guiding the learning process, technological support, etc.

Collaborative learning methods are based on the principle of "learning by doing" and are characterized by analysing key, complex aspects of the curriculum, in a way that is meaningful, constructive, authentic, and autonomous, culminating in the elaboration of products or goals that are not only curricular, but also more generalized in terms of personal learning and development (Badía, Becerril y Romero, 2010).And these achievements will favour students as well as teachers. It is also undeniable that ICTs have contributed (and will

continue to contribute) in an important way to providing the necessary tools for optimizing collaborative learning techniques(Barkley, Cross and Howel, 2007).

The new ICTs may make collaborative learning more effective, reinforcing inter-activity and making communication more agile (Carrió Pastor, 2007), facilitating project-based learning, teaching based on real situations and problems, inter-disciplinarity, and bringing us closer to achieving education centred on skills (Zabala y Arnau, 2009; Rubia, Jorri and Anguita, 2009). To this end, teachers may avail themselves of what is known as collaborative software (especially free software), such as that found on the 2.0 website, and which was designed specifically so that people could collaborate among themselves, or get support from other ICT tools not specifically designed for that purpose but which are adaptable for collaborative use.

In any case, we should bear in mind, as Gros Salvat & col. (2009, 122) point out, that designing cooperative learning activities "requires a significant amount of planning and monitoring effort since the act of creating a common space assures neither communication nor collaboration." In this sense, Johnson & Johnson (2009) provide detailed guidelines for organizing collaborative learning, with 4 significant points:

1. Making preinstructional decisions: formulate both academic and social skills objectives, decide on the size of groups, choose a method for assigning students to groups, decide which roles to assign group members, arrange the room, and arrange the materials students need to complete the assignment.
2. Explaining the instructional task and cooperative structure: Teachers explain the academic assignment, explain the criteria for success, individual responsibility, etc.
3. Monitoring students' learning and intervening to provide assistance: monitoring each group, teacher interaction, monitoring the learning groups, etc.
4. Assessing students' learning: evaluate the quality of student achievement, plan for improvement, student satisfaction with the group's work, group celebrations…

This decision-making process makes it clear that the scenarios for cooperative learning are designed and developed by teachers in the context of didactic curriculum planning in accordance with their educational concepts, their knowledge regarding this type of methodology, the technology they have access to, and the options for carrying out such activities available to them at their schools (depending on infrastructure, work culture, relationships with colleagues…).

In this sense, we wanted to study the methodological value which teachers see in collaborative work, and to learn about the ICT strategies, resources and tools that they use in their professional activities. Our view is that the methodological value they ascribe to collaborative learning will be conditioned by the attribution of improvements in the learning processes of their students and their learning outcomes, as well as by the possibilities for evaluating the skills and knowledge acquired by the students. At the same time, the worth of this methodology will be equally determined by recognition of its influence on their own professional development. The use of ICT strategies, resources and tools will be determined not only by classroom and school infrastructures, but also by the conceptions of the teachers regarding this type of method. These are the aspects considered in this study.

3. Methodology

The objective of the study we carried out was to analyse how teachers of Spanish primary (third cycle) and secondary levels of education conceptualize collaborative learning and the use of ICT strategies and tools for collaborative learning in a context of schools with adequate technology available for use.

Our beginning hypothesis is that the methodological value conceded to collaborative learning (CL) by teachers, and the use of tools for CL is conditioned by the following variables:

- CL influence on student achievement
- Evaluating students with CL
- Value of CL for teacher professional development
- Level of knowledge concerning ICT resources and tools

The study population was defined as the 5th and 6th grade primary teachers, along with secondary teachers at schools that have received ICT accreditation (level 4 and 5) from the *Junta of Castilla y León*, which signifies having a well-developed technological infrastructure at the school. The number of schools currently holding this accreditation is 148. All teachers in the study population were required to provide data. The answers obtained determine the size of the sample: 185 teachers.

Variable measurement was carried out using our own survey containing 53 items, using a Likert answer format, and containing five assessment categories (from 1 to 5). The survey begins with 6 questions for teacher response regarding what we call "classification variables". The 53 items on the survey, subjected to dimensionality studies through factorial analysis, generated six factors or dimensions, each one with a different number of items and which determined the "study variables". Survey content validity was considered achieved through acceptance of the items as adequate to the domain reference as per the opinions provided to us by experts in different stages of the study. The Cronbach α reliability coefficient is .86.

Thus, the variables we will consider in presenting this study are the following:

1. As "classification variables" with respect to teachers, we considered: gender, position at the school, grade level they teach, years of experience, type of school where they work, and geographical setting of the school. The categories contemplated for each variable are presented in Table 1.
2. As "study variables" we considered:
   a. Variables treated as dependent
      i. The methodological value ascribed by teachers to collaborative learning (CL). Our intent was to determine the opinions of teachers with respect to the value they assigned to CL as a support for classroom activity. This variable was measured through a subset of 14 items on the survey, in Likert format with five categories for answering. The Cronbach α reliability coefficient was .88. The range variable was from 14 to 70 points, and we called it "the Methodological Value of CL".
      ii. The use of ICT resources and tools for CL. This variable was configured through answers to 11 dichotomous items for which teachers state whether or not they normally uses different resources and tools with activities related to CL. The range variable was from 0to 11 points, which we called "Use of CL Tools. From this tally, we created a new variable which we called "Categorized Use" which establishes two categories for teachers: those who use ICT tools for CL and those who do not. This new variable will be called "condition variable" on the graphic analysis with ROC curves.
   b. Variables treated as predictors
      i. CL and student achievement. The opinions of teachers were analysed with respect to the influence of CL on student achievement. This variable was measured through a subset of 8 items on the survey. The

Cronbach α reliability coefficient was .87.   The range variable was from 8 to 40 points. This variable is called "Achievement with CL".

    ii. Evaluating students with CL.   Through studying this variable, we wished to learn about the opinions of teachers regarding the value they ascribe to CL for evaluating student success. This variable was measured through a subset of 4 items on the survey. The Cronbach α reliability coefficient was .57 which may be considered adequate for such a small subset of items. The range variable was from 4 to 20 points.   We named this variable "Evaluating Students with CL".

    iii. CL and teacher professional development. Our intent was to learn how teachers rate CL as a strategy for professional training and development. This variable was measured through a subset of 4 items on the survey.   The Cronbach α reliability coefficient for this application was .88.   The range variable was from 4 to 20 points, and we called this variable "Professional Development".

    iv. Teacher competence regarding ICT tools for CL. Teachers rated, on a scale of one to five points, their knowledge regarding 12 different tools for CL. The range variable was from 12 to 60 points and we named this variable "Competence Regarding Tools for CL".

Data analysis was carried out specifically according to the following:

1. Descriptive analysis, which will provide information about the resulting average values for the study variables under consideration for the entire sample of teachers and for each one of the subsets that were generated for the classification variables (Table 1). Comments were added to the comparative references among the averages for the subsamples of predictive variables.

2. Inferential analysis(comparative) of the dependent variable "The Methodological Value of CL" among the different subsamples of the classification variables.

3. Statistical-graphic analysis using ROC curves for the differences in some study variables with respect to the condition variable "Use of ICT Tools for CL category", with two groups generated: teachers who "use ICT" and teachers who "do not use ICT".

4. In the same way, as a novelty in methodological treatment, we examined how the ROC areas under the curve provide us with results that are similar to those found in non-parametric treatment of the study differences (Mann-Whitney and Wilcoxon significance tests).

4. Data analysis

4.1 Descriptive analysis

Table 1 shows the averages for the variables analysed for each one of the subsamples. Since each subsample was composed of a different number of items, it seemed appropriate to change the scores to a 1 to 5 point scale, except for the variable "use of CL tools", so that it would be easier to compare both the direct and the average scores. Generally speaking, the averages may be considered high. The highest was associated with the possibilities of teachers' recognizing CL as a training strategy linked to professional development. The lowest values were associated with the low value of CL for evaluation, and, above all, with the low competence concerning ICT tools, which suggests the need to design support training strategies for teachers in this sense. As far as the use of CL resources and tools, a variable which keeps its 0 to 11 scale, and which alludes to the number of resources used, it may be

observed that teachers use an average of 2 resources/tools in their classroom activities, even though the number of who do not use any accounts for almost 50% of teachers.

Variables	Entire Sample	Classification Variables					
		Gender		Position at the School		Grade Level	
		Male	Female	Headmaster	Teacher	Primary	Secondary
DEPENDENT VARIABLES							
Methodological Value of CL	3.85	3.77	3.89	3.91	3.83	3.88	3.76
Use of CL Resources	2.00	2.37	1.81	2.00	2.01	2.06	1.84
PREDICTIVE VARIABLES							
Evaluating Students with CL	3.36	3.43	3.33	3.61	3.28	3.37	3.34
Student Achievement with CL	3.84	3.76	3.89	3.89	3.82	3.84	3.83
Professional Development	4.21	4.15	4.25	4.27	4.20	4.20	4.26
Competence regarding ICT tools	2.98	3.02	2.96	2.81	3.03	2.88	3.29
Size of the subsample	185	65	120	44	141	140	45

Table 1. Averages for Variables Analysed for Each One of the Subsamples[1]

Variables	Independent or Classification Variables							
	Teaching Experience			Type of School*			Setting	
	- 10 years	10- 20 years	+ 20 years	CRA	CEIP	IES	Rural	Urban
DEPENDENT VARIABLES								
Methodological Value of CL	3.79	3.97	3.82	4.01	3.84	3.70	3.87	3.83
Use of CL Tools	2.18	2.11	1.83	2.14	2.06	1.74	2.19	1.78
PREDICTIVE VARIABLES								
Evaluating Students with CL	3.29	3.46	3.35	3.36	3.37	3.34	3.44	3.27
Student Achievement with CL	3.79	3.4	3.82	3.4	3.83	3.78	3.86	3.81
Professional Development	4.19	4.19	4.24	4.29	4.17	4.23	4.26	4.16
Competence regarding ICT tools	2.70	2.74	3.30	2.52	3.04	3.30	2.84	3.16
Size of the Subsample	56	46	83	42	100	43	102	83

Table 1. Averages for Variables Analysed for Each One of the Subsamples (continuation)[2]

[1] The scale for measuring variables ranges from 1 to 5, except for the variable "Use of CL Tools", which ranges from 1 to 11.

With respect to the analysis of differences in the predictive variables among classification variable subsamples, we found the following data:

1. Gender: There was no significant difference between men and women with respect to the variables that were analysed.
2. Position at the School: We found significant differences at α=0.01 for the variable "Evaluating Students with CL", giving a value of t=3.21 and an associated value of p= 0.002 (greater use by headmasters).
3. Grade Level: Significant differences for the variable "Competence regarding ICT Tools for CL", giving a value t=2.83 with an associated value of p=0.005 (in favour of secondary school teachers).
4. Teaching Experience: significant differences for the variable "Competence regarding ICT Tools" with a value of F= 11.67 with an associated value of p=0.000 (in favour of teachers with more teaching experience).
5. Type of School: significant differences for the variable "Competence regarding LC Tools" with a value of F= 3.70 and an associated value of p=0.027. The significant differences were found between the secondary schools and the clustered rural schools, on the one hand, and between the schools with pre-school and primary classes and the clustered rural schools on the other.
6. Setting: significant differences for the variable "Competence regarding CL Tools" with a value of t= 2.53 and an associated value of p=0.012 (highest level found in the urban setting).

4.2 Inferential Analysis

With respect to the dependent variable "Methodological Value of CL", inferential analysis with regard to the subsamples generated by the classification variables produced the results shown below in Table 2.

Subsamples	Categories	Averages	Statistical Contrast Value	Probability
Gender	Male	3,77	t = -1.39	p = 0.165
	Female	3,89		
Position at the School	Headmaster	3,91	t = 0.82	p = 0.411
	Teacher	3.83		
Grade Level Taught	Primary	3.88	t = 1.34	p = 0.193
	Secondary	3.76		
Teaching Experience	< 10 years	3.79	F = 1.82	p = 0.164
	10-20 years	3.97		
	> 20 years	3.82		
Type of School	CRA	4.01	F = 3.70	p = 0.027*
	CEIP	3.84		
	IES	3.70		
Setting	Rural	3.87	t = 0.51	p = 0.611
	Urban	3.83		

* Significant difference for a significance level of α = 0.05

Table 2. Comparative (Inferential) Analysis among the Categories of the Subsamples with Respect to the Variable "Methodological Value of CL"

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[2] Type of School: CRA = Clustered Rural School; CEIP = School with Pre-school and Primary Classes; IES = Secondary School.

Upon looking at Table 2, we notice that there were no significant differences for the variable "Methodological Value of CL" among the subsample categories for the classification variables we studied, except for the variable "Type of School", where there was a significant difference when comparing the averages at the clustered rural schools with the averages at the secondary schools, so that teachers at clustered rural schools (CRA) appear to more highly value collaborative learning for student achievement.

4.3 Studying the use of resources and tools for collaborative learning. A comparative analysis using ROC curves

In order to study the "Use of Resources and Tools for CL" the variable was dichotomized into two categories: "Use" and "No Use". The data for each one of these categories of the variable is presented in Table 3. We notice that 88 teachers do not use any resource or tool for collaborative learning that implies the use of ICT for the objective, while 97 teachers do use some resources. We then looked at the influence of the rest of the variables that were analysed (predictive) in this regard. We can see that among the categories of the variable "Use of Resources for CL" there is significant differences for all the predictive variables: "Methodological Value of CL", "Evaluating Students with CL", "Achievement with CL", and "Professional Development". We will use the ROC curves to graphically represent the differences in the variables analysed among the different subsamples, a topic we have worked with in other studies (García-Valcárcel and Tejedor, 2011a and 2011b). We will use the dichotomized "Use of Resources for CL" as the classification variable or condition variable.

Predictive Variables	Classification Variable		Differences	
	Use of resources for CL		t Value	p
	No use	Use		
Methodological Value of CL	3.71	3.97	-3.28	0.001**
Evaluating Students with CL	3.21	3.49	-3.33	0.001**
Student Achievement with CL	3.65	4.00	-4.15	0.000**
Professional Development	4.02	4.39	-3.98	0.000**
Size of the Subsample	88	97	-	-

** Significant difference for α=0.01

Table3. Differences in averages for the variables of the subsamples for the variable "Use of Tools for CL"

We will present the ROC curves for the variables cited in relation to the condition variable. Using the results that our analysis of these ROC curves, we will analyse, as an example, for only one variable "Methodological Use of CL", its similarity to the Mann-Whitney non parametric U statistic and the Wilcoxon non parametric W statistic.

In Table 4 we present a summary of cases for category 1 for the classification variable "Teachers Who Use CL Resources and Tools". In graph 1, we show the ROC curves for the four variables that make up the legend on the graph. In Table 5, we provide the values for the "areas under the curves" (AUC values) with an indication of their typical errors, signification values, and the limits of the associated intervals.

Use of Tools for CL	Num. valid
Positive (a)	97
Negative	88

(a) The real positive condition is « Use »

Table 4. A Summary of the Processing of Cases
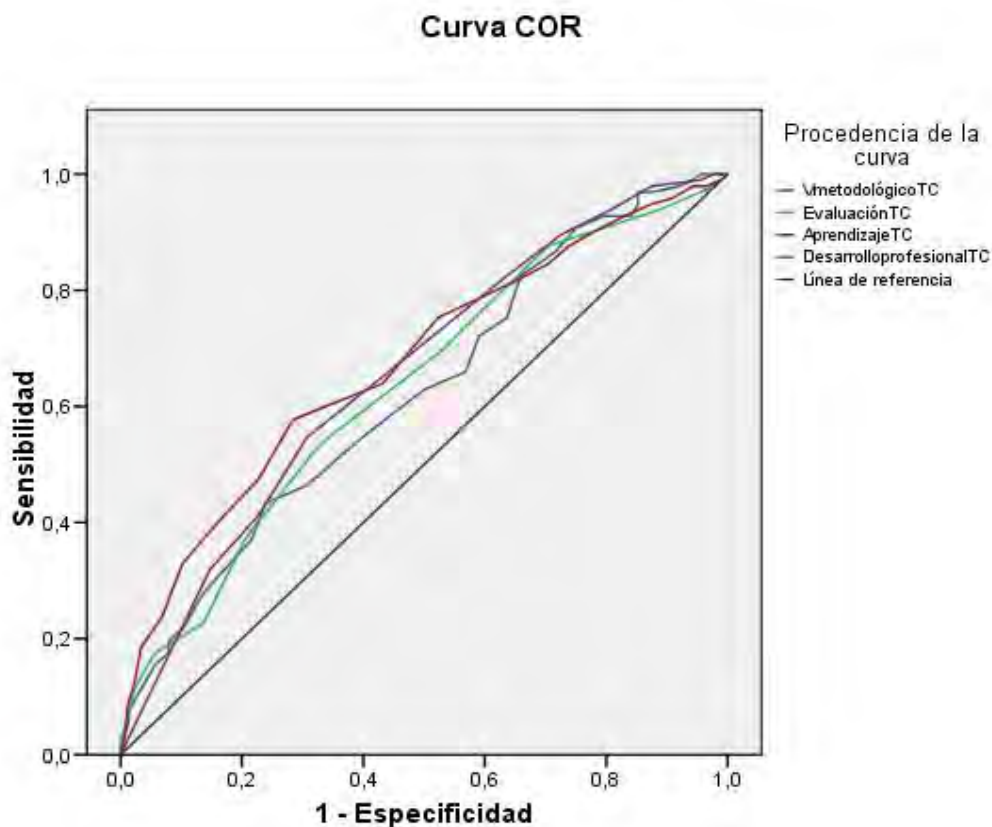
Graph 1. ROC Curves for the Variables Considered

Contrast Variables	Area	Typical Error	Asymptotic Significance	Asymptotic Confidence Interval of 95%	
				Lower Limit	Upper Limit
Methodological Value of CL	0.623	0.041	0.004	0.543	0.703
Evaluating Students with CL	0.635	0.041	0.002	0.555	0.715
Student Achievement with CL	0.674	0.041	0.000	0.597	0.751
Professional Development	0.657	0.041	0.000	0.578	0.735

Table 5. Area Under the Curves for the Variables Considered

We observe that:

- All the curves in Graph 1 are above the diagonal, which indicates to us that the mean values for the group of teachers who use ICT resources and tools for developing CL tasks are higher than those for the group who do not use these resources. We would say, therefore, that the teachers who carry out collaborative class activities with their students assign greater didactic value to collaborative learning methods than do their colleagues who don't, and they believe that student evaluation through these

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techniques is practicable, that CL may potentiate learning and be a positive factor in their own professional training and development.

- All areas in Table 5 were greater than 0.50; the probability values associated with all areas were significantly lower than 0.05. We can see that these were the same significant differences that we pointed out earlier when commenting on the comparative data among subsamples (Table 3). We can deduce this, as well, from the fact that the reliability intervals for the variables do not include the value 0.50, which indicates to us that the difference is significant.

5. Discussion

From a methods point of view, it is interesting to observe that the value of the "area under the curve" (AUC value) was equivalent to the Mann-Whitney test (nonparametric test applied to two independent samples whose data are measured to, at least, an ordinal measurement level); we can say, if one prefers, that it is equivalent to the Mann-Whitney U statistic. The equivalence between both statistics is established using the following equation:

$$AUC = U/(n_1 . n_2)$$

where AUC = value under the ROC curve
U = value of the Mann-Whitney statistic
n_1, n_2 = number of subjects belonging to each one of the subgroups of the classification variable

The AUC value is also the same as the Wilcoxon signed rank test, given the equivalency that exists between the statistics for this test (W) and the Mann-Whitney U statistic. Though we normally use the U statistic for independent samples and the W for related samples, it is possible to obtain and interpret the W value also for independent samples (when the SPSS program calculates U it offers the W value, as well). The equivalence between these two statistics is established using the following equation:

$$W = \frac{n_a (n_a + 1)}{2} + U$$

n_a being the size of the group which corresponds to the lower average of ranges.

Having established the relationship between the U and W values, we can now relate the W value to the AUC value:

$$AUC = \frac{U}{n_1 . n_2} = \frac{W - \{n_a (n_a + 1)/2\}}{n_1 . n_2}$$

As an example, we check these relationships for one of the variables considered: "Methodological Value of CL". The resulting U and W values are presented in Table 6:

	Categorized Use	N	Average Range	Sum of Ranges
Methodological Value of CL	No use	88	81.04	7,131.50
	Use	97	103.85	10,073.50
	Total	185		

	Methodological Value of CL
Mann-Whitney U	3215.50
Wilcoxon W	7131.50
Z	-2.897
Asymptotic Significance (Bilateral)	.004

Table 6. U and W Values

We now calculate AUC values based on the data in Table 6 for the variable under consideration. We apply the formulas given in the equivalencies presented:

$U = 3215.5$; $n_1 = 97$; $n_2 = 88$

AUC$= U / (n_1 . n_2) = 3215.5/(97 \times 88) = 0.377$

The AUC value corresponds to subgroup 2 for the classification variable. Therefore, the AUC value for subgroup 1 will be: $AUC_1 = 1- AUC_2 = 1- 0.377 = 0.623$, the value that appears in Table5.

With respect to the Wilcoxon W, we have:

$W= 7131.50$; $n_1= 97$; $n_2 = n_a = 88$ (n associated to the group with the lowest average of ranges)

$AUC_2 = [U- \{n_a (n_a + 1)/2\}] / (n_1 n_2) = [7131.50 – \{88 \times 89/2\}] / (97 \times 88) = 0.377$

$AUC_{1 = 1} – AUC_2 = 1- 0.377 = 0.623$.

We have been able to verify the equivalence between the AUC (area under the curve) values, the Mann-Whitney U, and the Wilcoxon W.

The paper we have presented clearly indicates that teachers working with students in the last cycle of primary schools and those teaching in high schools,in both cases where there is sufficient technological equipment available, hold a very positive view of collaborative learning methods and their impact on student achievement. We also see that they ascribe great potential to this type of activity for their own professional continued training and development. In spite of these expectations, teachers realize that their competence level regarding ICT tools is not very high with when it comes to applying these techniques. The average number of resources used is at around 2, and we must bear in mind that 50% of teachers use none of these resources.

In this sense, it is once again clear that teachers' conceptions challenge their own practices, showing a certain incoherence which might be explained by a lack of training in strategies and tools for collaborative learning, as well as by current teaching practices that are excessively traditional and centred on teacher, themselves, and on the use of textbooks, even when teachers have access to new technological resources that make learning possible through other practices and techniques.

On the other hand, based on a comparison among the subsamples, we find slight differences with regard to gender, position at the school, grade level taught, type of school, or school setting, though a higher level of technological competence may be found among secondary school teachers who have more experience and who teach in an urban setting. For the rest of the variables considered, teachers hold similar opinions. We do point out, however, the paradoxes found in the sense that it is the primary school teachers who, while less knowledgeable with regard to ICT tools, use more CL resources and tools than do secondary teachers. This indicates that this issue might be more related to the methodological techniques appropriate for each grade level than to the level of knowledge of teachers, and might lead us to rethink training strategies based on basic competence with tools in order to propose teacher training that is centred on an analysis of teaching methods and a contemplation of coherence among concepts (values) and practices.

The second paradox revolves around the fact that younger teachers were less knowledgeable about ICT tools, even though they used more strategies and tools for CL, a finding that is contradictory to the results of other studies previously carried out by us and other authors (…..), which have shown greater knowledge among younger teachers in relation to technological resources.

6. Conclusions

Teachers of primary schools and high schools ascribe great potential to collaborative learning methods and their impact on student achievement, however they realize that their competence level regarding ICT tools is not very high with when it comes to applying these techniques.

Teachers who are engaged in the use ICT resources and tools for CL assign a higher value to collaborative learning, its usefulness for student evaluation and achievement, and for their own professional development.

As far as the use of the ROC curves as a technique for analysing data, we emphasize its value for representing differences among variables and its equivalency with other better-known nonparametric statistical techniques.

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Integrating technology and teaching with Learning Solutions

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Abstract
Innovating teaching using technology involves a renewal of the ways to use and produce knowledge. Innovative advantage of technology highlights the need for institutional, organization and educational changes. This view is the counterpart of to the use of technology to reproduce traditional teaching practices. Based on these premises, the main themes of the paper will be three: a) the effectiveness of technologies in relation to teaching and learning; b) a factual ground in which to innovate teaching; c) the integration of technologies in teaching with Learning Solutions Approach (LSA). The background of this approach is an Italian project named "Scuol@ Digitale–Cl@sse 2.0" (Digital School–Class 2.0). The Autonomous Province of Trento started, in the school year 2010-11, a research-intervention aimed to apply the national project at a local level. It covers a three years period. Teachers work following the LSA. They applied it to reading comprehension and maths.

Keywords
Teaching, Technology, Learning solution, Contents, Effectiveness

1. Introduction

In Italy the Ministry of Education launched in 2007 a National Plan for Digital Schools to mainstream ICT in Italian classrooms and use technology as lever for innovating education and promoting to new teaching practices, new models of school organisation, new products and tools to support teachers (Avvisati et. al, 2013). The national plan includes a measure named "Scuol@ Digitale – Cl@sse 2.0" (Digital School – Class 2.0) (MIUR, 2009)[1]. The aim of the initiative is to encourage schools to set up innovative "learning environments" oriented to individualization and personalization, formal and in-formal learning mediated by digital content and teaching based technology methods.

The Autonomous Province of Trento started in 2010 a research-intervention to implement Class 2.0 in two primary schools. The research covers a three years long period: from third to fifth grade. The local version of Class 2.0 has been a factual ground in which to innovate teaching trough technology. This project has reached this goal thanks to the integration of technologies in teaching with *Learning Solutions Approach* (LSA) (Gentile, et. al, 2012).

The introduction in Italian classroom of computers, video-projectors and IWB does not employ, finally, the achievement of an educational innovation. In this regard, we should ask what educational innovation mean? What kind of factors are involved in schools technological innovation? When technologies are helpful for learning? On which educational principles or models can we integrate technology into teaching? The main goal of this paper is to discuss these matters. This paper is organized around three main topics: a) the effectiveness of technologies in relation to innovation of teaching practices; b) a factual ground based on Class 2.0 whereby innovating teaching; c) the integration of technologies in teaching with LSA. After this deepening, we describe the design of local version of Class 2.0 and its core features. We conclude the article with some recommendations on how to integrate technology in teaching and evaluate their impact at school, teacher and student level.

2. Innovating teaching with technology: what works

In some countries, although laptops and video projectors have replaced blackboards and chalk, most of the students continue to experience the role of "receptors of information" rather than problem solvers, information producers, makers, researchers (Fullan, 2011).

According to the Centre for Educational Research and Innovation promoting full innovation, is an activity that involves a strong commitment and the need to manage multiple resistances (OECD/CERI, 2009; 2011). Following the findings of an European project named Creative Classrooms, we define educational innovation as all those products, processes, strategies and approaches that significantly improve the state of things becoming a point of reference for a community, a system, a country (Kampylis et. al, 2012).

Technologies can offer new learning opportunities but also develop a huge set of obstacles. Around technologies tend to materialize problems of different nature. There are concerns about lesson and classroom management, teacher behaviour and actual effectiveness of technologies.

1. *Technologies and classroom management*. A study on the use of IWB in the classroom it has been observed that the teacher-pupil interaction was mainly based on questions put to students (Smith et. Al., 2005).This trend absorbed a considerable part of the total lesson time. On the other hand it was seen that the IWB can play a role in encouraging greater attention, concentration and motivation to learn (Wall et. Al., 2005).

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[1] An introduction to "Scuol@ Digitale – Cl@sse 2.0" is available here: http://www.scuola-digitale.it/classi-2-0/il-progetto/introduzione-2/

2. *Technologies and teacher behaviour.* In using technologies such as desktop, video-projectors and IWB, the teachers' ways of standing at the front of the students was frequently observed (Maor, 2003). This trend can be restrained if the teachers move from an interaction centered on the teacher-student relationship to one that promotes student-student relationship (Latane, 2002). When IWB, is used as a static technology, it does not cause significant changes in teaching practices (Beauchamp, 2004). The only use of IWB does not affect the improvement of different teaching.

3. *Technologies and learning.* We cannot conclude that there is a direct relationship between technology and learning outcomes. The evidences are inconsistent. Studies show, for example, that is not the technology to make a difference but the teaching methods. The learning outcomes are influenced by technologies that help teachers to achieve distinctive aims, especially thanks to the interactive nature of technologies, and when technologies are easily linked with tasks that emphasize metacognitive thinking (Hattie, 2009).

Like any other educational innovations, the effective use of technology may depend largely on the human and financial resources invested supporting teachers (Zevenbergen & Lerman, 2008). Despite this, technologies are used effectively when integrated with a variety of teaching strategies and used as learning tools. More precisely (Hattie, 2009):

- when they offer different ways of knowledge access and provide the opportunity of a personal control on learning;
- when they push the peer interaction and support teachers to assess learning in a formative way.

In other words, technologies may affect teaching and learning, especially when they are e focused on the students and change teaching processes.

3. How students learn

On a more strictly pedagogical ground a good starting point may be the *How People Learn* (HPL) framework (Donovan & Bransford, 2005; Lopez, 2010). The HPL suggests to focus teaching on pupils' learning process. In this picture teaching can become, essentially, a decision-making activity: "what tasks do I organize for my students so that they can get an idea, gather knowledge or skill, develop a competence, etc." Our hypothesis is that the principles of the HPL may provide a general framework for the use of technology as learning tool (Gentile, 2012b). Below we report a brief summary of each principle associated to its educational implications.

- *Principle 1*: People learn better when knowledge arises from what they already know. The principle involves the ability of teachers to coach, explore, discuss what students know or think to know about a topic.
- *Principle 2*: People learn better when they have the chance to cooperate with others. Examples of cooperative tasks: writing questions, reflecting on what content has been learned and how the content has been learned. The principle involves the use of discussion, exchange of material and roles, reciprocal help, etc.
- *Principle 3*: People learn better when teaching and schooling practices are responsive to cognitive needs and learning styles of the students. The principle involves the use of different ways to describe and represent information.
- *Principle 4*: People learn better if what they learn is a core knowledge in the curriculum. That knowledge should be essential and well-connected to a general concept, based on evidences that show the practical application of the concept in many

situations. The principle involves the design of cognitive tools to make easier the organization, retrieval and application of knowledge.

- *Principle 5*: People learn better when they have the opportunity to receive feedback and to check out learning. The principle involves the ability to provide regular feedback and to create opportunities for systematic assessment and self-assessment.

Briefly, technologies combined with a clear idea of how it is supposed that students learn, may be a relevant educational resource. On these premises, we have developed a research-intervention project focused to the integration of technology in teaching with the LSA. In the next two sections, we will present the core features both of the LSA as well of the research-intervention project.

4. The Learning Solutions Approach

The LSA implies the design of learning activity intentionally focused on cognitive goals aligned to the national curriculum. In LSA activity (LSAA) students recall knowledge, interact with a software, carry out paper and pencil tasks (writing, reading, calculate), cooperate with classmates, reflect on how and what they learn. In this context, technology is one of the tools of learning mediation, not the only one.

A LSAA last from a minimum of 2:30 hours to a maximum of 4. Usually a LSSA is divided in three parts. The first one features an arrangements of activity steps. The second part is about tasks and interaction with technologies. The third one is mainly focused on assessment and feedback. A LSAA has five components (Figure 1).
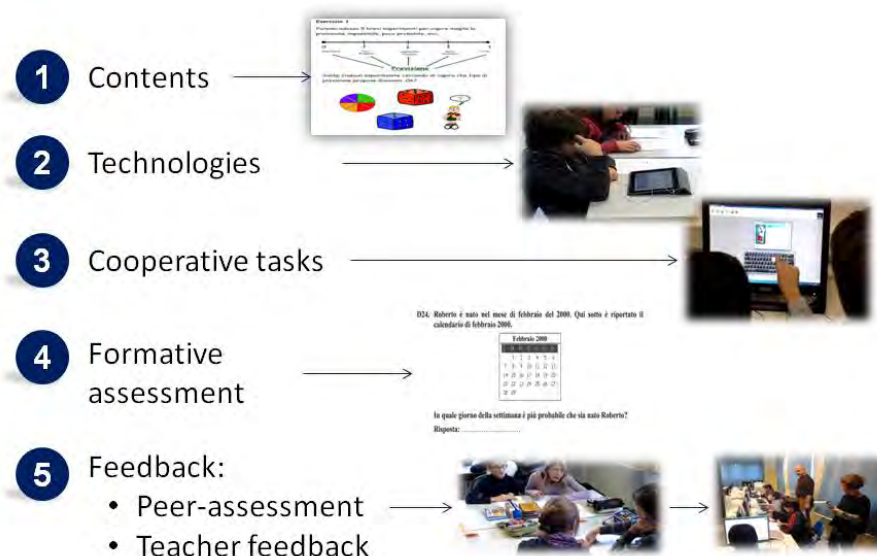

Figure 1. Five parts of a LSAA

1. *Contents.* Contents are the learning goal aligned to national curriculum and topics on which students work. A learning goal is a statement of what students will learn or will be able to do. It is what we expect that students learn as well is reported in national curriculum. From a cognitive point of view, a learning goal is a cognitive process underlying the development of a competence. We have focused the project on two main competences: reading-comprehension and math. The reading-comprehension competence are based on two contents: narrative and informative texts; reading comprehension skills. The mathematical competence consists, on one hand, of

contents aligned to the national curriculum (number, space and figures, data and predictions, relations and functions), and the other, of eight cognitive processes (knowing, solving, applying, etc.).

2. *Technologies*. A variety of devices and software have been integrated in reading-comprehension and math teaching.
   a. As hardware devices teachers have used every desktop PC available in computer classroom, a limited number of laptops for their flexible use in classroom, and an even smaller number of tablet-pc and the IWB installed in all the classrooms, network connections.
   b. The LSAA have been based on different types of software: a. educational applications to teach specific knowledge and skills; b. software to construct and manage digital materials. For example, to teach "grammar", we used the software "Coerenza" (grammar consistency)[2]. To teach the "mental calculation" we have proposed a game produced by IPRASE titled "Il lupo e la lepre" ("The wolf and the hare")[3]. To create digital materials we have used various applications: HotPotatoes[4] and QuestBase[5] for off-line and on-line assessments; Didapages[6] to write an e-Book on data representation; NoteBook[7] to make interactive pages to teach the concept of prediction in math and inferences in reading-comprehension.
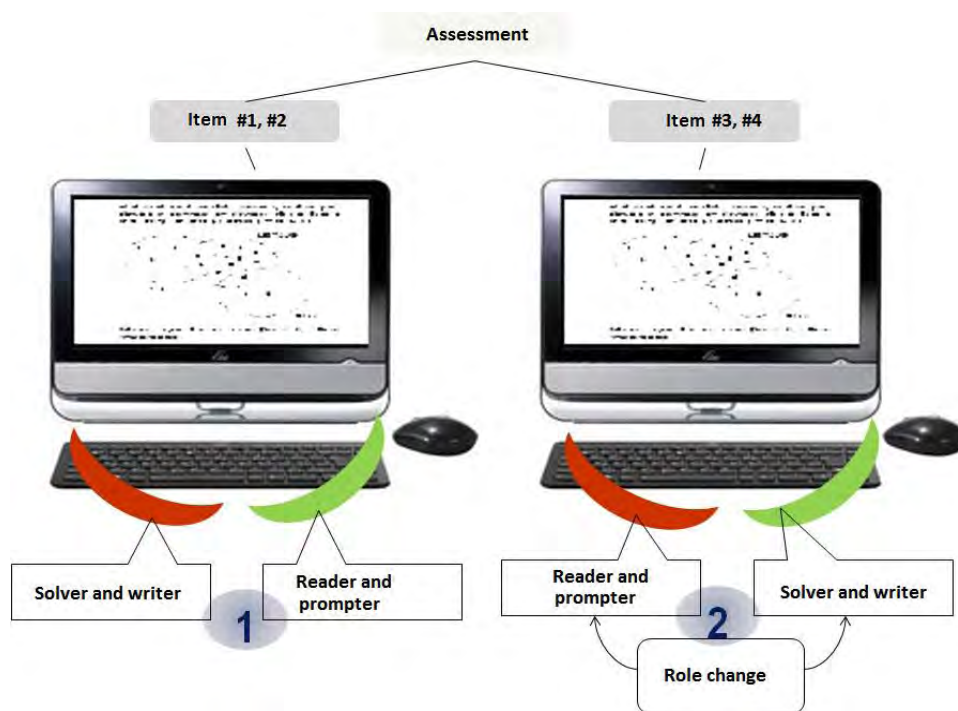
Figure 2. Structure of a cooperative task: assigned roles during a web-based exercise

[2] To download "Coerenza" go here: http://www.ivana.it/
[3] To download "Il lupo e la lepre" go here:
http://try.iprase.tn.it/prodotti/software_didattico/giochi/matematica/gioco.asp?id=682
[4] To download "HotPotatoes" go here: http://hotpot.uvic.ca/
[5] To use "QuestBase" go here: http://www.questbase.com/product/
[6] To download Didapages go here: http://www.didapages.com/
[7] To see example og digital material built with NoteBook go here: Notebook: http://exchange.smarttech.com/ # tab = 0

3. *Cooperative tasks*. A LSAA provides a variety of teaching events: individual tasks, lecture, peer interaction, assessment, etc. The peer-interaction was managed trough cooperative task (Gentile & Petracca, 2003). Generally, pupils work in pairs or grouped in four members. Figure 2 shows an example of a cooperative interaction during a mathematical task based on QuestBase.
4. *Formative assessment*. A LSAA usually ends with a formative assessment based on multiple choice, true-false, multiple true-false, open-ended short answers (Frey & Fischer, 2011). Pupils do assessment by computer. Formative assessment is carried out in two ways:
    a. in cooperative pairs after a series of tasks in order to assess understanding or skills;
    b. individually, after the conclusion of all the exercises and tasks undertaken in the classroom (Figure 3).

Whether in pairs or individually, assessment has clear purposes: collecting evidences to improve pupils' learning. Teachers look at the findings, in order to prepare feedback.
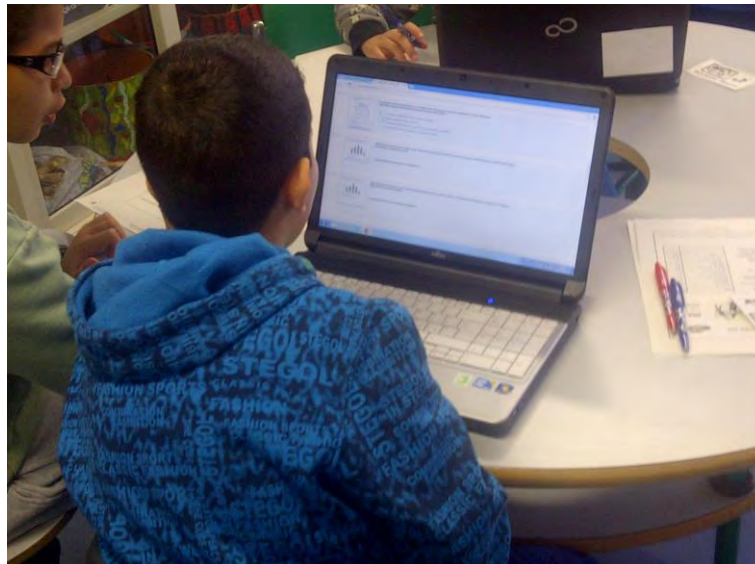
Figure 3. Session of formative assessment in pairs with QuestBase

5. *Feedback*. Feedback plays an pivotal role in the improvement of educational outcomes (Hattie, 2002). Feedback is a returning information emitted by a source to one or more recipients. In the educational field, feedback should reflect a learning opportunity. Teacher may observe three general rules providing feedback: a) saying what worked, b) saying what did not work, c) telling how to make improvements. On the basis of these indications, we have suggested to produce and provide feedback using the format shown in Figure 4.

We're good ...	**We need to improve ...**
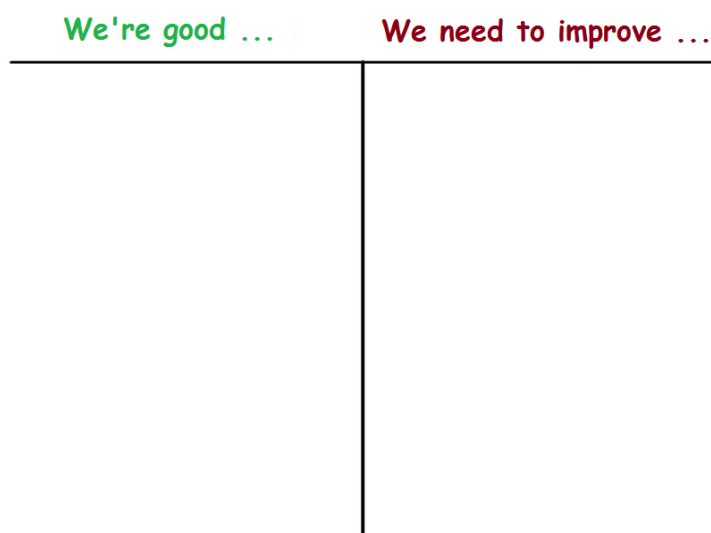
Figure 4. Feedback form used by teachers to communicate findings after assessment phase

5. A research-intervention project

The Autonomous Province of Trento has started in the 2010 a research-intervention aimed to apply Class 2.0 at the local level. The project will end in May 2013. The research is a collaboration between the Knowledge Department of the Province, two primary schools and the Provincial Institute of Educational Research and Experimentation (IPRASE). The subject-matters are Italian (reading-comprehension, narrative ad informative texts, grammar) and Mathematics (number, data display, shapes and measures, relations and functions). Teachers work in classroom following the LSA, as already mentioned (Gentile et al, 2012).

The number of classes involved is 8: 4 experimental classes (85 students) and 4 control classes (84 students). Teachers involved are 11: 3 mathematics teachers, 4 Italian teachers, 2 SEN teachers and 2 teachers from schools' information technology support staff. In one school, mathematics teacher is holding two classes; in the other school, for each class there is a dedicated teacher. In the experimental group, actual teachers are 6. The other 5 function as support resources to colleagues for: a) provision of computers and/or teaching materials, b) co-presence and/or co-management of LSAA during the implementation.

The project has an evaluative component and a pedagogical one. The evaluative component is based on two levels: student and teacher. At the student level, the measures are based on a pre-post experimental-control group design. The student level measures are:

1. outcomes on national testing regarding reading-comprehension, grammar and mathematics (INVALSI, 2012);
2. a motivational questionnaire based on *Self-determination Theory* (Ryan & Deci, 2002) concerning three motivational states (intrinsic motivation, extrinsic motivation, amotivation).

At teacher level the measures are collected through a structured non participant observation instrument. The instrument is an adaptation of an observational checklist used in previous IPRASE projects (Gentile et. al., 2012b; Pisanu & Gentile, 2010; Pisanu & Gentile, 2012). The observed variables are: teachers' physical posture during LSAA, classroom management, interpersonal styles, technology management, learning activity management. At this level, we have narrowed the observations only for the teachers that work in experimental classes.

The pedagogical component consists of three features: learning goals, coaching teachers, intervention phases. Firstly, we have aligned the learning goals of the project with the

contents and cognitive goals of the national curriculum. Secondly, for an extensive part of the project we have coached teacher before, during and after the implementation of LSAA (Gentile, 2012b). Finally, an intervention phase reflects a package of activities delivered for each one school grade. By 2010 and until the end of 2013, the work in classes has been organized in three phases. In the next sections, we will report details regarding each phase.

5.1. Phase 1

The first phase of the project was started in the 2010-11 school year. Teachers of both conditions (experimental and control) have shared a common starting point, that is the examination of INVALSI state testing results obtained at the end of second grade by project's students. Results analysis was carried out by modifying the original INVALSI report (Gentile, 2012a). The aim was to make the students' skills to improve more visible. These skills are those whose performance was positioned between level 1 (L1) and level 3 (L3), as provided in the evaluation scale developed by INVALSI.

Italian[8]	Mathematics

1. An undeviable night (Part 1)
• Contents: Narrative text
• Competence: Read, analyze and understand texts
• Task: Seek basic information
 	
2. An undeviable night (Part 2)
• Contents: Narrative text
• Competence: Read, analyze and understand texts
• Task: Seek basic information
 	
3. Nights of the pufflings
• Contents: Informative text
• Competence: Read, analyze and understand texts
• Task: Search, categorize and represent information
 	
4. The little lump of clay
• Contents: narrative text
• Competence :
  a. Read, analyze and understand texts
  b. Grammar
• Tasks:
  a. Use concordance, articles, adjectives, names
  b. Search for the implicit/explicit informations
  c. Write a simple narrative text
	1. Balance of numbers
	• Scope: Number
	• Competence: Applying typical ways of mathematical thinking
	• Tasks:
	  a. Understand the concept of equality
	  b. Mental calculation practice
	  c. Find alternative solution strategies
	
	2. I learn histograms
	• Contents: Measurement, data display
	• Competence: Applying math for quantitative processing of information (applying)
	• Tasks:
	  a. Represent quantities using bar graphs
	  b. Collect data in a problem to find a solution
	  c. Understand the main features of an histogram
	  d. Draw an histogram
	
	3. Representation of data
	• Contents: Measurement, data display
	• Competence: Applying math for quantitative processing of information)
	• Tasks:
	  a. Collect data from a text, pick them up in a table and represent them in a graph
	  b. Illustrate in a text data represented in a table
	  c. Read data represented in a table and in a graph
	
	4. Playlogic
	• Contents: Numbers, shape and measures, Relations and Functions
	• Competence: Reasoning (generalize, reflect, apply models)
	• Tasks:
	  a. Solve quickly brief math problems
	  b. Discuss solutions with group mates

Table 1. 2011-2012 school year: Titles, scope, competence and purpose of the LSAA

[8] The texts are taken from the IEA-PIRLS 2001 survey (Mullis et. al, 2003).

Italian: Reading-comprehension and grammar *The little lump of clay*	Math: Data display *I learn histograms*
1. In classroom • Introduce and explain the activity via IWB • Ask students to read individually "The Little Lump of Clay" • Group students in pair 2. In computer classroom • Ask students to complete the file card "Choose_the_word.doc" • Students in pairs exchange their cards for a peer-evaluation, doing the exercise with the "Consistenza" software, loading the option "find the word that completes the sentence" • Ask your students justify their choice with the card "What do I think about ..." • Show how to complete the exercises "sentences reorganization" with the software "HotPotatoes" • Explaining how to perform the individual test with "HotPotatoes". • Student fill in the final test.	1. In classroom • Show how to perform task via IWB • Open the e-Book "I learn histograms" clicking on index.html file • Show your students how to move from page to page • Let them retrieve prior knowledge • Give definitions of some new concepts that students will meet during the task • Group students in pair 2. In computer classroom • Prepare computers for each pair with the e-Book folder already open • Both pair members must be actively involved through a continuous sharing of ideas and solutions • Pair members change roles (player/enter & prompter/writer) after every two pages. • Pairs start the first part of e-Book and play the tasks. If pairs end within 1 hour they can go to the second part • Tell them how to carry out to the third part of e-book in which students are asked to identify different ways of data presentation • Finally, save your work in a PDF format 3. In classroom • Use IWB to discuss with pupils tasks and e-Book contents • Share their responses and reasoning
Software used: *NoteBook, HotPotatos, Consistenza*	Software used: *Didapages*

Table 2. Examples of LSAA: Steps, learning tasks, software

We tried then to create a close alignment between national curriculum learning goals and those of the project. On this basis the experimental classes work with activities, materials and software designed explicitly to improve students' skills, starting from a low level of performance. Teachers in control groups have complete autonomy in fielding appropriate activities. From this point of view, experimental teachers implement activities and educational software in the four experimental classes.

5.2. Phase 2

The 2011-12 school year has been dedicated to the development and implementation of learning activities in the experimental classes. Working sessions were a total of 4, and has been realized between February and May 2012. Both in Italian and Mathematics has been applied 4 LSAA. In Italian the activities has been focused on reading comprehension and

grammar of narrative and informative texts. In all the LSAAs grammar exercises related to the content of the texts. In maths we have covered the following topics: the concept of equality, histograms, data representation, probability.

Table 1 shows titles, contents, competence, tasks of each LSAA administered in the Phase 2. In general, the LSAA were designed taking into account the following realization timing: from a minimum of 2,5 to a maximum of 4 hours. As discussed in the previous sections, the LSAA have been designed to improve students' skills whose levels of mastery were positioned, at the end of second grade, between L1 and L3. Table 2 summarizes two examples of LSAA administered during these school year.

The first activity is devoted to reading-comprehension and grammar. Student-technology interaction has been organized around three software: NoteBook, HotPotatoes, Consistenza. Teachers support their students during classroom activity (Figures 5a, 5b, 5c, 5d).

a. NoteBook
b. Consistency
c. HotPotatoes
d. A teacher supporting pairs
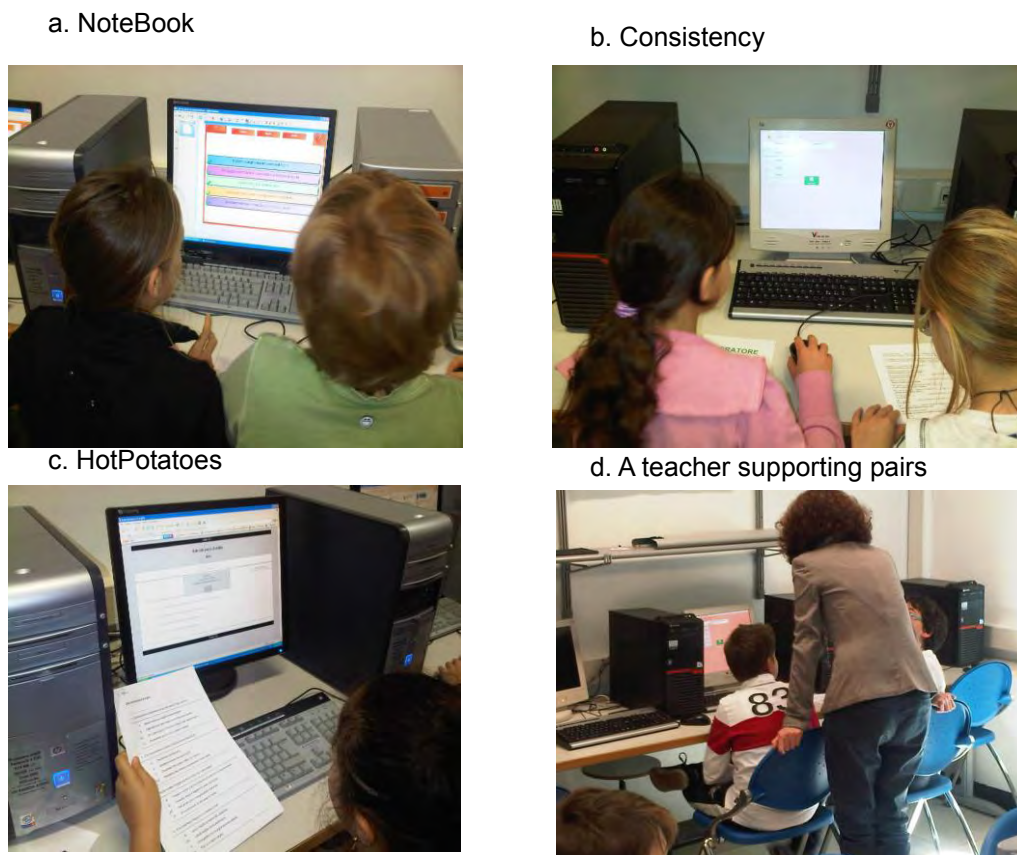
Figure 5. Software and teacher support in "Small piece of clay"

The second activity is aimed to data displaying with table and histograms[9]. The activity promotes a direct relationship between student and technology (Figure 6). Teachers support their students during the work. The software used is Didapages.

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[9] A short clip of this activity is available here: http://youtu.be/9UbTPmIfABw
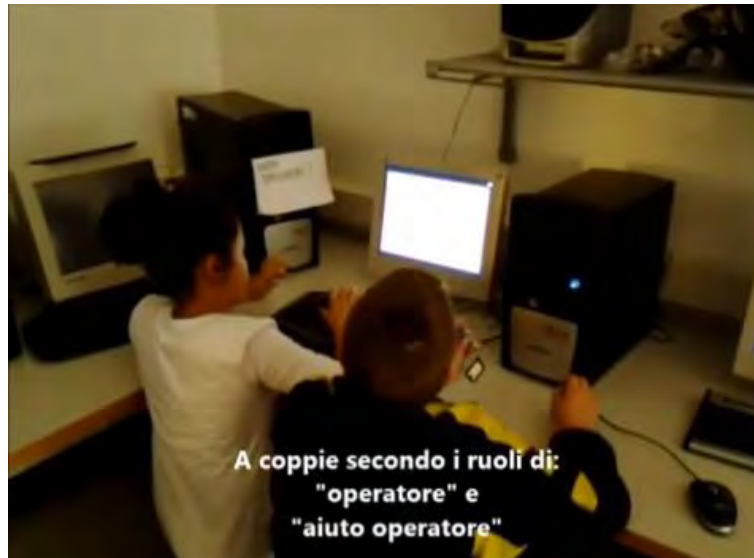
Figure 6. Work in pairs on e-Book "I learn histograms"

Figure 7. Student-technology interaction during "Mental Calculation" LSAA

5.3. Phase 3

In 2012-13, the current year of the project, development work of learning activities is still continuing along with classroom practice and teachers support. Two examples of two LSAA are shown in Table 3. In this year of the project, we have devoted a significant part of the project to the evaluation of the cognitive and motivational results achieved by pupils.

The first activity is aimed to a formative assessment of reading-comprehension skills. The student-technology interaction has been organized on QuestBase on-line software (or WinAsk, for classroom without internet connection). Also in this case teachers support pupils during their work and provides a final feedback.

The second activity is devoted to strengthen four mental calculation strategies to solve addition and subtraction. To increase pupils' involvement there has been proposed the use of an educational game developed by IPRASE named "Wolf and Hare". In this case student-technology interaction is evident throughout the first part of the activity, both in the introductory phase and later during pairs' strategies testing sessions (Figure 7).

Italian: Reading-comprehension *Think, discuss, answer*	Math: Number *Mental calculation strategies*

1. In classroom
 	
• Present the activity steps following the scheme proposed in the LSAA guide
• Group your students in four according to an academic performance criterion
• Subsequently organize each group into pairs
• If you work in the classroom you will have one notebook/tablet for each pair of students. If you work in a computer room then you will have two students per computer
 	
2. In classroom or computer room
 	
• In classroom or in computer classroom pupils work in pairs.
• On computer screen appears an online questionnaire with 15 items.
• Pairs work with the following role structure: "Player & Enter" and "Prompter & Writer". Every two items students change role to repeat the same operations
• When all the items are answered, the two pairs compare the first two items answers to the list that appears on the screen (or by the printed version of the questionnaire). If between the two pairs there is no agreement, all the students in turn explicit verbally their reasoning and exchange different points of view trying to reach an agreement
• During the peer-assessment work, teachers move between groups in order to listen to their discussions, get an idea of solution strategies, prepare a summary of what students have well done and what they need to improve
• Based on what they have collected, they then communicate a global feedback to their students, highlighting the points that they consider most important
	1. In classroom
	
	• Teachers introduce to students the concept of "tricks or strategies" to improve mental calculation effectiveness
	• Teachers present each strategy on the IWB following these steps:
	   ○ A brief introduction and demonstration of each strategy
	   ○ Worked examples shown on the IWB, with individual students' activity carried out through a dedicated paper based document to be distributed
	   ○ Recognition, with students' help, of precondition needed to use each strategy
	
	2. In classroom or computer room
	
	• In pairs short sessions of "Wolf and Hare" software game are proposed for each strategy, with two roles, "Solver" and "Recorder"
	• With the same pairs of the previous phase, students will return in the classroom, with a small group composed by two couples organization. Each pairs verify the other's strategies comprehension
	• For each calculation proposed in the document, pairs identifies a strategy and explains why they have chosen it. Every five calculations, students' roles need to change
	• Then the couples share their documents for a peer review, in which they try to confirm or not their previous choices, arguing why
	• In closing part teachers give the feedback. Comments and feedback after students' activity are based on the block of exercises and are useful to figuring out how to help pupils from a cooperative behaviors point of view and from a learning point o view

Software used: NoteBook, QuestBase, WinAsk	Software used: NoteBook, "Wolf and Hare"

Table 3. School year 2012-13. Examples of LSAA: activity steps, tasks and software used

6. Conclusions and recommendations

In this paper we have presented technologies as tools to support learning (Higgins et. al. 2005). For this reason we think it is difficult to offer teachers guidance in how to use them without a clear understanding of how pupils learn (Howland et. al., 2012). In the project we

have tried to address both issues by proposing to teach Italian and Mathematics trough the LSA. The LSA is based on HPL framework five principles, is associated to a clear and deliberate strategy to improve learning outcomes and provides a systematic support to the instructional work of teachers.

We believe that a project such as Class 2.0 might get the status of educational innovation, both at local and national level, if it will help to develop a key focus on the following points:

1. design and implementation of classroom-based solutions which help teachers to integrate technology in subject-matters learning (Archambault & Barnett, 2010);
2. encourage a flexible use of hardware and software devices and provide pupils with lots of opportunities for learning (Roblyer & Doering, 2013);
3. ensure a systematic support to teachers during the instructional work (Beglau et. al., 2011).

From our point of view, to evaluate the impact of technologies should be considered the following levels of analysis: a) technologies (devices and software); b) school (learning environments, principal leadership styles); c) teacher (digital skills, use versus integration of technologies); d) student (learning outcomes, educational outcomes). The four levels could undertaken a framework in order to collect evidences and to evaluate the impact and validity of the several teaching practices based on technologies.

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A literature review on Intelligent Tutoring Systems and on student profiling

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Abstract
Personalization represents a discussed topic among the scientific community that deals with Intelligent Tutoring Systems (ITS). To allow a meaningful personalization ITS requires good procedures to generate detailed user profiles. User profiles are built referring to different models that focus on various characteristics of the students, related to various aspects that are considered crucial during the learning process. The aim of this paper is to outline a detailed overview on the main progresses made in the field of user modeling and user profiling.

1. Introduction

Personalization represents a discussed topic among the scientific community that deals with Intelligent Tutoring Systems (ITSs). The ability of intelligent systems to adapt their environment to the needs of the students is often recalled as one of the explanations to support the implementation of ITS within learning projects.

It seems necessary to emphasize that this personalization should be meaningful to the learners. This is the reason why an ITS requires a good profiling procedure, an activity that leads to the composition of a user profile able to collect and elaborate information that are considered important for the recognition of specific needs.

User profiles are built referring to different models that focus on various characteristics of the individuals. The data considered can vary according to the particular research hypothesis, even according to the specific learning outcomes that are associated with the ITS.

The aim of this paper is to outline a detailed overview on the main progresses made in the field of user modelling and user profiling. We will take into account both the traditional approaches and the recent advantages, in order to highlight new lines of research.

2. Different types of ITS from different types of personalization procedures

Different types of ITS can be classified thanks to various characteristics. An alternative way to diversify them is to consider the various methodologies that are the basis of the personalization process.

2.1 Cognitive Tutors (CT)

The first family of ITS is that of Cognitive Tutors (CT). They derive from an approach that is grounded in a specific theoretical basis: the ACT-R theory of cognition (Adaptive Control of Thought-Rational), developed by John Anderson (Anderson, 1990; Anderson et al., 1994).

The ACT-R theory formulates a representation of human knowledge, dividing it into *declarative knowledge* and *procedural knowledge*. Declarative knowledge is a factual knowledge, involving facts, images or sounds. It is typically acquired through perception and its elements are usually considered as *chunks* of knowledge (Mitrovic et al., 2003). Procedural knowledge is goal-oriented, because it is related to the comprehension of how to do things. It is typically acquired through practice and its elements are usually conceptualized as *production rules*: they specify the plausible conditions of their application and the consequences, in terms of actions, of their application (Ritter et al., 2007).

The learning process arises from two phases. It starts accumulating declarative knowledge, while in a second phase it is converted in declarative knowledge. A complex task involves a set of cognitive skills to be resolved. Such skills can be decomposed and represented as production rules. The ability to solve a given task, therefore, lies in the control of those elements of knowledge.

CT promises personalized support while students are engaged in problem solving activities. The system observes each learner's behaviour to identify the most suitable problems to assign and the most suitable feedback to provide. They can achieve this goal using a cognitive model that represents the description of the skills and strategies, expressed as a set of production rules, required to solve a task in a particular knowledge domain. Creating such a model is a complex challenge, because it must include all the knowledge components that are considered essential within a certain domain, the analysis of human

behaviour while solving a particular problem, all the possible paths that we can follow to solve it. (Ritter et al, 2007).

A CT constantly monitors its users, collecting information about their behaviour in a profile. Then, it compares it with the elements stored in the cognitive model in order to assess if a student needs help. This process is called *model tracing*. If an inappropriate action is detected the tutor reports it to the student and gives him/her suitable hints and feedback. Another important process is that of *knowledge tracing*: each action of the student is related to one of the skills provided in the cognitive model (Aleven & Koedinger, 2002). Then, the tutor makes a prediction about the probability that this skill is correctly mastered by the learner. The tutor uses this information to propose activities and exercises that focus the attention on those skills that must be strengthened (Ritter at al., 2007).

2.2 Constraint Based Models (CBM)

The second family of ITS is usually defined Constraints Based Models (CBM). They are projected to overcome some limitations of CT.

To design cognitive models we need a long and very complex process. Referring to some particular domains, such as Human Sciences, the process can result impossible because problems can have multiple solutions and, furthermore, they can be solved following a wide variety of possible paths. Even referring to those domains, such as Mathematical Sciences, in which the process is possible, CT present a second type of problems. The main purpose of the tutor is to understand when and why a certain student makes an error. The tutor can understand it only if it is able to replicate that action, even if it is incorrect. As a consequence, it becomes essential to incorporate within its cognitive model also the so-called *buggy rules*, that are all those choices that lead to a wrong result (Mitrovic, 2012).

CBM represent a new methodology for building models, which are no longer based on production rules, but on the constraints (Ohlsson, 1992). This approach derives from a theoretical basis: the theory of learning from performance errors (Ohlsson, 1996). According to this theory, knowledge is divided into declarative knowledge and procedural knowledge, in the same way we discussed above referring to ACT-R theory. While procedural knowledge is crucial to generate actions, declarative knowledge is crucial to evaluate the consequences of our actions. Errors derive from missing or faulty procedural knowledge. Learning from errors follows two phases: *error detection* and *error correction* (Mitrovic, 2012). The ability to detect an error depends on declarative knowledge. If it presents some gaps, a certain person won't be able to detect an error individually. This means that he/she needs some help. This support can come from an intelligent tutor that needs a model no longer based on production rules, but on constraints.

Constraints are the basic principles of a domain knowledge. Once established these principles, it becomes possible to determine the correctness or incorrectness of any solution given by students. To be defined correct a solution must respect those principles. If it violates even one of them, it is incorrect (Mitrovic et al., 2003). This reasoning can be applied to any answers elaborated, regardless of the strategy used to achieve it. The solution path is not considered important even for the generation of feedback, because it is directly linked to the violated constraint.

This new type of ITS leaves much space for creativity (Mitrovic, 2012). Every solution and every strategy can be defined correct if they respect the domain constraints, even if they were not inserted into the model by designers.

2.3 Curriculum sequencing

The third family of ITS follows a different approach, usually remembered as curriculum sequencing. It aims to generate personalized learning paths adapting, in a dynamic way, the didactic content of the course according to the student's objectives, to his/her previous knowledge and to his/her success in acquiring new knowledge (Brusilovsky, 2001).

The system monitors users' behaviour in order to select the most appropriate *teaching operations* for each individual, such as different sets of materials, examples, questions or problems, in order to support the achievement of personal learning goals (Brusilovsky & Vassileva, 2003). All teaching operations are stored in a database. To select the most suitable for a certain person the system requires at least two models: a model for representing a specific domain knowledge and a model for representing the learner's current state of knowledge (Heller et al., 2006).

A theoretical support for this purpose could come from the Knowledge Space theory (Falmagne et al., 1990). It assumes that a domain knowledge can be represented as a network of concepts, that are thought as questions or problems. The knowledge state of a learner in that domain can be considered as a subset composed by all the questions that he/she is able to solve individually. The problems within a domain are linked by mutual dependencies. For this reason, not all the possible knowledge states can be plausible. The group of plausible knowledge states, referring to a certain domain, is called a knowledge space. We can also assert that a knowledge space determines the structure of prerequisites among concepts within a domain (Desmarais et al., 2006).

Comparing the three types of ITS that we are proposing, we can highlight that CT and CBM share some purposes. This is the reason why Brusilovsky unifies them into one category: *problem solving and solution analysis tutors* (Brusilovsky & Peylo, 2003). CT and CBM share the main aim to provide students with just-in-time, specific and effective feedback while they are engaged in problem solving activities. The main aim in curriculum sequencing is to elaborate an assessment of a larger set of skills in order to adapt learning content in general. Due to the number of skills to take into consideration the tutor needs a model able to establish network of skills, to make the process sustainable Desmarais & Baker, 2012).

All the traditional approaches presented are based on the idea that students profiles must deal with skills and levels of knowledge. More recent researches assume that student profiling can take into account a larger range of elements, as we will discuss in the next session.

3. New challenges for personalization

Over the past 15 years, the topic of personalization has received renewed interest from the scientific community that deals with ITS. Starting from the consideration that the learning process is affected by a whole series of factors, the fundamental question becomes whether and how these factors play a crucial role even when the process is computer-mediated.

3.1 Emotions, motivation and disengagement

Emotion, motivation and disengagement are three correlated aspects that play an important action in affecting the learning process. It is extremely important to understand how ITS can detect them and how they can provide consequent feedback. This is a very complex task, because when learning process is computer-mediated we don't have an easy access to a vast

amount of information, such us facial cues, postures or gestures, that can help us to draw a picture of a learner's current state.

Conati and Maclaren develop a method to reveal a vast range of students' emotions while they are interacting with an educational game (Conati & Maclaren, 2009). To record these emotions they use four non-intrusive biometric sensors to measure skin-conductivity, electromyography of some facial muscles, blood-volume pressure and respiration.

Mota and Picard monitor children while they are solving a task using a computer to recognize different affective states related to different levels of interest displayed (Mota & Picard, 2003). They analyse different postures that are gathered using two matrices of pressure sensors mounted on the seat and back of a chair.

Chaouachi and Frasson measure the electrical activity of the human brain (Chaouachi & Frasson, 2010). Using 8 biosensors and two video cameras, they demonstrate that different emotions affect students' performance, engagement and response time.

Forbes and Litman work with an ITS with natural language dialogues to create an automatic method to predict students' emotions (Forbes & Litman, 2004; 2006). They use as reference points acoustic and prosodic features.

D'Mello and colleagues investigate the transitions between affective states (D'Mello et al., 2007; 2008). They use videos of participants' faces and recorded interaction histories to map possible paths to identify four specific emotions: boredom, flow, confusion, and frustration.

Some of the researches presented share a possible limitation: the use of sensors. Arroyo and his team create a relatively cheaper and more comfortable suite of sensors to use at school (Arroyo et al., 2009). Conati and colleagues highlight that children who wear them do not perceive the condition as intrusive, but the issue of their possible application to a wide population remain opened (Conati & Maclaren, 2009).

The emotional state of a student is often related to his/her motivational state. De Vicente and Pain conduct an empirical study to analyse some diagnostic procedures to infer it (De Vicente & Pain, 2002). Analysing the students' interactions with an ITS for learning Japanese numbers, researches create various rules to diagnose a motivational states that are later incorporated in a model within an ITS. These rules are often related to the quality of students' performance, such as duration of the interaction, mouse movements or the order of exercises followed by an individual.

Rebolledo and colleagues add a different motivational model into an existing ITS, that is able to provide consequent scaffolding (Rebolledo et al., 2006). This model is based on three main elements: effort, independence and confidence. Some years later Rebolledo tries to create a new model where motivation is also linked to the student's level of attention (Rebolledo et al., 2010).

One of the problem in ITS is students' disengaged behaviour, often associated with negative learning outcomes. It is important for an intelligent tutor to understand what type of behaviours could imply this particular situation. Baker and colleagues study a particular attitude that can be considered interesting in this direction: gaming the system (Baker et al., 2006). They describe it as: «attempting to succeed in an educational environment by exploiting properties of the system rather than by learning the material and trying to use that knowledge to answer correctly» (Baker et al., 2006, p. 101). As they demonstrate that this attitude can negatively affect learning, they develop a method to detect this strategy and to generate the most suitable remedial. Arroyo and colleagues assert that gaming the system can also derive from a poor usage of meta-cognitive resources (Arroyo et al., 2007). For this reason, they try to create a different type of support, including the production of meta-cognitive feedback.

3.2 Meta-cognition and self-regulated learning

Meta-cognition and self-regulation are important aspects that can affect learning process. Recent researches have been demonstrating that ITS can support these factors, studying different types of features, such as self-explanation, self-assessment, planning, reflection. An open question is to establish the most effective method to measure the presence of such elements and, consequently, make the tutor able to react according to the situations identified.

Aleven and colleagues focus their attention on a particular meta-cognitive skill: help-seeking, that is the ability to ask for help and use it in an efficient way (Aleven et al., 2006; Roll et al., 2007). They noted that students often use help facilities provided by ITS with unproductive attitudes. In contrast, when students use the same hints in appropriate ways, their learning improves (Aleven & Koedinger, 2000). The aim of the project is to implement within a CT an intelligent agent, called Help Tutor, that is useful to support students to develop better help-seeking strategies, providing them feedback referring to the way they are asking and using help facilities. In order to do it, it requires a model that summarizes how a learner should act.

Shih and colleagues analyse a typical students' behaviour, that is, to avoid abstracts hints to find the most detailed and concrete hints, suitable to lead rapidly to the solution of the problems they are working on (Shih et al., 2008). Shih and colleagues aim to demonstrate that in some cases this behaviour is not unproductive, because the students look for concrete hints using them as worked examples. For this reason, they try to create a model able to distinguish bad usage from good usage, considering the time spent on each hint.

Biswas and colleagues work with an ITS that uses the learning by teaching paradigm (Biswas et al., 2010). In this environment students develop science or mathematical knowledge while they are teaching to a computer agent, called Betty. Students can benefit from meta-cognitive supports, provided using different methods to quantify and assess different patterns of students' behaviour through the analysis of their activity sequences.

Montalvo and colleagues consider an important element of self-regulated learning, that is, the ability of planning (Montalvo et al., 2010). They study a method to infer students' planning processes while they are learning with an ITS for scientific inquiry. The main aim of the researchers is to develop a model able to distinguish different planning behaviours in real-time, while users are conducting inquiries. The model manages this purpose by tracing time spent looking at data tables and hypothesis lists.

3.3 Collaborative learning

Learning contexts, even when they are computer-mediated, often offer students' the possibility to work in small groups. Group activity can positively affect learning, but individuals need support to interact effectively. An open question is to analyse how ITS can do it. Researches in this field are focused on three main lines. First, it is necessary to understand which kind of collaborative behaviours are relevant when a team is communicating through online tools. Secondly, it is essential to design a method to automatically detect and classify those behaviours (Kumar et al., 2007). Finally, it is vital to make ITS able to react in an appropriate way to each collaborative state individualised.

Prata and colleagues analyse the registrations of all the dialogues generated while elementary students are working in pairs through a collaborative interface (Prata et al., 2009). Researchers identify different categories of speech acts that could be implemented into a model to automatically divide students according to their collaboration behaviours.

Walker and colleagues attempt to automatically classify students' dialogues while they are using an ITS for peer tutoring (Walker et al., 2010). The system provides two types of feedback, a domain support and an interaction support, that is created using a model that summarizes the characteristics of good peer tutoring and compares it with the students' actions.

Vassileva and colleagues design a multi-user environment, called I-Help, able to support peer collaboration and peer tutoring (Vassileva et al., 2003). I-Help follows a particular modelling approach, based on a multi-agents structure. Information about students are collected by different agents, that are able to dialogue between them, in order to individualize the best combination of users.

4. Conclusions

Research in the field of user modeling and user profiling has been experiencing an interesting evolution. Traditional approaches are based on the conviction that students' profiles derive from the analysis of the skills and of the levels of knowledge implied in their performances. Trying to implement new procedures, researches take into account a vast range of elements, such as emotion, motivation, engagement, collaboration, factors that are considered able to affect learning processes.

ITSs, designed and tested in specific domain such as mathematics, sciences or information technologies, lean toward new applications. Their objectives are no longer limited to the acquisition of specific tasks, but broaden towards the development of more general ability such as those of peer collaboration or meta-cognition.

Following recent researches within the community that deals with ITS, we think that their application in new domains such as that of human sciences becomes a reachable destination. The attention given in this last 10 years to the issue of *ill-defined* domains (Fournier et al., 2010) seems to confirm this hypothesis.

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Can Computers Teach Students Biomedical Laboratory Technology?

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Abstract

The bachelor programme of Biomedical Laboratory Analysis includes both theoretical and practical learning arenas being an alternance study programme. The gap between the two learning arenas challenges the students in integrating skills and knowledge from one learning arena to the other. Teachers from the two arenas have collaborated in developing an internet based learning material with the aim of generating a convergent learning arena including both theoretical and practical themes. The collaboration process has been evaluated as well as the students' experience using the learning material. Both focuses are part of the present analysis and are based on the assumption that collaboration in developing learning material is made difficult by different learning understandings of the participants. The students' experience of the learning material is positive due to a larger degree of flexibility. The flexibility may as well give the students more responsibility for the learning process. Our analysis offers a possible explanation to why students may experience a smaller gap between theory and practice if the study programme includes internet based learning material developed in collaboration between representatives of the two major learning arenas.

1. Introduction

The curriculum of the biomedical laboratory technology study at VIA University College, Denmark, requires students to become acquainted with both laboratory practice in hospital laboratories and on-campus theoretical teaching. From this combination of learning locations during the three and a half years of studying follows that the students encounter very different learning situations and several different pedagogical approaches.

The study programme is divided into 14 periods of 10 weeks, 11 of which include both work practice in hospital labs and theoretical teaching at college. Three periods are exclusively theoretical and contain no practical teaching. The 11 practical teaching periods range from 3 to 8 weeks. At the hospital, qualified teachers from the laboratory function as laboratory teachers to no more than 6 students at a time. The students follow one, or in rare cases, two teachers during the time at the hospital lab. In this way a close relationship will be created between the students and the laboratory teacher, thus giving a good background for adjusting the dialogue between teachers/instructors and the individual student; and as the number of co-learners is small, the teaching level can be adapted to the level of the individual learner. In this learning arena, students meet the professional reality and see how practices are performed by qualified medical laboratory technologists. They also have the opportunity of performing some of the procedures themselves. That gives the students an important insight into what is expected from them when they enter the profession after graduation. During their time in the hospital-based learning arena, the students receive some teaching on theoretical topics in authentic workplace surroundings, and they will be dealing with the theoretical aspects of the work as they handle theory related procedures.

When the students are in the theoretical learning arena at college, the number of students in each class is between20 and 36. A typical day is divided into 4-8 lessons of 45 minutes each. Students meet 3-7 different teachers in every 10 weeks teaching period. As a result, the teachers do not know the students very well, and they are not able to adjust the dialogue according to the knowledge level of every single student.

At college, students learn the basic theory and solve tasks and problems based on theories, and teachers try to relate the theoretical work to hospital laboratories by mentioning what happens there and by asking students to share experiences from their internships in the hospital laboratories. In spite of these efforts, it is clear that students have difficulties connecting theory with practical procedures.

1.1 The history of the study programme

Historically, the biomedical laboratory technology study programme was based on an apprenticeship model until 1995. This meant that the learner spent the entire time of training in a hospital, learning the profession from experienced colleagues. The current teaching culture in the hospital laboratories is based on this tradition. Today, the periods of theoretical teaching are longer and designed to teach theory relevant for all five types of specialised laboratory departments; the theory presented in the curriculum is general for handling human samples for laboratory analysis and not specific as it is expected to be in hospital laboratory teaching.

This has led to a clash in expectations regarding qualifications of college graduates, as they are now trained to be generalists, but usually employed by specific hospital departments, where specialist competences are expected from them, which were previously taught only during the apprenticeships.

This means that students face different expectations dependent on whether they are in the theoretical arena in the college or in the hospital laboratories. This situation underlines the separation between the two teaching and learning arenas, a separation which, according to Carr (1986),has existed and will continue to exist as long as we articulate it, and as long as we draw a distinction between "theoretical issues" concerning "knowledge" and "non-theoretical issues" as practical purposes.

The challenge for the students is that they bring insight into and knowledge of both learning arenas. The students are expected to integrate theory with practice and practice with their understanding of the theoretical aspects. This integration is supposed to happen by thinking as well as by action and articulation. If they succeed in this integration, the expected knowledge, skills, and competences described in the curriculum can be obtained easily. It is well known, however, that such integration is not easy for learners to achieve, and this is one of the reasons why this project is both relevant and necessary.

1.2 Aim of the research project

This project is based on the assumption that for the biomedical laboratory technology programme, there is a separation of the learning environment into two, which are expected by everyone to be predominantly either theoretical or practical in their orientation.

The existence of these two learning arenas may add to the depth and completeness of the students' learning, but at the same time it is the cause of the existence of parallel knowledge forms and parallel understandings of subjects in the study programme and in the profession, respectively. In addition to this separation of the learning environment into a theoretical and a practical part, also different pedagogical traditions exist. This constitutes the educational framework within which the student must learn the knowledge and skills required by integrating the two dimensions with equal weight and focus.

In order to assist the integration, this project aims to create a teaching material, which integrates both practical and theoretical perspectives in order to facilitate and support this integration.

In this study we present an example of such a teaching and learning tool. The main focus, however, is on the process of developing the tool, as it included teachers from both the hospital laboratory and the theoretical learning arena (the college). Furthermore, we study the student's experience using the learning material. In addition to the challenges of combining theoretical and practical sides of the programme, there is an expectation from both society in general, the healthcare system in particular, and the students themselves that information and communication technology (ICT) plays an important part in supporting the students' learning processes.

At the Faculty of Health Sciences in VIA University College, we implement ICT in the curriculum. Students bring their own laptops to classes; and there is a well-established infrastructure with wireless internet on campus, a learning management system (LMS) for all programmes, and remote access to college resources and networks for students and staff, so there are no practical obstacles regarding the integration of ICT into the students' learning processes.

The project therefore has the following two parallel foci:
1. To evaluate the development process of an e-learning material created via collaboration between teachers from both the practical and the theoretical learning arena.
2. To evaluate the students' experiences from using the e-learning material, and their perceptions of this type of learning.

2. Theoretical framework

2.1 Practical versus Theoretical Teaching

As the educational theorist Carr (1986) describes it, it is a challenge to correlate theoretical issues to practical knowledge through a theoretical scheme, which, at the same time, is constitutive of the individual practice and the means for understanding the practices of others. This means that educational practice will be closer to the theory according to the level of systematics and coherence (Carr 1986). The two very different learning arenas in the study of biomedical laboratory science are not connected, as there are five different practical learning arenas and just one theoretical learning arena (as illustrated in figure 1 below). The five clinical disciplines have a few subject matters in common, but there are more differences than similarities between the five disciplines. This makes it difficult for teachers of theoretical teaching to relate to the clinical disciplines, a fact which results in the five being somewhat non-coherent and non-systematic. In relation to the distance between theory and practice, this situation is likely to continue as long as the five clinical disciplines are integrated in the study of biomedical laboratory science.
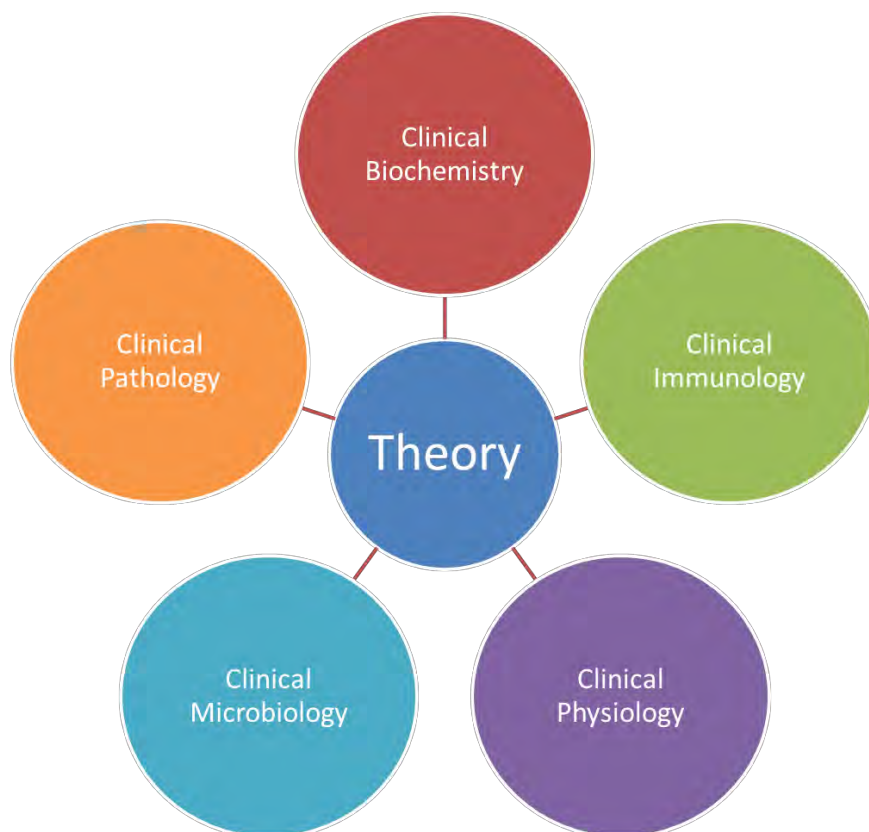
Figure 1. Five Clinical Disciplines in the Study Programme

Separating the learning environment into a theoretical and practical learning site respectively creates a risk of splitting the students' learning experiences into separate, non-combinable parts. To prevent this from happening, the strain is on the student to be able to handle the different knowledge forms from the two learning arenas. Currently this is the focus of another study at the college, which looks at whether students are capable of utilising knowledge acquired from campus-based teaching in the practical scenario at the hospital laboratory. In the study, a distinction between three types of learning outcome is used, i.e.

knowledge, skills, and competence. The preliminary results from this study show that students are primarily utilising skills and competences in their work practice in hospital labs, whereas activation of (theoretical) knowledge is markedly reduced. This is the case despite the fact that the students in the study had passed an exam in theoretical knowledge less than six months prior to their work practice in the hospital laboratories.

These findings correlate with findings of Leinhardt et al. who argue that educational institutions should take an active role as connector between practice and theory, a role which, "(…) involves approaching the tensions between theory and practice as worthwhile locations for reflection and opportunities for integration of knowledge." (Leinhardt, Young & Merriman 1995, p. 408).According to the authors, in the teaching of practitioners, theory is no better than practice and vice versa.

Educational theorist Wahlgren (2011) describes transfer (between the theoretical and practical domains) to be harder to achieve in the speech-founded programmes as opposed to the act-founded educational programmes, e.g. biomedical laboratory technology. Nevertheless, a need to consider the challenges of showing students the meaningful connection between theory and practice still remains, no matter the content of the curriculum.

In describing a study of graduates' perception of the gap between skills and knowledge obtained during study and the skills and knowledge they encounter in the professional field, the graduates define both theory and practical training as important. They add the importance of achieving methodical and more practice-related, personal-bound skills during their study (Wahlgren, 2011). Interestingly enough, the graduates from Wahlgren's study are capable of articulating the importance of theory, whereas the students in our pilot-study are very weak in articulating how theoretical knowledge is used. The same goes for the students in the study that we present in this paper. Wahlgren argues that it is important that situations included in the learning programmes have a certain identity with the subsequent practice. The concept of "certain identity" is not precisely defined, however. We understand this identity as the actions and the surroundings in one learning arena being somewhat similar to the actions and surroundings in the other learning arena; in this case in the theoretical versus the practical (the college and the hospital lab). This means that the gap between practice and theory can be seen as both a curriculum related, pedagogical issue, and a psychological, learning issue.

2.2 Situated learning

In the framework of Lave & Wenger's (1991) theory of situated learning, a relevant topic of discussion is how the students' processes of remembering, using and developing knowledge obtained from the theoretical learning arena can be supported when students enter hospital laboratories for practical training. The differences between the two learning arenas are not just related to the physical surroundings, but also to the way in which the students and teachers engage in dialogue. The internship offers the student the possibility of learning the dialogues related to actions and furthermore to focus on one topic/subject area for a longer period of time. This gives the student time to absorb the experiences and to integrate them through cognitive processes into a deeper understanding of the topic. According to Lave and Wenger all learning is situated (Lave & Wenger 1991), and therefore the activation of obtained knowledge will depend on the surroundings. In the theoretical arena, the dialogue is less easy to relate to actions and to the specific situation. In contrast to the practical learning arena, the theoretical framework is presented in the classroom to the students primarily through talk and text/pictures/videos. The activity for the learner is listening, reading and watching, so learning is supported by less dialogue than in the practical environment of the hospital lab. In the theoretically oriented periods of the study programme, knowledge

obtained by the students is broader and less connected to physical actions of the learners. Primarily the students obtain understanding through discussions in groups with co-learners or teachers, but even so we believe the learning to be embodied in the student. Figure 2 illustrates the learning process and shows how the social part of learning is divided between the various arenas, and still connected through the personalisation /embodiment in the student. This model is a modification of the model of the collaborative learning process presented by Gerry Stahl with the subdivision of learning into a personalised and a social part (Stahl, 2006).

Figure 2. Learning Model inspired by Stahl (2006)

2.3 Teachers in dialogue

The two learning arenas have in common dialogue as a pivotal part of the students' learning; however, the dialogues are differently shaped. Teachers from one learning arena are familiar with their own way of handling knowledge and actions in their discussions, but have only very little insight into the "settings" of the other learning arena. Few teachers have tried to teach in both arenas, and those who have describe their experience as two distinctly different ways of teaching. It is not uncommon for teachers from the practice arena to give up on the dialogue-based approach when they enter the theoretical learning arena. In the classes of 25-30 students, dialogue is then replaced by primarily one-way communication in lecture-style teaching. On the other hand, teachers from the theoretical arena find it hard to teach or interact with students more than 3-4 lessons a day, as they are not used to whole days of teaching, which is the situation in the practical arena. At college, lecturers are used to shorter and less personal dialogues with students. This difference in how teachers from the two arenas act is a challenge to the convergences between theoretical and practical teaching.

As students experience the differences in teaching style and level of dialogue dependent on which learning arena they are in, it would be interesting to take the dialogue away from both arenas and individualise it in a way to suit the needs of the students. Furthermore, we find it important to support the embodiment of the learning in students by giving students an opportunity to personalise or individualise the learning process. Here we find that ICT has a huge potential. The specific potential of ICT to support differentiation in teaching has been documented by e.g. Mayer (2010), and in addition to this, it is well known that ICT can support a freedom of choice in relation to time and place of learning.

2.4 Focus of our research project

In order to achieve a higher degree of student-centeredness in the learning process, we hope to achieve better support for the students' embodied transfer of knowledge across learning arenas, as well as their activation and utilisation of it in the various learning areas. This raises an important and central question at this point: How can e-learning reduce the gap between theory and practice by integrating the various learning arenas into an internet-based learning environment? Furthermore, the following questions are relevant issues of exploring this question: What is the most optimal design for such integration? What can be gained in relation to reducing the gap between the various ways of understanding, the knowledge systems, and the pedagogical approaches by collaborative processes of developing the e-learning material?

In this study we developed an ICT-based learning material, put it to use in teaching at the biomedical laboratory science-programme in college, and subsequently asked the students about their experience with the learning tool. The learning tool was developed by three types of collaborating experts: domain experts from the practical side of the profession (teachers from a hospital lab), domain experts from the theoretical side (lecturers from the college), and e-learning experts from a centre for e-learning in the health sciences.

There is no prior history in the School of Biomedical Laboratory Technicians for successful collaborative constructing of teaching and learning materials in collaboration with teachers of theoretical and practical subjects. The teaching cultures have been regarded as too dissimilar, so until now, materials have been developed separately, or – as a minimum level of collaboration – teachers have showed their materials to colleagues in order to achieve minimal support for the student's transfer between the learning arenas.

3. Methodology

The dual focus on the development process and on the student experience is included in our research question: which preconditions are required in order to develop learning materials including both the theoretical and the practical learning arena?

3.1 Setting the scene

Before development of the e-learning tool, the subject of Transfusion Medicine was taught at college by hospital teachers. It was a two days-course with full day lectures. This course was selected for redesign for various reasons, mostly political ones, including a demand to reduce the teaching budget. In fact, the alternative to an online learning object would have been no teaching at all. Two teachers from a hospital laboratory and two lecturers from the

college took part; the subject area was given; the students were technically ready to face online teaching; and from the centre of e-Learning came technical expertise to host and build the learning object.

The content was selected from previously used teaching materials like Power Point presentations, mini-quizzes and case stories. The content was then separated into five parts (see overview in Table 1 below):

1. A collection of video samples
2. Three 'courses' or modules, which were slides with a voice-over giving the most important basics, while figures or text in bullets is shown.
3. A final multiple choice test.

The set-up was designed in such a way that the students were supposed to provide the correct answers in the multiple choice questions in order to proceed through the learning object. The user interface in the learning object gives the students immediate feedback, so they will know not only whether their answers are correct or not, but also why.

In the top menu on the computer screen, the student can choose to see the outline of slides, to see the text from the voice-over, or to see a list of headlines from the slides. The student can shift between the slides and see and hear them as many times as needed. When a subject comes to an end in the system, a multiple choice question is presented in a slide, making it possible to proceed only after giving the correct answer.

Videos	Course 1	Course 2	Course 3	Final test
Voice-over videos of 5-10 minutes showing different procedures in the hospital laboratories	Power point slides with voice-over. When the subject changes an interactive slide was presented.			20 questions which all have to be answered correctly in order to pass the test

Table 1. Contents of the learning objects

If a question is answered incorrectly in the final test, it is returned to the pool of questions waiting in line for the student. This creates time-flexibility through differentiation: The fast learning student can go through the test quickly, and other students are given the same questions again, until they have all been answered correctly. The test was chosen because the subject is not tested in any formal exam, so the learning object needs to give its own evaluation of the student's learning outcome. Another important feature in the learning object is the flexibility as regards time and place. The learning object has to be available on the Internet for the students both in hospital laboratories, on campus, and at home at any time of the day. It was made available through the learning management system of the college.

The learning object was also designed to be relevant for newly employed staff in hospital laboratories dealing with transfusion medicine, so that a possible commercial sale of the learning object to another hospital laboratory would finance the maintenance of it.

Analysing the development of the learning object became possible through an interview-based evaluation of the collaboration between the participants in the development group. The interview questions were designed to give information on the participants' experience regarding both the collaboration process and the final outcome of their work. The students' use of the learning object was evaluated through a questionnaire, given to the students in the week after completion of the final test.

4. Data and findings

The data obtained from focus group interviews with developers and from student questionnaires will be analysed separately.

4.1 Data analysis. Development process

The development process was evaluated through three focus group interviews: two teachers of theory, two teachers from the hospital laboratory of clinical immunology, and two script authors from the Centre of E-Learning. All three interviews had the same semi-structured frame as shown in table 2.

To establish the context	Interviewer informed about the reason for the interview and informed that the interview was recorded for transcription.
To set the scene	Interviewer briefly reviewed a paper with text boxes showing the project process, meetings, and deadlines in the process
To evaluate process	Interviewer asked how the participants had experienced the process. What was good about it and what was not so good?
To evaluate the final product	Interviewer asked about the result, whether they were satisfied with it, and asked them to elaborate their answers.
To evaluate future perspectives	Interviewer asked whether they would like to collaborate like this in the future, and if yes, what would they do differently next time

Table 2. Overview over interview questions

All participants gave almost identical answers; none of the three groups had markedly different views. All three groups were proud of the result of the collaboration, acknowledging that it had been a challenging task.

All participants had identified differences between the three types of collaborators in their ways of articulation their understandings of the topic, in the expectations towards the other partners, and in their ways of working. These differences could potentially result in conflicts based on misunderstandings and faulty expectations. A large part of the process dealt with learning to communicate in order to understand each other's perspectives and wishes to avoid conflicts. What made all parties in the collaboration particularly proud was the fact that they all succeeded in keeping the learning object and the learning process of the students' as their main focus.

According to the participants, one important reason for success was the fact that the subject matter was clearly cut, easily defined, and not too complex. A manageable subject matter made it a realistic accomplishment and made it possible to reach the goal: a self-assessing online course offered to the students.

The data shows how the participants share the experience of getting a better understanding of the working areas of the others. They would like to enter a new development process on another topic. For future collaboration, they all point to strengthening the communication as an important means to repeated success.

The three main conclusions regarding the reasons for a successful collaboration are:

1. The participants did not encourage conflicts between the partners. They let them die out through conversation and through a common wish to understand each other's points of view.
2. The participants kept focus on the subject and not on differences between participants.
3. The subject was a non-complex and well defined one.

4.2 Data analysis. The students' use of the learning object

The questionnaire regarding the experience of the students was designed to give information both on how they experienced the e-learning concept and whether the learning outcome was satisfactory to them. Besides background data, the students were asked how they used the learning object (where, for how long, with whom, when), and they were asked about their learning experience (motivation, experienced outcome, relevance).

By far, most of the students used the tool in their homes and on their own (93% and 94%), and 73% of them used it in the afternoon or the evening. 93% of them completed the course in less than 2 hours. Comparing the students' evaluation of their own effort to the learning outcome experienced, there seems to be a correlation between effort and learning outcome.

The students particularly liked the flexibility in the e-learning object. They integrated it into their daily studying routines, which probably is why they used it alone and at home. Many respondents commented on the issue of the time and place flexibility as one of the central and positive features of the e-learning object.

5. Discussion

The first question raised in this article is whether computers can teach biomedical laboratory medicine. The theoretical framework describes the two learning arenas as theoretical and practical. This may be too narrow a description of the learning process in question. There may be several other learning arenas if the definition is not only based on where the credits for the degree are earned(in the hospital labs and in college, in this case). The question is whether we managed to produce a new learning arena using the Internet and a self-assessing e-learning object? If we did, this kind of learning arena may be difficult to implement into the existing curriculum.

Our research question is: *Which preconditions are required in order to develop learning materials including both the theoretical and the practical learning arena?*

As described in the theoretical framework, we defined two learning arenas for the students. In the current project, the e-learning object did not include the possibility of having an online dialogue, however. The students could have chosen to sit together to work with the material. They did not. As they find their learning outcome satisfying, we may conclude that they do learn even without dialogues, which are believed to be very important for the depth of understanding. We still believe, however, that dialogue is important, rather than crucial, for all parts of the curriculum.

Dialogue was important as well for the participants in the development process. They felt successful in obtaining a result from the process in the form of an e-learning object, but perhaps they succeeded in their own learning process as well? As a minimum, everyone involved experienced how different the learning arenas are, and they obtained valuable knowledge about the other arena. This may help them in their future dialogues with the students because it probably helps them understand the students even better, as they shift from one learning arena to another.

What are the consequences of trying to *combine* the two historically separated learning arenas? It may be that the students have to carry more and more of the responsibility of leading the learning process. The students are the only ones with the possibility and competences to activate knowledge and skills learned in one arena in another arena. So they are forced into taking a larger responsibility concerning their learning process. If this happens, it will change the role of the teachers in both learning arenas; the teacher will be less important as the "wise teacher". Instead the teacher will have an important role in building surroundings and arenas for the students in which to learn.

Combining several learning arenas may also give the students a better insight into what is needed when they graduate. It is our expectation that if the various learning arenas can be combined in a better way, students will be better equipped to utilise knowledge and skills in various situations and contexts, rather than just using the theoretical knowledge in the classrooms and using their practical skills in the hospital laboratories.

We have no exact knowledge about the learning outcome from using the learning object. Do students learn how to remember things within two hours just well enough to give the right answers in the test? Or do they actually learn something about the subject? And how long lasting is the knowledge they acquire in this way?

Based on the evaluations provided by the students, the level of explanation in the learning object seems to be just right. Most students found the subject relevant and interesting. As they have now worked with the topic in the learning object, the students should be able to recognise it, when they come across this rather specialised area in their practice teaching later on in their study programme or as graduates.

The linear learning in the present learning object may be enough for small topics consisting of facts and many cognitive elements. If we wish to teach personal competences and specific actions to students, a markedly different type of online learning is needed. The intention to individualise the learning process was accomplished due to the linear approach, and the conclusion in this case is that it is enough for this kind of positivistic (scientific) subject.

On the basis of the evaluation of this first learning object, we feel inclined to take these ideas further. The competences are available, and we are expecting the students to benefit from it in many different learning situations and arenas. We hope to be able to meet the challenge and to develop an online course with a non-linear approach, maybe even including game-based elements.

6. Conclusions

There is no doubt that the teachers involved have achieved a better understanding of how different the two teaching arenas are, due to their difficulties in finding a common use of language when discussing teaching material development. Therefore we conclude that different learning arenas play an important role in the type of bachelor degree curriculums that include both theoretical and practical teaching.

Another conclusion is that the different learning arenas are not easy to integrate into each other, but that it may be possible to create a clearer connection between them by offering students a learning process free of the two dominant learning arenas. In this case we developed a self-assessing e-learning course. The main feature, however, may be that the e-learning course had elements from both learning arenas, and it was physically free of both.

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Multiliteracies inprimary school mathematics learning

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Abstract
This paper reports on a small research project with 9-10 year old Australian primary school students. Over four sessions students created a multimedia product that described a mathematical concept. The teacher conducted the sessions, with the researcher a participant observer. The research aimed to determine whether students at this age group could use the given software to depict mathematical ideas, whether the media products had the potential to inform the teacher about the mathematical understandings of students, and also to explore the possibility of assessing the media products across several curriculum subjects. Data collected included paper-based storyboards, media products, video recordings of some students working with computers, video recordings of class discussions following the computer sessions, and teacher–made notes of class discussions about the content of projects. While these students had no previous experience with digital story-telling or animation, all displayed more technical skills than expected. The contents of the products were mathematically correct, but there were many spelling and grammar errors, even though the teacher had corrected the storyboards. By linking mathematics to an everyday context some students demonstrated a high level of understanding. Overall the project was worthwhile for both teacher and learners.

Keywords
Multiliteracies, Writing in mathematics, Digital stories, Primary school.

1. Introduction

Now "we live in a world of iPods, wikis, blogs and SMS messages. With these new communication practices, new literacies have emerged" (Cope & Kalantzis, 2009, p. 167). The previous quote is from the section of an article where the authors discuss changes in the ways we use technological applications to communicate, both in and out of school. The authors reflect on the fact that when the term 'multiliteracies' was proposed (The New London Group, 1996) the technologies they name did not exist. The terms 'multiliteracy', 'multimedia', and 'multimodality' have all been introduced in attempts to describe and define some of the ways people interect with, and communicate with, advances in technology. To avoid possible confusion, in this report the term 'multiliteracy' will be used generically to encompass all of the terms listed.

While it is not uncommon for primary school curricula to proposeand encourage integration between the students' major language and mathematics, such integration is usually suggested through reading, writing, and speaking. Sometimes this will occur through the use of presentation software such as PowerPoint or Prezi. However, as argued by Cope and Kalantzis (2009),classroom practices based around the idea that reading, writing, and speaking are the only elements of language teaching and learning have been superceded.

The focus of this report is a project conducted with a single grade of Year 4 (9-10 years old) students in an Australian primary school. Over a period of six weeks the students were introduced to a piece of software that none of them had seen before. The task that was set for them was to use the software to create a media product that involved various modes of media to describe something they has learned in mathematics during the year.

2. Theoretical framework

Education at primary and secondary school levels is a responsibility of the state and territory governments under the Australian constitution. As a consequence there are between-state variations in curriculum content and design. The project described here took place in a government (public) primary school in the state of Victoria. The Victorian curriculum does not specify any core or compulsory ICT or media subjects. Instead it argues for the integration of ICT across all subjects at all levels. As there is no formal processes of inspection or accountibility of what teachers actually teach, it is not possible to know how much integration occurs in reality. Table 1 contains an extract from each of the English and the ICT curriculum at the Year 4 level. Both extracts are the closest that could be found to suggest that students could or should have experiences based around to produce material using a variety of electronic modes of communication.

English – writing progression point	ICT – learning focus	Mathematics – learning focus
composition of short, sequenced factual and imaginative texts in print and electronic forms	Individually, students learn to process data in the form of text, images and sound to create planned information products, such as invitations, short stories, presentation files (for example, a Microsoft PowerPoint file), animations and title pages for books	They use a variety of computer software to create diagrams, shapes, tessellations and to organise and present data.

Table 1. Selections from Years 3-4 Victorian English, ICT and Mathematics curricula.

The extracts shown in Table 1 indicate that at Year 4 there does not appear to be any real concept of integration of ICT involving learners using multimodal softwareinto either English or Mathematics. Many teachers believe that in this area the curriculum is deficient and out of date because of the proliferation of multimodal literacies in in the everyday lives of students outside the school classroom.

2.1 Use of ICT by young students

Two research studies conducted in 2011, one in the US and the other in Australia, will be used to discuss the use of ICT by children. While neither of these studies actually targeted the Year 4 age group reported on in this paper, one looked at children just prior to Year 4 and the other at children in a later grade.

Rideout (2011) reports on a survey of 1384 American parents of young children conducted in mid 2011. Some of the findings relating to 5-8 year old children indicate that this age group interacts with a variety of media and ICT. In this group it was reported that 90% had used a computer and 60% had used a mobile device. The following table shows that this age group interacts with many different forms of media.

Watching TV, DVD, videos	Reading/ being read to	Listening to music	Playing media games	Education software/ homework	Other apps on mobile device	Total
2:02 hr	0:33 hr	0:23 hr	0:40 hr	0:07 hr	0:01 hr	3:46 hr

Table 2. Time spent with media daily. Source Rideout (2011, p.18).

While it might not be surprising that children in the early years of schooling spend more time watching material on television screens than using any other media form, the predominance of this and of playing media games, 2:42 out of 3:46 hr or 72%, is surprising. These data clearly show that the use of ICT is not a major part of the daily life of 5-8 year old children.

A final set of data from Rideout (2011, p.13) relates to media multitasking among 5-8 year olds. In this sample 48% reported never using more than one media format at a time. Of the remainder, 28% reported doing this 'once in a while', 20% reported doing it 'some of the time' and 3% reported doing it 'most of the time'. Media multitasking is not often reported in classrooms, although it is not uncommon for students to have several software applications running while they use computers in school classrooms or computer rooms. While the students might have several programs running at the same time it is difficult for younger students to multitask by, for example, simultaneously watching an online video and searching the Internet. Older students learn how to open multiple windows or tabs and run different applications on each page.

In the context of students in an upper primary grade, research carried out for the Australian Curriculum, Assessment and Reporting Authority reports that the overall level of ICT literacy is increasing (Ainley, Fraillon, Gebhardt & Schulz, 2012). In 2011 a nationally representative sample of 5700 Australian grade 6 students were assessed on ICT literacy. Each student received a score and was assessed as achieving or not achieving a set proficiency standard. Similar assessments had been conducted in 2005 and 2008.

Year of assessment	2005	2008	2001
Average year 6 score	400	419	435
Proficiency standard achieved (%)	49	57	62

Table 3. Year 6 ICT literacy proficiency. Source Fraillon (2012 p.3).

The data shown in Table 3 suggest there have been increases in both the average score and in the number of participants achieving the proficiency standard over the three assessments. In terms of the project being reported here, the researchers were uncertain of the level of ICT literacy and the nature of technological skills of the Year 4 participants. However it was known that all students used school computers on a regular basis, even if it was usually for a relativel short period of time.

2.2 Writing in Mathematics

In many educational circles it is accepted that school mathematics involves considerably more than numbers, shapes and problems. Practitioners and researchers have spent many years investigating the place of aspects of language such as writing and reading in mathematics. For example Bossé and Faulconer (2008) recognise differences between writing and reading **about** mathematics and writing and reading **in** mathematics. The former typically involves students writing/reading biographies of mathematicians or reading picture and comic books. Clarke, Waywood and Stephens (1993) suggested that formal journal and expository writing were ways of having students write in mathematics. It was the concept of writing and reading in mathematics that was of interest in this project.

Writing in mathematics can involve "understanding of numeric, symbolic, graphical and verbal representations, their uses, and their interconnections (Bossé & Faulconer, 2008, p. 9). These researchers also note that reading in mathematics often involves students reading text interspersed with examining diagrams, charts, graphs or tables, as well as contemplating matheamtical symbols and expressions. "[R]eading mathematics often differs from other types of reading because in addition to reading left to right and top to bottom, students must jump around the page to associate text with tables, graphs, symbols, and vice versa" (Bossé & Faulconer, 2008, p. 9).

It has been reported that "many teachers struggle to link writing and mathematics and honor the integrity of both disciplines at the same time (Wilcox & Monroe, 2011, p. 521). They also argue that there are two levels of integration for teachers to think about when planning writing activities in mathematics, and that both levels need to be used. Writing without revision is the more easily applied level. Examples of this level include students keeping personal learning logs for reviewing content learned previously, and for students to make, as opposed to copy, notes that could include personal thoughts and observations. In both these examples the writing is by and for the student, and the teacher would not read, correct, or assess.

The second level, writing with revision, can take more class time and be a shared activity. One example of this would be groups of students working with a teacher to review what they have learned about a specific topic. "[T]he mathematical ideas are constructed through group interaction, students help one another learn to communicate mathematically" (Wilcox & Monroe, 2011, p. 526). An extension of this activity is when students collectively create classbooks such as a class mathematical alphabet book or dictionary.

Both writing and reading in mathematics become critical when it is remembered that the use of standardised mathematics tests is increasing, and that questions in these tests are often

open ended, "requiring students to read, understand the question, and then compose responses" (Bossé & Faulconer, 2008, p. 11).

2.3 Multilieracy assement

Composition
    - *Linguistic*
    - Visual
    - Gestural
    - Spatial
    - Audio
	Effect	⟷

Structure Discourse Modalities signal habits of mind and ways of working.	⟷	
Grammar of Visual Design Available Design Design Redesign		

Repertoires of Practice
 Practices in digital space
    - Remixing (playing with text genres such as anime and manga)
    - Using visuals for words
    - Shifting discursive spaces		

Table 4. Multimodal learning practice: a framework. (Burke & Rowsell, 2007, p. 339)

One aspect of the third research question for this project related to how a computer-based multiliteracy artefact produced by a student could be assessed by a teacher. One of many different approaches to this is shown in Table 4, which shows a framework developed by Burke and Rowsell (2007). They comment that prior knowledge and interests impacted on how students engaged with the various multiliteracies they used. They found that "the repertoire of practices these students infused showed how these texts vary in the sphere of authorship and composition. This is an important and needed point for consideration when disseminating assessment criteria (Burke & Rowsell, 2007, p. 339).

3. Methodology

The aim of this research project was to investigate whether a class of Year 4 children could create meaningful stories about a mathematical concept using a simple computer-based animation program. It was anticipated that the software would allow users to employ a number of different types of literacy, that is to display multiliteracy.

3.1 Research questions

The project was based around answering the following three research questions:
1. Could the Year 4 students effectively use the multiliteracy software to respond to the set task?
2. Could the Year 4 students create a meaningful multiliteracy story about a mathematical topic they chose?

3. What could teachers learn about the students' mathematical knowledge from the multiliteracy products they created?

3.2 Setting and participants

The research took place in the classroom and the computer room of a government primary school in metropolitan Melbourne. Melbourne is the capital city of the Australian state of Victoria and has a population in excess of 4.2 million people. The school is located on the northern fringe of Melbourne and in 2011 had approximately 350 students over seven grades.

The participants in this project were one teacher and his Year 4 class of 26 students. The students were all aged between 9.5 and 10.5 years and came from more than ten cultural backgrounds, although almost all had been born in Australia.

3.3 Research design

This project comprised four separate phases, although it was presented to the student participants as a single entity. In the first phase students were introduced to the multimedia software they would be using; in the second phase they used paper and pencils to develop a storyboard that outlined each screen they intended to produce; students then used the software over four sessions to convert their storyboard into a multimedia/multiliteracy product (technically an animated Flash file); and finally additional time was provided for those students who had not completed their animation in the four sessions. The research aspect of the project was limited to the second and third stages.

Extracts from the work of three students is presented to assist in clariying some of the points discussed in this section. Two of these examples were selected because they are typical of what students produced, and the third example (Adding fractions with mixed numbers) is presented because both the teacher and the researcher considered it to make use of more of the software options available.
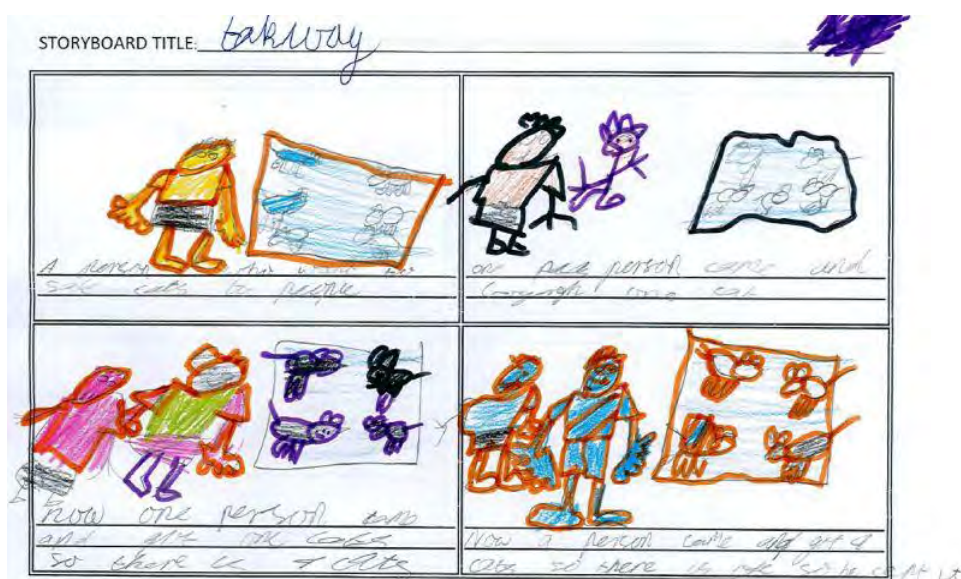

Figure 1. Storyboard: Selling cats

The first phase, introducing students to the software, took place in a computer room and students worked individually at a computer. Prior to coming to the computer room there had been a class discussion about stories in general and how they might be adapted and modified to run on a computer. No student had used the software before, so initially all the students were considered to have the same level of knowledge and skill with the software. However it is recognised that there were major differences among the students in their general ICT skills and experiences. The software used, 2Simple 2Create a Superstory (2Cass), enabled students to create a series of connected pages. When finished the story could be saved as a Flash (swf) file that could be shared through the school's website, or emailed for playing at home. In the first phase students explored ways of using text, drawings, sound and the built-in animation.

During the two phases in which data was collected students were observed and at times video-recorded. This data clearly shows that the students worked steadily and consistently on the task. While planning and drawing their storyboard there was very little communication and sharing of ideas among ther students. The teacher moved around the room providing assistance as requested, and checking the content of the developing storyboards. However this changed dramatically when students began working at computers in the third phase. Some of this phase took place in the classroom, when one-third of the students could work at a computer, and some in the computer room. In both settings there was continual movement of students around the computers, with discussion, questioning and sharing of ideas.

One significant difference between the storyboards shown in Figures 1 and 2 is the approach of the two students to what constituted a story. As will be discussed later, many students did not really have a story, but rather presented a series of mathematical facts or concepts. During some of the video-recorded class discussions some students suggested that they had difficulty writing in mathematics as opposed to doing mathematics. It was clear that writing in mathematics was an unfamiliar and difficult activity for these students.

3.4 Data analysis

The data collected from each student consisted of their paper-based storyboard and the software file after four computer sessions. In addition there were some video-recordings of students creating their storyboards and also working on the computers. For this report the storyboards and computer files were analysed to try and answer the research questions.
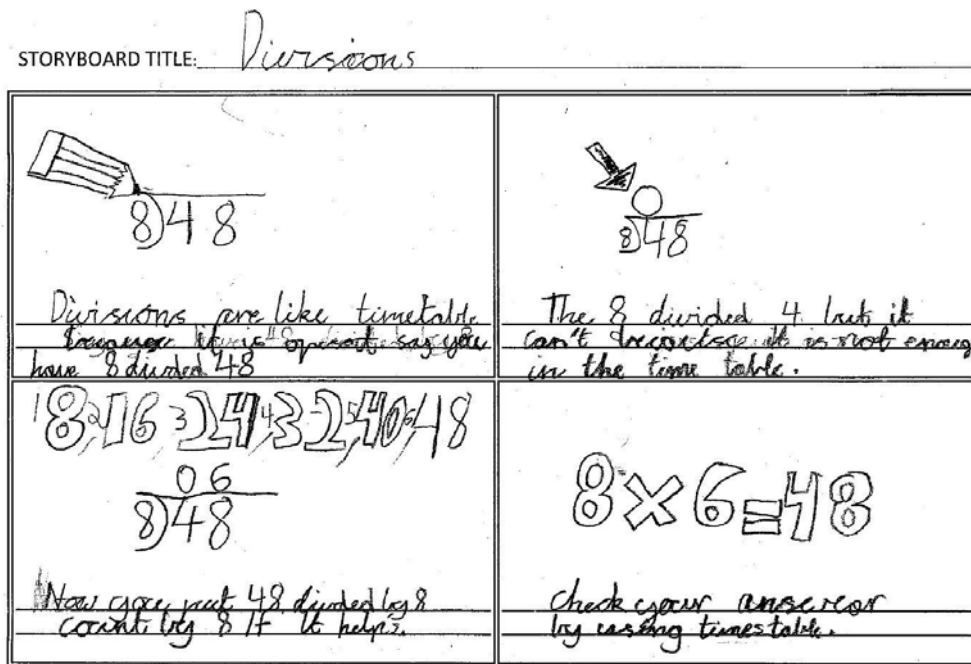
STORYBOARD TITLE: *Divisions*

Figure 2. Storyboard: Divisions

A matrix was constructed that listed the student file names on one axis and a set of items across the other. These items included information about the storyboard (number of screens and content) and about the computerised story (number of screens, amount of animation, sound and text that was used, a comment of the English grammar and spelling in the text, and a note of mathematical errors).

4. Findings and discussion

As noted above, not all students were able to combine the concept of a story with some mathematics. One of the things that is not clear is whether this is related to the language skills of the students. Because some students came from homes where English was not the first language, it is possible that creating and writing any story in English would be difficult.

Name	Pages	Literacies				
		Animation	Sound	Images	Text (words)	
					Footer	Screen
Selling cats	5	None	None	Cats, people drawn	44	2
Division	5	On 2 pages	None	Numbers, symbols drawn	86	0
Adding fractions	5	On all pages	On 4 pages	Pizza, people drawn	26	8

Table 5. Matrix summary of computerised elements of three mathematical stories

Table 5 shows part of the matrix developed to assist with the analysis of the multiliteracy stories. The data shown here relates to the computer file and not the paper-based storyboards. The various literacies reflect what was available in the software, and what was used. Sound was used least, and many stories did not have animation on the pages. In its final form as a Flash file, the computerised stories could be moved from page to page which many students considered to be animation.

In general the computerised stories followed what had been planned in the storyboards, but with simplifications and changes to wording. Many of the storyboards did not include formal title and end pages, although the computerised stories did. In Table 5 the 'Selling cats' story has five pages, but these include a title and end page. The four pages shown in the storyboard (Fig. 1) were condensed into three and a title and end added. The computerised 'Division' story has the four pages from the storyboard, plus an end page.

It had been anticipated that as the students incorporated animations and sounds into their stories the number of words would reduce. However this did not occur, and in the 'Division' story there are 48 separate words or numbers written in the footer of the storyboard (Fig. 2) but 86 in the computerised version. Because most students used 25 or more words in their footers, the issues of incorrect spelling and grammar arise when teachers consider assessing artefacts such as these mathematical stories. In addition to outlining what would be in their story, the storyboards gave the teacher opportunity to discuss language issues and suggest changes. However this was not done for the computerised stories analysed for this study.

After the stories had been completed the teacher and the researcher discussed the project in relation to the research questions and to other issues that had arisen. One concern was the effort and time involved in recording what was accomplished in each computer session. At the end of each session students saved their 2Cass file with a name and number from 1 to 4 representing the session. From this it was possible between sessions for the teacher to ascertain where each student was up to. However doing this after each of the four computer sessions added a significant amount to the teacher's workload.

One of several unanswered questions from the project was whether one of the literacy formats available in the software was a better representation of learning than others. Every student typed text into footers at the bottom of the page. Very few students used either speech balloons or voice recording, both of which were explored during the first phase. Similarly the option of animating text or images was not widely used. Discussion with students indicated a common belief that there was a strong link between between stories and text. Students were uncertain they could imagine creating a story without a lot of text. In turn this leads to the issue of finding and maintaining a workable balance between explicit modelling of software options and expecting students to use those options.

One problem for the students was to clarify for themselves what the teacher was asking them to produce. Initially it was intended to offer a context for writing a mathematical story. The idea of writing for a friend who has missed an important lesson is not new, and doing this about a methematics lesson was considered. Eventually the idea was dropped in favour of simply asking for a mathematical story and seeing what the students came up with. By doing this it was hoped that students would write a story and not just describe some mathematics, but there more descriptions that stories. The project reported on here was small scale and its outcomes are not generalisable to other classes or schools.

5. Conclusions

This small research project builds on evidence reported in the research literature showing that it is possible for teachers to engage students in meaningful learning activities that involve creative student use of ICT. It was shown that the Year 4 students could use features in the given software to create a story-like artefact. Technically many of the artefacts were not stories, let alone mathematical stories. However in one discussion there was general agreement among the students that with what they learned in this project they could now produce a multiliteracy mathematical story.

The project was discussed with other teachers, and the issue of how these stories could be assessed was quite divisive. If ICT is integrated throughout the curriculum, what does this imply in terms of assessment and inaccurate mathematics or incorrect spelling and grammar? At primary school in Australia the same teacher teaches mathematics, language and technology and so it can not be logically argued that assessment of a computerised mathematical story must not include assessment of the mathematics, language and technology.

The artefacts produced by these students suggested to the teacher that the students had a sound grasp of the mathematical topic they wrote about. There were no conceptual errors in the mathematics portayed in the stories, and while they initially thought it was unusual, the students expressed no qualms about creating a story based around mathematics. For all of these reasons it is believed that this activity was educationally beneficial for the students, the teacher, and the researcher.

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How to Improve the Earth Science Teaching at School Using the Web

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Abstract
In the last decades the development of virtual tools for teaching science in school has increased really fast. In spite of the availability of on-line material, the largest part of the web production is in English and this discourages the regular use by Italian teachers. The project, of which this paper represents the first part, aims at making available to the teachers virtual lessons that are a "repository" for the most interesting and useful Earth science existing tools. The selected material will be adapted to the Italian school system, with the aim to provide an effective support to the teachers without a geological background.
The purpose of this work is: 1) to evaluate Earth science teachers' attitude towards the digital tools, 2) to understand the need of an updated web tool for science teachers in Italian, 3) to select the main themes it should contain, 4) to build it, 5) to test the material produced on in-service teachers. To determine how to proceed a questionnaire was sent to a selected sample of teachers. By the analysis of the data, the first themes to work on were selected and a pilot session has been developed, in order to test its effectiveness.

1. Geoscience: a neglected field

Even if Earth science is a discipline absolutely essential for the development of the society, as well as being fascinating in many aspects, unfortunately this seems not to be the perception of many people. Moreover the teaching of this subject at school is often overshadowed by the chemistry and biology, due to the fact that the majority of the science teachers do not have a geological background (more than the 60% of the secondary school science teachers are biologist, www.anagrafe.miur.it) making it difficult to engage the students in the geoscience topics. The results of this is directly seen in the small number of students enrolled in Earth science university courses: for example, Italian students enrolled in Geological Sciences degree courses during the academic year 2008/2009 were only 1073 of a total of 312104 newcomers (www.anagrafe.miur.it) and the numbers have been decreasing in the last years. Moreover the results achieved by the Italian students in OCSE-PISA science texts in 2006 and 2009 show, especially in the context of Earth sciences, scores well below the OCSE average (http://www.invalsi.it/).

The little sympathy for the Earth sciences observed in the Italian schools and universities is revealed in the perception and management, often superficial, of the complex environmental issues that characterize our country. Many of the environmental disasters that constantly hit Italy are partly the result of a lack of basic scientific culture, more precisely a lack of geological and environmental education because "the widely held perception of science being difficult and not relevant to the lives of most people" (Ramsden, 2008).

It should be remembered that "science is a socio-cultural activity [...] Any nation's schools have a duty to develop scientific literacy among its pupils so that they can participate in democratic debate on scientific matters of significance. Citizens also need the skills to discuss the nature and purpose of science, skills that can be developed in school" (Roger Trend, 2009). This is true for all the sciences taught in school, but it seems to be even more important for the Earth sciences, because "geosciences helps to create a planetary perspective" (Celso Dal Ré Carneiro, 2004).

2. The reasons of the project

On the basis of this background we can affirm that "Earth science educators have the great responsibility to transform geoscience education into a process that must go beyond mere teaching and learning the facts, laws and theories; it must involve understanding the nature of geoscience and its relationships with society" (Bezzi, 1999). For doing that, it is needed to contextualize the Earth sciences to make them as concrete and fascinating as possible. Moreover this is even more crucial in relation to the new Italian educational reform, which shifted the teaching of Earth science to the first years of high school, when the students are at just at the beginning of their higher education.

Literacy shows as "field activities are essential to geological teaching because they play a basic role at the different school levels" (Mauricio Compiani,1993), and that "the readily accessible contexts for learning Earth sciences may introduce young adolescents to features of scientific reasoning such as observing, hypothesizing, and drawing conclusions from evidence" (Orion, 2006). But if we analyse the present Italian situation we notice that this teaching approach is not the most common one, for example we know that "most of the Italian student are interested into laboratory activities, but they enter in the labs rarely" (Berlinguer, 2008). At the same time if we analyse the international "web-landscape" about Earth sciences teaching tools, it is quite clear that there are numerous interesting publications,

events and sites that deal with the teaching of Earth sciences, also because "in the last decades the development of virtual tools for teaching science at school has increased really fast" (Doherty, 1996). Thus the questions are: how much these web materials are really exploited? What could be done for engage more teachers in their use? Would teachers like to have more materials for teaching Earth science at school? Which kind of material they would prefer? Would this material really help the teaching, and the learning process?

In fact it must be clarified that existing teaching materials are extremely important, but for being efficient they should be carefully selected according to the real students needs, than they have to be deeply understood and widely discussed by the teachers with their pupils.

3. The phases of the project

For the reasons explained above, this project tried first to understand how much the new teaching web tools are really utilized by Italian Earth science teachers at secondary schools. Thus the first step of the project consisted on the development of a questionnaire for investigating the effective use of educational multimedia and hands-on activities in the Earth sciences teaching at the Italian high schools. Moreover the purpose of the questionnaire was also to select the Earth sciences topics of greater interests, by crossing the ministry guidelines with individual teachers' personal impressions.

The questionnaire is composed by a series of semi-structured questions pointed to find out Earth science teachers' attitude during their lessons and to discover their educational needs towards Earth science teaching. Some of the questions required a yes or no answer, while others asked an answer based on a Likert scale of agreement, extended from 1 to 7 (1: strongly disagree, 7: strongly agree).

The sample chosen for the starting analysis was the group of teachers who inscribed their school at the 2012 edition of Earth Science Olympiad. However, we are aware of the fact that this is a specific sample with peculiar features, but we have chosen it for the following different reasons:

- it is large (close to 400 teachers)
- it is geographically various (spread over almost all Italian regions)
- it comprehends different kind of schools (not only "Lyceum", but also technical schools)
- it is quite easily reachable by email
- it is supposed that these teachers are more engaged than an average teacher into dynamic update teaching process, given the interest in making their students participating to the competitions for the IESO – International Earth Science Olympics.

4. The data analysis

After a month from the questionnaire submission we received back 64 questionnaires, from most of the Italian regions. The analysis of this first set of data allows us to make a some considerations, both regarding the teaching system for sciences and the needs for improving them.

As it appears clear from fig. 1, most of the interviewed teachers normally use PC and projector for doing their lectures, much more than an interactive blackboard (LIM). This means that, right now, the projector is still the most common technological device in use by teachers during their science lessons. Moreover, by the analysis of the qualitative answers regarding the motivation of such an attitude, it emerged that one of the reason for the

preference of the projector than the interactive blackboard is the lack of LIMs at school and the difficulties connected to the classes booking plan for using it.

Another really interesting consideration about this first set of data is the fact that a really high percentage of teachers affirm to use specific websites for teaching Earth sciences and to do hands-on activities as well during their lessons.
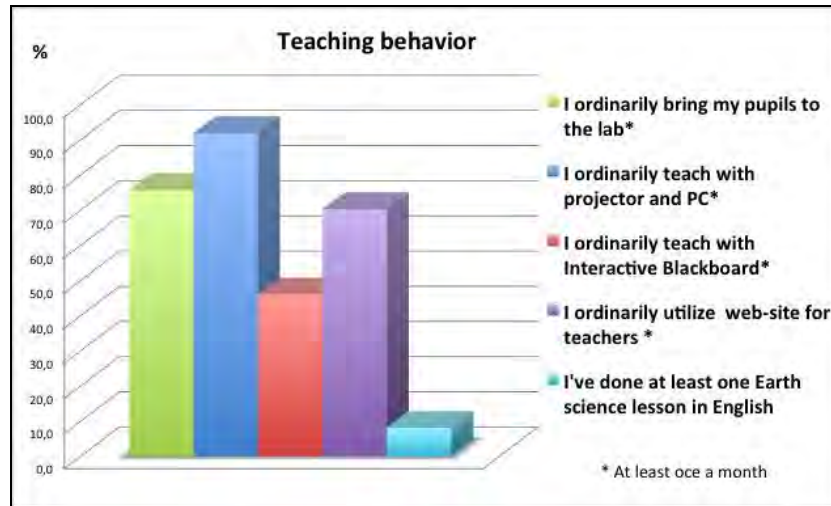

Figure 1. The teachers' behaviour

On the basis of the previous answers is therefore really interesting to find out what teachers said when they were asked about the need of new supplementary materials for teaching Earth sciences at school. In the fig. 2 the percentage of interest for different materials potentially available on-line, as shown by the interviewed teachers, is reported using a Likert scale.
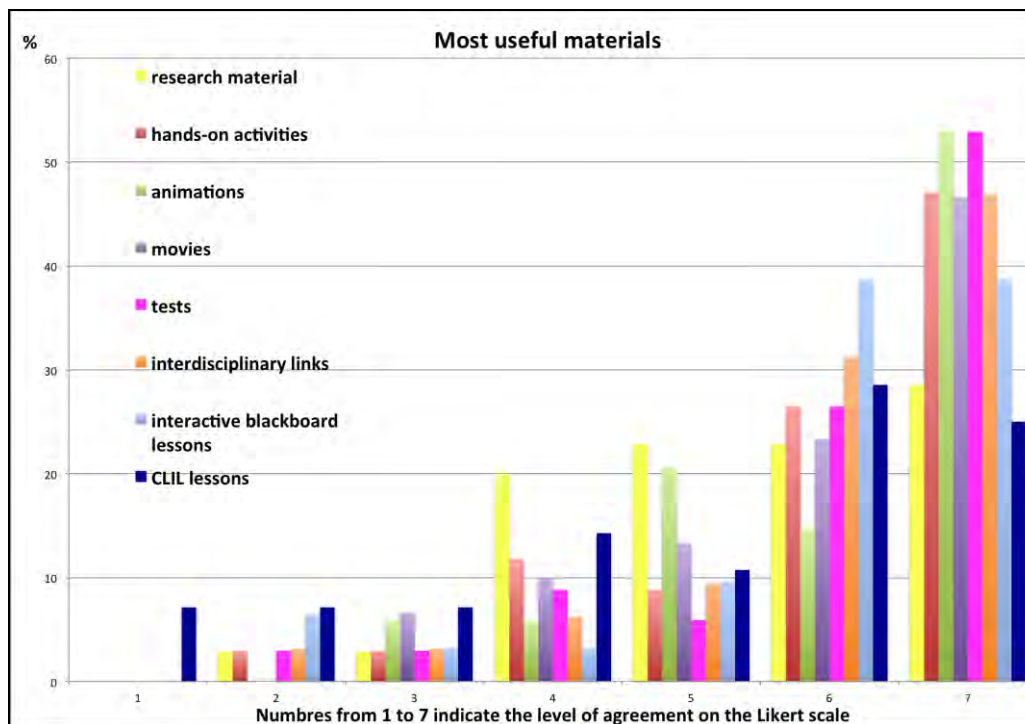

Figure 2. The most useful learning object, as indicated by the teachers

Moreover, we asked the teachers to select for which topics they would prefer to have more material about (each teacher had the opportunity to choose maximum 5 different items from a set of 12). The results are reported in the figure 3.
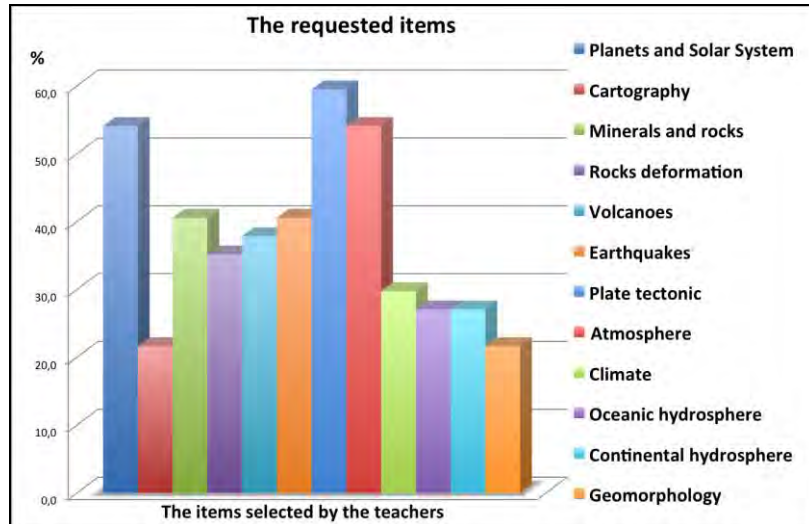

Figure 3. The items selected by the teachers

The last question of the interview had the purpose to find out teachers' degree of knowledge about e-learning courses and their opinion about their usefulness as in-service formation activities. It is clear from the fig. 4 that about 30% of the sample affirms that e-learning courses could be an effective way to improve the teaching knowledge and to update the professional skills.
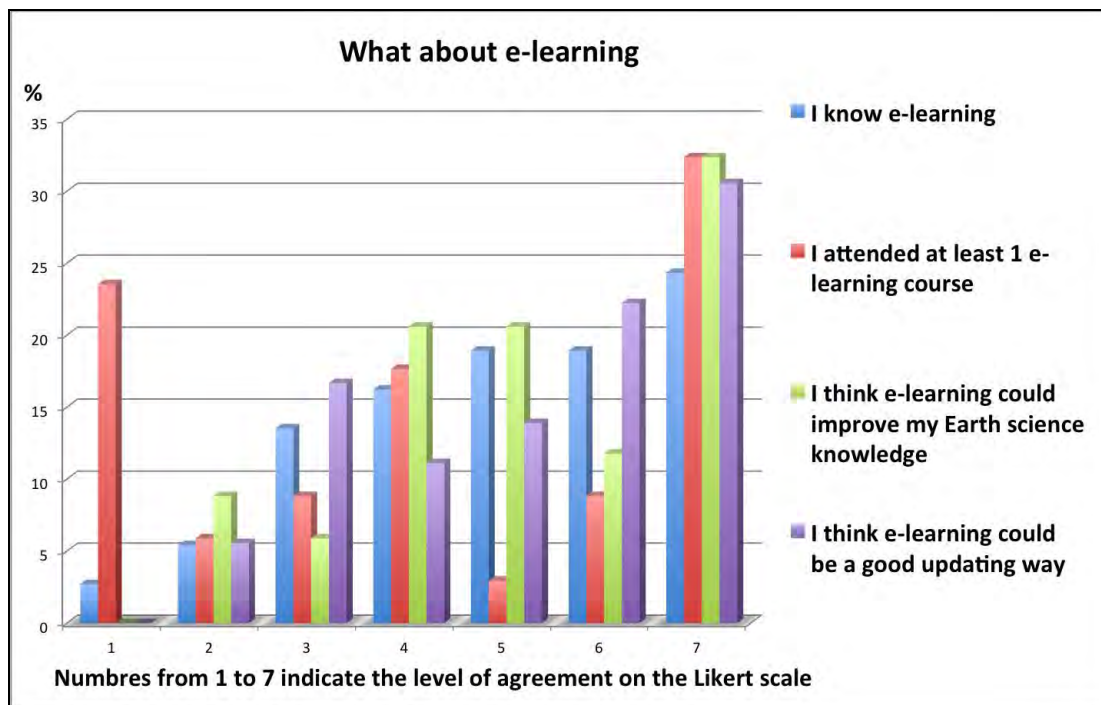

Figure 4. The level of knowledge and agreement about e-learning courses shown by the teachers

On the basis of these preliminary results we designed a website structure trying to respond to all the needs shown by the teachers and we developed new learning objects to upload. At the moment the website hosts different kind of files that undergo the Creative Common Licence, and that are free to be used and even modified by the registered teachers.

Among the Earth sciences topics most selected by the teachers, we collected the existing web teaching material (hands-on activities, simulation, models, animations, etc.) that best fit the real teachers needs. In this regard, the selection criteria are defined as the relevance to the selected topics, the scientific validity, the ease of use, the economic and logistical needs, the link to everyday life and the relationship with the territory.

At the moment, the first unit about the plate tectonic is complete and it is structured in different lessons, each composed by different learning objects:

- a power point file, consisting on a key point text flanked by the most interesting pictures and images available in the web. The file is enriched by the presence of a list of web links to the most useful external materials (animation, labs, etc. …),
- a pdf file, consisting on the transcript of the whole lesson, which is composed by the same images present in the power point lesson and by a richer text,
- a set of exercises, consisting on a group of multiple choice (from 10 to 20, depending on the lesson length) and a group of 10 open-answers questions,
- a video of the whole lesson, consisting on a MP4 file lasting between 6 and 12 minutes and describing the entire content of the lesson,
- a set of specific short movies (lasting around 2 minutes) about significant key concepts, thought for explaining in a easy way the most important items of the lesson.

Presently, the website where the material is contained is in the experimentation phase and science teachers interested in the testing have to register themself in order to receive the log-in password and get the free access to the material.

Once registered teachers can use the material as they prefer:

- the ppt file is free to be used directly, but it can be also modified in relation to the specific teaching needs,
- the pdf file is a sort of a "guide" of the lesson and is thought as a support for the teachers, but could be also study material for the students,
- the mp4 files are thought as a support for the teachers, but could be used for the students as well, in the "flipped classroom" approach,
- the exercises are a suggestion for the teachers who would like to test the students about the content of the lessons.

The desire is that teachers can find in this website most of the material in the preliminary questionnaire they said were interested about.

Soon a new questionnaire will be uploaded in the website. This second questionnaire will have the purpose to understand if the proposed material fits the teachers' needs and also to find out if this website really help to make secondary school science teachers (when they are not geologists) more confortable toward Earth sciences teaching.

5. Conclusion

By this first part of the research emerged that teachers mostly use "traditional" digital instrument for teaching Earth sciences at school, such as laptop and projector, and that they usually utilize the web for finding useful teaching materials. Moreover emerged also that high school teachers are not completely satisfied by the materials present in the web, because they said they would like to have available more specific teaching tools, like animations, movies,

but laboratory protocols and research materials as well. It must be underlined that we received little more than 16% of answers to the preliminary questionnaire. Even if this result indicate that we had a feedback by the teachers of 1:7, we must highlight that we were not able to contact all the 400 teachers directly, but the Regional representative for the Natural Science Olympiad where asked to submit the questionnaire to the teachers of their region. It is possible that the actual number of teachers reached for this investigation could have been much less then predicted, increasing actually the percentage of answers received.

On the basis of teachers' answer to the preliminary questionnaire a website, in Italian, has been built in order to answer their needs. The first teaching unit has been created according to selected topics based on the preferences shown in the questionnaire. A first set of materials on plate tectonics has been organized and inserted in a specific website. At the moment this website is in an experimentation phase and it is going to be tested by in-service teachers, in order to evaluate its usefulness and efficiency. After that, the results on these new set of data will be evaluated and the on-line teaching materials produced will be improved according to the criticisms received.

It must be underlined that the teachers chosen sample represents a particular kind of teachers, because the fact that they enrolled their pupils to the Natural Science Olympiad is not really representative of the average of the Italian science teachers. But, in absence of other data and of another group of teachers potentially interested in participating this experiment, we assumed that the teaching needs of the selected sample can be extended also to most of other science teachers. In fact, we made the consideration that, if our highly motivated teachers' sample would like to have access to more material, it is reasonable to presume that also others, less motivated, would appreciate it as well.

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Use of multimedia, virtual field trips and geomatic tools in Earth Science education

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Abstract
The research analyses the effectiveness of the use of multimedia, virtual field trips and geomatic tools in the teaching/learning process of Earth Sciences. It aims to enhance proper use of new technologies, by introducing new input in the teachers formation. A collaborative experience was set up for a group of teachers, mostly working in secondary school. A questionnaire was proposed, to inquire about their opinion on the use of ICT at school. Then, the multimedia product "Geological tours in Italy" was analysed and discussed. The connection of virtual and real tours creates an educational path allowing the students to understand the methodological process that is behind the construction of virtual reality. On the field, it is possible to georeference photographs, to trace a tour and to fill a table with relevant geological data. Later, these data can be downloaded at school, in order to construct a personal virtual tour. By using ICT in the classroom, improvements to the quality of Earth Science multimedia products are possible. However, since the field activities are fundamental for Earth Science education, new didactic tools related to geomatics are needed.

1. Introduction

The large use of ICT in everyday life is making easier the access to geographic and geologic data: satellite images, aerial photographs, Digital Elevation Models (DEM) and Global Navigation Satellite System (GNSS) data are no longer limited for study and research to professionals, but they are accessible to the citizens. As a consequence, several scientific and sophisticated data can be daily used by everybody, mainly unaware of their origin, quality, formats and processing methods.

The larger use of ICT in schools allows these data to be considered as a relevant didactic tool in Earth Science curricula, useful to design new educational projects devoted to increase students' awareness of the geological features of a territory. In the XXI century, this is an important skill for people in the society, because it is related to a better understanding of topics like natural hazards, resources, use of the land and sustainability (Press, 2008).

A collaboration between researchers and teachers in designing shared action-research projects in which students are actively involved, through collaborative learning and a problem-posing/problem-solving approach, as foreseen by the IBSE method (European Commission, 2007), allows students to deal with an active learning process, and researchers to improve the multimedia products to be used in classroom and on field.

This research aims to trace one or more methodological protocols for didactic projects that compare the use of digital and analogical tools, leading students to acquire new Earth Science notions, as well as new skills and competences. We foresee that it could give the opportunity to teachers and students to approach Earth Sciences using new technologies in a constructive way, enabling them to reproduce the same methodologies used by geoscientists in the research process.

2. Theoretical framework

The core of this research concerns the conservation of the geological heritage (geoheritage). *Geoheritage* is a term applied to sites or areas of geologic features with significant scientific, educational, cultural, or aesthetic value (O'Halloran et al., 1994). The geoheritage concept is based on an integrated consideration of Earth's processes and products: not only geologic features such as distinctive rocks or mineral types, unique or rare fossils, but other attractive Earth characteristics or distinctive geological "objects" that bear value for better understanding the history of our planet, as well as for increasing people awareness about relevant topics like the use of the land and the natural risks. Moreover, geoheritage is a part of the landscape whose meaning encompasses an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors (Wimbledon, 1999; Wimbledon et al., 2000).

In this context:
- it is important to consider the social role attributed to geological objects by communities outside Earth scientists (Pena dos Reis & Henriques, 2009);
- a good communication strategy is essential, because the first step towards an effective conservation plan is by rising the public awareness of the value of the geological heritage (Carrada, 2006; Gray, 2004; Gray, 2011; Henriques et al., 2011);
- the core for achieving this goal is given by an active cooperation among scientists and local communities.

In the Piemonte region (NW Italy), the multidisciplinary research project PROGEO-Piemonte aims to achieve a new conceptual and operational discipline in the management of the geological heritage by means of the development of techniques for recognizing and

managing its rich geodiversity at the local and regional scale (Ferrero et al., 2012; Giardino et al., 2012). In this project, nine scientific teams analyze critical aspects to advance their knowledge about the geological history of the Piemonte Region, while four interdisciplinary research teams cover the aspects of Information Technologies (IT) applications for geoheritage. The main topics covered by the interdisciplinary teams concern the use of geomatic applications for Earth Science data collection and management (Perotti et al., 2012), and the evaluation of the best solutions for visual representation of geological environment and processes produced for promotional and learning purposes. Moreover, the role of one of the interdisciplinary research teams is to test and design didactic tools for educators, schools and public in general (Belluso et al., 2011; Magagna et al., 2012a; Magagna et al., 2012b). For these reasons, in this context, a didactic research on the use of multimedia products in the teaching/learning process of Earth Sciences is carrying out.

The study of Earth Sciences requires a set of thinking and investigative skills that are not commonly found in other areas of the science curriculum or within the curriculum in general (King, 2008). Geological objects refer to a wide range of geological features (Joyce, 1995), from microscopic (e.g. minerals) to gigantic (e.g. mountain belts) dimensions, whose genesis can take place during a wide range of time, spanning from seconds (e.g. paleoseismites) to millions of years (e.g. a sedimentary basin) (Pena dos Reis & Henriques, 2009). These features requires a large-scale thinking and a spatial ability thinking (three dimensional thinking), the perception of geological time and the skill of integrating large and incomplete data sets, bringing to the development of an holistic thinking, involving consideration of major Earth systems (King, 2008; Huntoon, 2012), that is fundamental for enhancing a sustainable development of the territory.

We believe that these abilities can be trained combining fieldworks with an effective use of ICT at schools, and that this goal can be more easily reached working with people on geological heritage. The reason is that geoheritage refers to real geological objects that involve emotions, stimulate wonder and curiosity, integrate the heritage value in a social-cultural perspective. Many geological objects have a relevant aesthetic value, that is related to the scenic content of a landscape (Pena dos Reis & Henriques, 2009), and these objects can be considered attractive for multiple interdisciplinary aspects related to everyday life.

In the last decade, the study of geological heritage by geoscientists is increasingly related to geomatics, that is the discipline of gathering, storing, processing and delivering geographic information in digital format, with spatial reference, using informatics. In the last years, these data are available for the general public, to be used both indoor and outdoor, with PC and portable devices (Figure 1). Since the field activities are fundamental for Earth Science education and for improving a better awareness of the territory, new didactic tools related to geomatics are needed (Qiu & Hubble, 2002; Small, 2005; Van Loon, 2008).

Figure 1. Nowadays, geographic and geologic data are available for everybody. It is possible to access them on field, for moving and orienteering on the territory (e.g. using a satellite navigator system or a digital compass), as well as for collecting data. Moreover, they can be accessed and processed indoor (e.g. through free software for satellite image visualization, like Google Earth and Google Maps).

This mixture of values and features related to the geological heritage concept predisposes for the construction of didactic projects based on experimental and cooperative activities, with a problem-posing/problem-solving approach, according to the IBSE method. In these projects, the use of ICT can help learners in building a coherent mental representation of the presented topics (Mayer, 2009), improving a better awareness of issues like natural hazards, Earth resources and sustainable development (Orion, 2007).

Finally, this action-research project fits with the current requirement of the Italian national curricula for the Primary and Secondary level of instruction, that foresee the acquisition of skills and competences, in coherence with the Horizon 2020 Framework Programme for Research and Innovation (MIUR, 2007a; MIUR, 2007b; European Commission, 2011; European Commission/EACEA/Eurydice, 2012; MIUR, 2012). In fact, this project involves not only scientific and digital competences, but also social and civic competences, by developing in students individual initiative and responsibility.

3. Metodology

3.1 Research questions

A group of selected teachers provided the researchers with:
- opinions and information about the use of ICT at school;
- proposals on the use of virtual geological tours in educational projects;
- feedback observations on a specific multimedia product that shows 20 Italian geological tours, designed for Secondary School by the research team (Magagna, 2012).

The main research questions are: i) are the digital tools and the multimedia products used and considered effective for the teaching/learning process of Earth Sciences? ii) are the schools adequately equipped with PC, Interactive whiteboard, Internet connection etc.? iii) what didactic tools are the most used by teachers? iv) what kind of educational projects can be

designed and carried out with students, by using virtual tours? v) how can multimedia products on geological tours be improved? vi) is the use of digital tools (smartphone and tablet) on field considered useful?

This work is the initial part of a wider ongoing research project that aims to produce some guidelines for innovative educational projects in Earth Sciences, by using virtual tours and geomatic tools.

3.2 Participants

The research has been developed in collaboration with the Piemonte Region section of the Italian Association of Teachers of Natural Sciences (ANISN, http://piemonte.anisn.it/sito/), as a part of the teachers training course entitled "Una didattica per pensare" ("Didactic approaches to form our thinking"), recognized by the Italian Ministry of Education, University and Research. The course has been housed at the Regional Museum of Natural Sciences of Torino.

The participants were 16 Secondary School teachers and 1 Primary School teacher: even if it is a small number, it allowed the researchers to work with highly motivated teachers. It is a fundamental starting point for sharing ideas and designing pilot educational projects. In these contexts, each participant has the opportunity to take in the group its personal experiences.

The focus group had a minor participation (7 teachers), while the field trip counted 13 teachers.

3.3 Research instruments

This work is an action-research project, in which data are collected both in a quantitative and in a qualitative way (Elliott, 1993; Denzin & Lincoln, 2005).

Relevance is given to the interaction between researchers and teachers: teachers are conscious of being involved in a research and they are aware of the aims, as well as of the importance of their active collaboration for collecting opinions and achieving constructive debates on the use of ICT in the teaching/learning process of Earth Sciences. This approach allows a higher cooperation between researchers and teachers (Pimenta, 2005): the latter helps the former to collect data; these data are analyzed by the researchers and the results are shared with teachers; the outcome of this collaboration is fundamental for designing and testing innovative educational projects, that are continuously improved thanks to the reciprocal opinions (Figure 2).
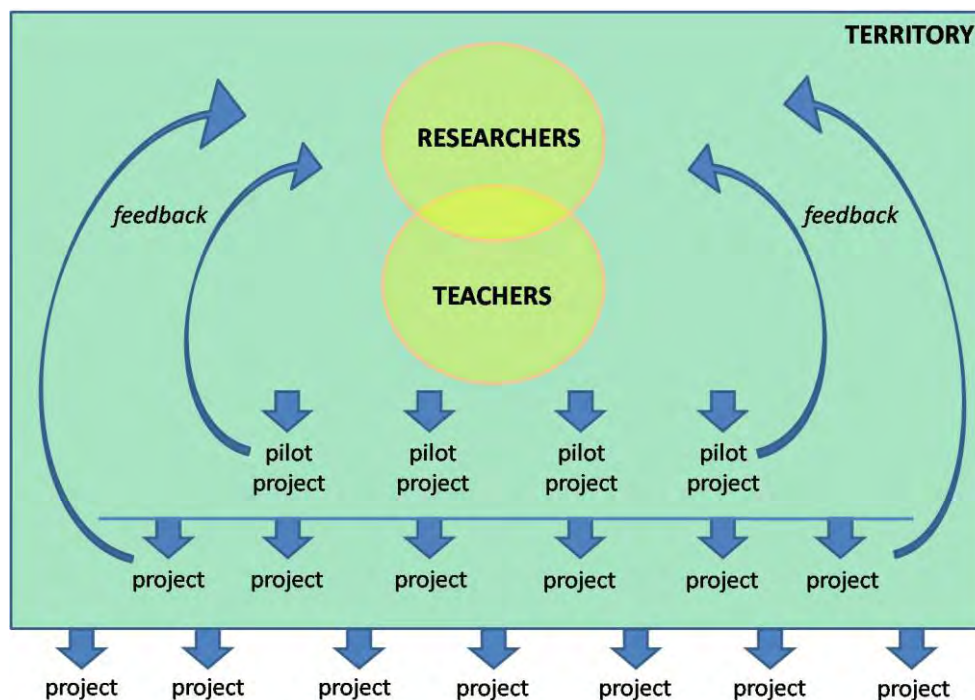
Figure 2. The collaboration between selected teachers and the researchers allows to design innovative pilot projects on the territory. The feedback of these experiences lead to the activation of new projects, also outside the initial territory, involving more teachers in a continuous improvement of the teaching/learning process.

The instruments used for the research are mainly closed and open response questionnaires, combined with methods like collaborative learning and focus group.

3.4 Procedure

The research developed through three indoor meetings and one field trip, from autumn 2012 to spring 2013.

The first contact with the teachers consisted of a few minutes for introducing the research, delivering a preliminary questionnaire on the use ICT at school and inviting teachers to go online and see the multimedia product "Geological tours in Italy" by themselves. The questionnaire was filled in individually and returned the following week.

The second and most important meeting was the lesson of the training course. In 3 hours, the multimedia product "Geological tours in Italy" was visualized and discussed in groups, and finally each teacher was required to elaborate an educational proposal. It had to be related to the use of the virtual tour located in the Piemonte region (NW Italy), in classroom and eventually on field. At the beginning of the activity, a worksheet with the guidelines for the personal elaboration was given, in order to guide teachers towards a critical analysis in groups. A final discussion on the activity was carried out.

A feedback on the collected data was given during a third meeting, structured as a focus group (Corrao, 2002): the results of the analysis were discussed with teachers, aiming at collecting some qualitative data useful for better understanding some answers and having some confirmation about new hypothesis produced for the ongoing research.

As a conclusion, teachers were guided for a day fieldtrip, going in the same place explored through the virtual tour (Aree Protette Astigiane, http://www.parchiastigiani.it/). From an educational point of view, this activity offered a final opportunity to compare the virtual with

the real. For the researchers, it was the occasion for presenting further results and ideas generated by the research project carried out together.

4. Data analysis and findings

4.1 Preliminary questionnaire on the use of ICT at school

The preliminary questionnaire is divided in three blocks: personal data (sex, age, degree, level of teaching, optional training courses); the use of ICT at school; the use of digital and traditional tools in the teaching/learning process of Earth Sciences. All the questions are closed, but most of them are followed by an open question asking for further explanations or integrations to the previous answer. It was filled in by 16 teachers of Sciences in Secondary School, all of them experienced in teaching Earth Sciences.

The analysis of the second block confirmed some previous hypothesis: all the teachers believe in the positive effect of using ICT at school and they all consider digital lessons more effective than traditional lessons. All the schools have an ICT equipment, but in 75% of the cases it is not sufficient for all the classes. The main technologies available at schools are Interactive whiteboard, PC, projector and Internet connection, but in most cases these are limited to 1 or 2 classrooms, or to a laboratory (informatics or linguistic one). This problem of accessibility makes the use of ICT at school difficult for teachers and students. Consequently, it is not so common that teachers use digital tools during the lessons. If we consider the digital homework (that mainly concerns preparing presentations or making researches on the web), this trend is even lower (Figure 3). Half of the teachers uses the multimedia products given with the textbook are used in classroom or at home for visualizing videos, animations or for interactive exercises.
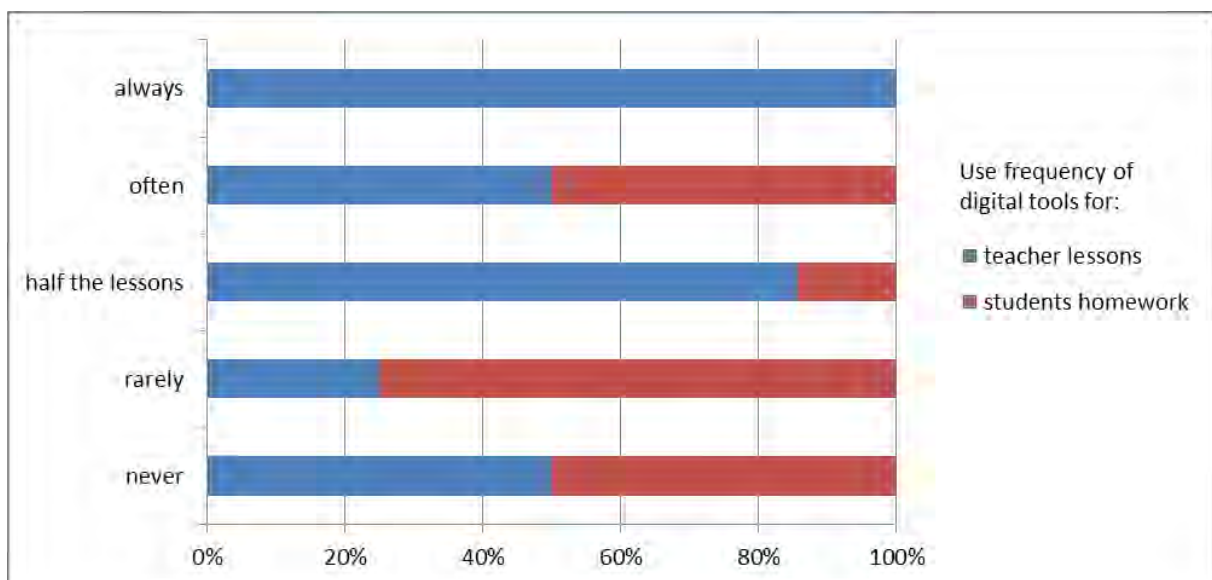

Figure 3. Answers to the questions "How often do you use digital tools for giving lesson to your students?" and "How often do you ask your students for doing their homework using digital tools?".

The analysis of the third block reveals that all the 16 teachers usually take their students on field for deepening Earth Science topics. Moreover, they believe that the on field activities can't be replaced by virtual tours, even if these are considered useful as an integrative tool in

the curricula. These results agree with our opinion on the relevance of both virtual and real tour, and it increases our conviction that it is important to work on both fronts.

Interesting results have been obtained on the effectiveness that teachers relate to a series of didactic tools, such as documentaries, guided tours in museums, interactive exercises, photographs, animations, field trips, models, drawing activity, Google Earth (Figure 4). The majority of teachers evaluates photos, animations, field trips and Google Earth as tools with an high level of effectiveness for the teaching/learning process of Earth Science topics, while the opinions on documentary, guided tours in museums, interactive exercises, models and drawing activities are dispersed and the majority of teachers consider them as moderately effective. These results are consistent with the methodological approach used for designing the multimedia product "Geological tours in Italy", that provides many photographs, Google Earth images and some animations for each geological tours, aiming at stimulating people in visiting the real territory.
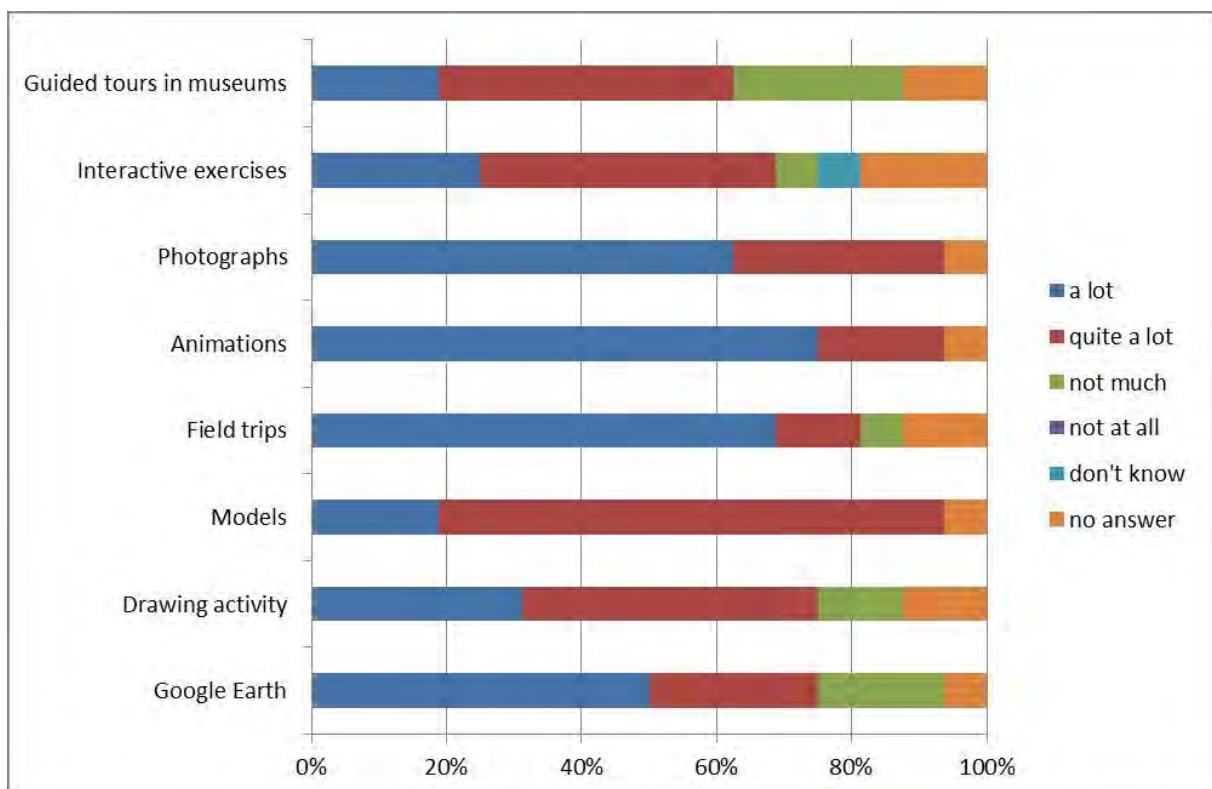
Figure 4. Teachers opinion on the effectiveness of some didactic tools for the Earth Sciences teaching/learning process.

4.2 Educational proposals on the use of virtual tours

The worksheet prepared for the analysis of the multimedia product "Geological tours in Italy" is divided in three blocks: the first one is a guideline that requires to reflect on the features (timetable, topics, tools, methodologies, goals) of a didactic project that uses the multimedia product at school; the second one requires to develop an educational proposal related to the Piemonte region virtual tour (Figure 5); the third one asks some opinions about the contents and the usability of the multimedia product.
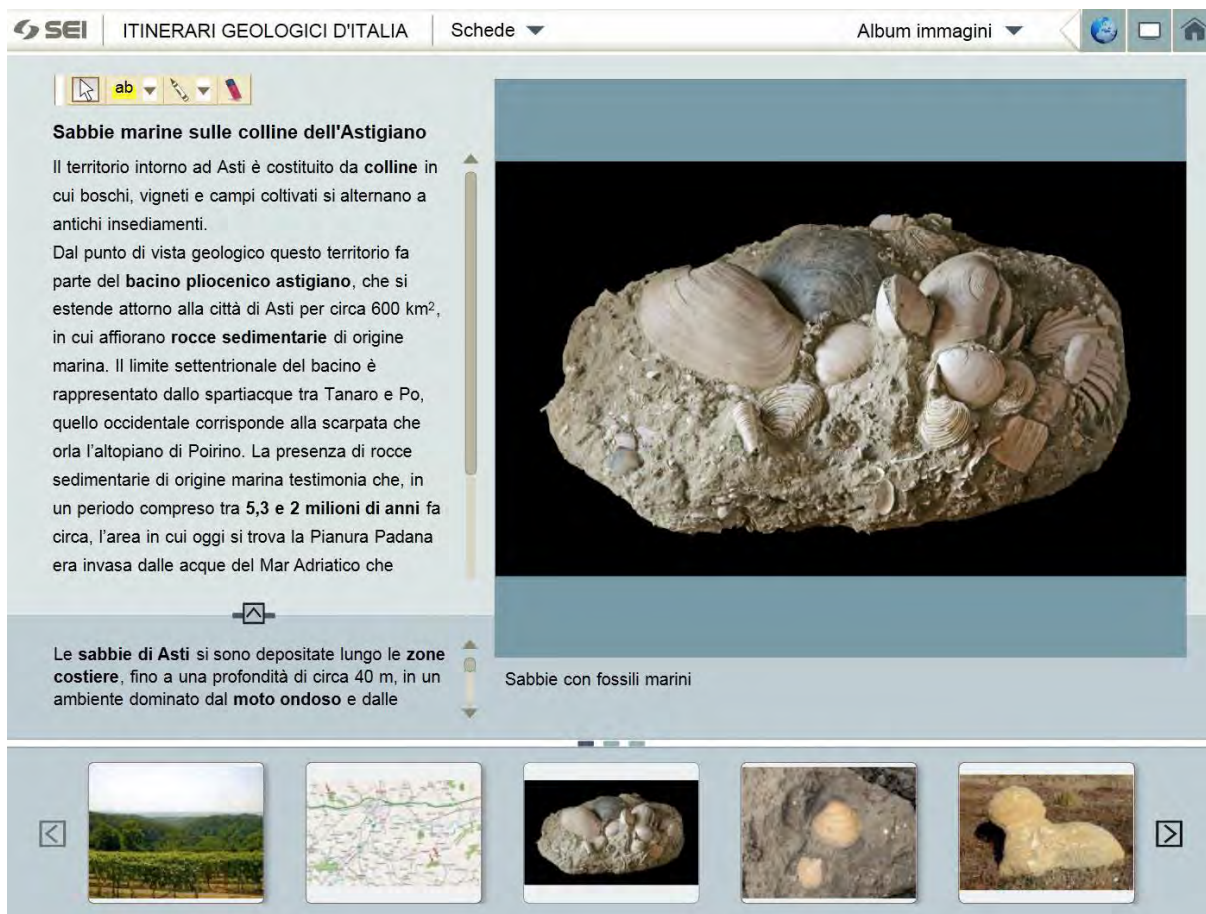
Figure 5. Digital page of the virtual tour "Marine sands on the Asti hills", included in the multimedia product "Geological tours in Italy". Many photographs, images and videos with short captions describe the features of the territory.

This activity was developed by 16 teachers of Sciences in Secondary School and 1 teacher of Sciences in Primary School, all of them experienced in teaching Earth Sciences.

The analysis of the worksheets reveals that some personal educational proposals have common features, because of the influence of the previous teamwork. For this reason, data have been analyzed in a qualitative way, giving more value to the variety of answers and proposals than to a numeric counting of categories. The decision of developing a preliminary teamwork activity was motivated by the will of creating a climate of cooperation among teachers. From a qualitative point of view, this approach had good results, because it stimulated active and constructive discussions among the participants. It could maybe be better to work individually first, developing the teamwork as a final activity together with the collective discussion. Nevertheless, a variety of interesting proposals were collected.

The majority of teachers (82%) would combine the virtual and the real tour and would propose the virtual tour in classroom for preparing students to the field activity (2 teachers didn't answer to the question and 1 teacher would use the multimedia product instead of the field activity). Most of teachers proposes the virtual tour within the Earth Science curricula, while someone proposes it within a multidisciplinary project, involving disciplines like sciences, history and literature. In any case, the majority of the proposals uses the virtual tour for introducing or deepening a variety of topics of Earth Sciences, like rocks, fossils, geological time, landscapes and geomorphology, even if the virtual tour was designed for deepening the sedimentary rocks. Many projects foresee a final comparison between the virtual and the real observations, as well as the integration between the use of the digital tools

and some laboratorial and interactive activities (observation of rock samples, use of a map, further photos and videos, preparation of presentations and reports). The students play mainly an active role, both in classroom and on field, and the teamwork (in groups or couples) is often proposed.

The answer of the third block reveals that the images and the contents of the multimedia products are appreciated, but teachers would prefer a more interactive product.

4.3 Focus group and field trip

The focus group had minor participation (7 teachers), but it allowed to show the analyzed data and to discuss some of the results. Consequently, focus group and final field trip have a qualitative evaluation.

The first topic discussed in the focus group concerns the minor use of ICT by students for doing homework than by teachers for doing lessons. Teachers assume that the main reasons of this tendency are related to the difficulty of collecting, correcting and discussing multimedia products at school, as well as the availability of digital tools at home for every student. Moreover, technical problems related to the non-functioning of the digital tools (e.g. Internet, laptop or PC broken) are often reported as an excuse for not doing digital homework. Finally, it is not to underestimate the fact that often students don't have enough abilities and skills for using these tools, for doing researches on the web or preparing digital presentations. Parents also influence this tendency, because many of them are scared of leaving their "child" browsing alone in the web. Some positive experiences created a space on the web dedicated to the classroom, using social network or blog, for sharing report, video, workflow etc. It seems that students appreciate more this approach, based on sharing resources and ideas, compared to the traditional homework that mainly requires to prepare a digital presentation.

During the focus group the role of photos and drawings has been discussed too. These are often used in different ways in the Earth Sciences teaching/learning process: selected photos and drawings can be critically analyzed by students, but students can also take their pictures and they can draw, focusing on selected topics (Benciolini et al., 2012). These activities are very effective for improving the spatial scale perception and the observation of geological structures. As a conclusion, it is interesting to design Earth Sciences educational projects that include both photographs and drawings.

Finally, a brief discussion was developed about the use of satellite or aerial images at school and the opportunity of gathering field data with mobile applications. These topics deal with the activity proposed during the field trip: teachers used some free applications for mobile devices (smartphone and tablet) that allow to collect data and to track the route. All these data can be downloaded and processed in the classroom, stimulating a participative attitude of the students.

5. Conclusions

The research combines the theoretical framework of multimedia learning with three different fields of research dealing with Earth Sciences, that are: i) geoscience education; ii) geological heritage and geoconservation; iii) geomatics.

The collaboration with a little group of teachers, all experienced in Earth Science education, allowed the researchers to collect relevant data for the ongoing research. The analysis of the quantitative data, the focus group and the field trip revealed the need of integrating traditional and virtual tools. Moreover, because of the high value given to the field

trips, researchers concluded that new didactic projects related to geomatics are needed: through portable devices equipped with free applications, it is possible to georeference photographs, to trace a tour and to fill a table with relevant geological data collected on field. In classroom, these data can be downloaded and discussed, and personal virtual tour can be produced.

The ability of three dimensional thinking, the perception of geological time and the skill of integrating large and incomplete data sets can be trained combining fieldworks with an effective use of ICT at schools, and this goal can be more easily reached working on geological heritage. The connection of virtual and real tours creates an educational path allowing the students to understand the methodological process that is behind the construction of virtual reality. The core of these innovative projects is a learner-centered approach (Mayer, 2009; Reynolds et al., 2002), aiming at raising critical thinking about complex topics and developing individual initiative and responsibility. In this context, not only scientific and digital competences are improved, but also social and civic ones. These are fundamental for the modern society, because of their relation with a better understanding of topics like natural hazards, Earth resources and a sustainable use of the land.

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The "behind the scenes" of teaching with digital media: why are teachers not really interested in the use of ICT in their pedagogical practice?

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This paper has as object of study the adoption of ICT and the Internet in didactic processes. It originated from a research carried out by the research group Networking Young People of the Department of Education at PUC-Rio, Rio de Janeiro, Brazil on this them. The researched group was composed by secondary school teachers, working in public and private schools in Rio de Janeiro, Brazil. The chosen research method was the qualitative research, using the Focal Group as an instrument for data collection. The findings have been critically analyzed and compared with the results published in 2012 by the Brazilian Internet Committee (CGI-Br). Data showed that teachers still demonstrate a strong resistance with regards to the use of ICT and the Internet in their teaching practice, being this restricted to only a small group of teachers. Some of the barriers mentioned by the researched teachers were related to personal, administrative and political issues. The data gathered allowed a critical reflection around the question: what hypothesis can be raised when data show that teachers do not appreciate and neither are interested in the use of ICT in their pedagogical practice? The final part of the present article addresses this question.

Keywords
teaching practice, teaching with digital media, ICT, Internet, digital barriers

1. Introduction

When we examine the trajectory regarded by digital technologies from the first attempt of its appropriation in the school environment, we notice a tension concerning this new.

This happens either by the kind of teaching that has kept the margin of these changes, either, in a first approach, because ICT not potentiates the classroom, where teacher is the main member for the quality of a course.

Unfortunately, over time, nothing can be seen as a major improvement of teaching changed its status; digital technologies remained apart, avoided, denied as an aggregator of value for teaching.

We think that in principle the reason would be the precarious digital resources available in public school. In order to solve this problem, there was a governmental action to provide schools with computers, creating computer labs. However, this cost-benefit, considered important for the authorities, did not have the expected result, only serving to further develop teachers' fear of the machine, "as in the film Metropolis by Fritz Lang - the man being replaced by the machine and submitting to it".

As a counterpoint, there was a whole literature that supported technological advances for appreciation of a future's culture that was already present. However, the presence courses remain strengthened, even if this pedagogical model not always guarantee the competence of the teacher, the student's attention, or its successful performance . The real factor in education quality remains, therefore, in presence.

This position is grounded in the belief that virtual is the opposite of real, i.e., virtual would be the absence of the real. What I infer from this is that what is not working "concretely" in front of the eyes becomes less important, because its materiality is denied. But this relationship is not true. I agree with Lévy (1996 p.17) who says that "the virtual is not opposed to the real, but at the present," as a reference to the Aristotelian concepts of actuality and potentiality. "The tree is virtually present in the seed ... potentiality and actuality are only two ways to be different."

Paraphrasing an example of Lévy (1996, p.18) about the virtualization of an institution, I propose to follow the virtualization of a class that is only in the presential form:

In a conventional class, teacher and students are under the same roof, in the same building. Students and teachers take their places precisely located; classes are scheduled in sequence with their curricula and lesson plans specify work schedules to be met. Already a semi-virtual class explores the possibilities of web as knowledge source. The use of a communication network between teacher and students would add to the physical presence of teachers and students in one place, participation in a network of two-way electronic communication, with the possibility of resources and programs that reinforce cooperation.

Thus, virtualization consists mainly in making the space-time coordinates of classes rethought always a problem and not a stable solution. The center of gravity of the School is no longer a set of classes, textbooks, reviews plastered and carefully complied, but a coordination process that redistributes, always differently, the space-time coordinates of the dyad teacher - students and the position of each one, according to various requirements.

Thinking about taking a step forward in the use of digital technologies by teachers, there is a second stage of public policy that advocates the need to give teachers not only computers, but tablets available for students. So, again, continued changes were made in objects: machines, applications, etc. as if they, themselves, could perform such ambitious digital revolution.

Another interesting fact, even within this thinking, was that, if on one hand public policies offered machines, on the other, small attention was given to basic resources that allow the Internet to be accessed with quality and speed.

Recently, with the rapid transformation of technology, the problem has become even more complex, since today is no longer restricted to simple network access. Overcoming the digital exclusion currently goes through access to broadband, high-speed connection, allowing the user a full experience of using the web (with data downloads and uploads). (Savazoni, 2009, p.60)

The teacher continued to receive "material" for which he was still not worth seeing. This, in a certain point of view, is true. The government has not provided the training of teachers to use the technology with expertise in the service of better teaching and more consistent learning.

Now, the teaching that takes advantage of digital technologies is not done thus. It is essential to empower, support and encourage the improvement of teaching skills in current times, with these digital artifacts.

2. The current status of the teacher and students with notebook and tablets

Research *Masters in Web: representation and significance of the Internet for school teachers* carried out between 2008 and 2011 by the Directory of Youth Research Network of the Education Department of PUC-Rio, presented interesting results that may help understand this teacher's difficult relationship with digital media.

This research had two main goals: to verify which the articulation possibilities could exist between representing the Internet as part of a group of high school teachers from public and private schools of Rio de Janeiro, and how these teachers worked with formative systems in the digital society. Rio de Janeiro was the city chosen as the place of research because, although being the second largest in Brazil in terms of social economic development, it still maintains, in its surroundings, a great belt of poverty with a precarious situation of public education, health, and very little access to digital media. The chosen research method was the qualitative research, using the Focal Group as an instrument for data collection.

Data identified the practices of these groups of teachers on the use of digital media in school and life environments. The collected data reinforced the idea of a position of teachers tending to more canonical practices.

They preferred expository teaching with traditional materials, because they considered the workday teaching too exhaustive to add the use of a new technology; "The weight of excess information that invades your space, your Sunday and your dawn." (Someone said) Perhaps, this consideration reflects a teaching reality, since they are paid only by giving lessons, and most of the times, receiving nothing for the time spent in preparing lessons and correcting assessments.

Asked about what use they did of the Internet, always or almost always consulted search sites (93.5%), 72.5% read informational pages and 71% wrote e-mails. Download programs and applications were considered too little done by teachers, which showed an underuse of the Internet, perhaps because they are unaware of the potential of the web.

In fact, they felt that there is still a lack of domain of Internet by the teachers. Regarding control, for them the Internet is an uncontrollable space. Therefore, it is not possible to be used by the teacher in its work practices.

The speeches of many actors in the survey also revealed the perplexity with this tool, revealing the fear that can cause an attack of the new, of what is not dominated. *What aspects I'm going to borrow?* says a teacher of the group.

In the same way, also emerged a kind of fear to be subtracted from their professional status. The teachers fantasize that the new technologies will dismiss him/her from its functions, replacing him/her by the machine, which cheapens the cost of a course within a commercial society of educational practice.

Before considering this totally unfounded threat, we wonder if there would be no built therein a trail of hidden truth, in the society we live in, which the prevalent idea that all economic activity aims to profit. If so, in a capitalist society, the machine would not be more profitable?

On the other hand, it appeared the threat of the control over teacher when they say: *What is spoken takes the wind ... As we say; on the web everything is recorded. there is a greater exposure of "nonsense" that in the classroom as what they say is not registered. Even in EAD we are more exposed than in the classroom. What we say is more registered. Really, we expose ourselves much more and this is very dangerous!* These statements show how the teacher is still insecure about their skills. Or how much the discrediting of their profession and consequent poor remuneration carries them to give really bad lessons, poorly prepared, with little appreciation for what they do.

As for what is produced on the Internet, teachers showed difficulty in achieving the importance of collaborative text, authored collective action without controlling teaching. They said: *(see) a Wiki - a matter of someone moving in the production of the other. Students have the Internet productions that are not controlled. I've never seen a discussion with the teacher guiding!!*

The Internet was also represented as a dangerous facilitator to make homework: *the problem with Ctrl-C, Ctrl-V promotes the copy without authorship; it became much easier with the Internet. School did not prepare the young for that technology as a tool of knowledge. It is preparing to use as leisure activities, social relations, not to search. So, in my classes, I used to say: I want written; close the Internet and write!*

The Internet has been considered also by some teachers as insecure because *anyone can put a page in the air. The Internet is an outlaw space, which provides the simulation, anonymity, leaving open the possibility of perverting youth, leading them to dangerous relationships*. Or, *was seen as dangerous by the excess of information, making the young man did not discriminate as what is real and what is true, therein this is the most dangerous for me. It's easy for anybody to put something there. So you can not just throw the child on the Internet!*

What emerges from these testimonies and from other more collected in the survey is that there was negative fanciful representations of the Internet. But we also noticed, in the group heard, the awareness of the great ignorance of teachers and school system regarding the proper use of digital tools, its potentialities and its limits. *Did we ever stop to think how many of our professional staff is really working with this tool*? Said one teacher.

Also teachers pondered how far the investment of public policy to give computers for teachers would really leverage their digital competence: *I drew attention a search in the state school system about what teachers were doing with the laptop which got from the statewide network. Over half of the teachers took the laptops and gave them to their children and, when they used it, was just for socialization.*

Finally, the finding that *the school did not incorporate technology into teaching and student incorporated in your life* denotes some misunderstanding about the real domain by young people in relation to the potential of the Internet. Another survey developed by the Youth Directory Network, regarding social networks, found that youth said to master the technique of using the tics, but had no grasp on its functionality in class, did not know how many useful tools it provides, nor the possibilities of academic pursuits on the Internet and how to use them profitably. Many didn't see the use of ICT in school as appropriate. I'm sure it does not happen only in Brazil!

The youth reported having broadband on their computers, some already on their mobile phones, with the function of leisure activities, gaming and develop social relationships, but did not think the Internet used in the classroom as part of didactic resources, nor the possibility of academic exchange between students and their teachers. At this point, the young were always under the impression that *the Internet is for life* and not out there to practice in education. The book was still considered the quintessential resource for school learning.

The Guardian website, discussing Why ICT should still be taught in schools and a way to do it properly, presents interesting placement of a child under 12:

ICT is boring. At school we go in, sit down, the teacher explains what we are going to do, and then we just get on with it. Every lesson we are learning how to use Microsoft and Excel and making documents. I'm not really good with computers so it's not fun. But I like using my laptop at home to go on Facebook and play games – I'm good at that. I've always wanted to design my own game, I really wish we could learn how to do that at school; I'd make a really good one and share it with all my friends. (David Whittaker, 12, Birkdale high school, Southport, Merseyside)

I wonder: how much this traditional school model does not have responsibility for this opposition? Certainly it has, because this comment is the result of negative social representation of the school that still exists between us. Because, unfortunately this is true.
Fears pointed here hinder the teacher to enjoy the real potential of the Internet (no false illusions) and offer him a distorted representation of what is truly possible to do with the Internet. Many of dangers allocated to Internet are also present in courses with traditional classes. Why? Because they are not inherent to the Internet, but the way the school learning is conducted, either in person or just adding digital media resources.

3. Still the real problems

At the core all this messy state hovering between the opinions of teachers on ICT, pointed so far, are diluted some other problems that challenge those who consciously and competently, believe in the potential of the digital world in the construction of knowledge.

The biggest problem remains the school dropout and those who are in consequence, less skilled.

In fact, we believe there are also embedded in these causes raised, the small possibility of students follow the study, the precarious resources in some Brazilian regions, a point that is true because of the different socioeconomic conditions and developments that make Brazil, many Brazils.

According to Simões (2011), John Vianney, associate consultant at Hoper Group, defends that "the question involves a conceptual change. The technologies have brought the possibility of studying 'anytime, anywhere'. That is, the student can study at any time and from anywhere, "he emphasizes. But is there enough autonomy for that?
Yet in 2009, Litto, President of ABED, talking about the profiling of e-learning students says: have good content, be well organized and be interactive. "The student decides what he/she wants to study," he explained. According to Litto, "a student who only learns under punishment or praises is only able to face-to-face classroom. Is that true?

First of all, this characteristic, considered by Litto primordial for a student (in the case e-learning), refers to heutagogy, concept coined in 2000 by Stewart Hase of Southern Cross University in Australia and Chris Kenyon, to define self-learning determined. The word seems to come from a Greek words set: ευρετικός (heurist) meaning "discover" εφευρετικός

(heuretikos) meaning "inventive," εύρημα (heuriskein) meaning "find" and άγω (ago) meanings "drive".[1]

> Heutagogy places specific emphasis on *learning how to learn*, *double loop learning*, *universal learning opportunities*, *a non-linear process*, and *true learner self-direction*. So, for example, whereas andragogy focuses on the best ways for people to learn, heutagogy *also* requires that educational initiatives include the improvement of people's actual learning skills themselves, learning *how to* learn as well as just learning a given subject itself. Similarly, whereas andragogy focuses on structured education, in heutagogy *all* learning contexts, both formal and informal, are considered.[2]

As such, it encompasses on one hand, a body of learning strategies focused on the maturity of the learners. On the other, hopes that the teacher encourages students to develop a critical consciousness that leads to the ability to question knowledge, creating and recreating them in a movement of permanent change.

So, this characteristic is not the privilege of ICT in Education. It was mentioned a long time ago and coveted by many educators. Talking about just a few decades ago, we mention Freinet, Dewey, the constituents of the Progressive Education, Piaget and his successors, Paulo Freire in Brazil, among others.

Moreover, the current psychology, in their different schools, argues that the human being is a social being and, as such, its knowledge is neither in the subjectivity representation nor in the objective representation, but instead in interaction between them. It is a construction weaved throughout human life, which occurs through the interaction between subject and environment, by direct apprehension of reality or indirectly, i.e. through the significant people who introduce him in the world.

Depending on the type of human being that "school of life" and life of school are forming, the learning process of young or adult will always be a result of what has been built in previous stages of its development, either in the rational dimension, or in motivational and contextual dimension. There is no way to be different.

Then, how to have a young student with: innovative, autonomous with large capacity copyright, both in collaborative classroom learning and in distance learning courses, whether in our elementary and high school, still dominate in the curricula the climate of silenced voices, knowledge focused on the teacher, rigidities in respect of time to teach and assess?

How to pass, suddenly, from this model of teaching-learning closed to a modality in which the person has freedom to choose the sources of their searches, even though these may not be the best, or not being teacher's universe? The captive bird reach the possibilities of their peers raised free? I'm sure not. And here I feel the need to make two considerations.

First, the almost impossibility and danger of moving from a pedagogical model for another with total different structures, without a period transition that breaks paradigms, helpful for any education modality.

Second, the fact that, both in this transition phase, as at any point in changing cultures, there will always be those people in the social context that will have the role of "master", i.e. the function to pass for those who do not know their experience and their knowledge.

Is it essential for the beginners to live together with the elders, teachers or experts. The construction of skills has centrality in observation, i.e., one that doesn't knows the function in which is being initiated must observe essentially how one who already knows acts, to perform the function. In antiquity, the young warrior watched the more experienced. The Apprentice

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[1] The opposite is andragogy (standard for student attendance), considered bearer of the best ways to learn, structured education: the way actually has been adopted in elementary and secondary education.
[2] http://en.wikipedia.org/wiki/Heutagogy, accessed in November, 04, 2012.

helped and watched the master craftsman's workshops Medievo. (Oliveira and Andrade, 2008 s / p)[3]

Facing such considerations, I believe this is the teacher's role, either when exercising his chaft of teacher, as when debates the issues with their students providing them strengthen their arguments. That is, to provide the starting point of knowledge, guide the boldest, questioning those who have only certainties, encourage the more timid to place their views, discuss the content, these are precisely the functions of the one whom is usually called *sufficiently enough teacher.*[4]

But, in that empirical basis my belief is woven? We will explain in the closure of this paper.

4. Conclusions

Let to start with the question "why teachers are not really interested in the use of ICT in Their pedagogical practice?". I think to have left a trail of reasons that should be known by administrators and teachers about the real possibilities and value of ICT as well interlocked.

And if, retaking the walk of this path, were given to the teachers the knowledge of their relevant role in the construction and implementation of a successful activity with digital media, they would see there is much to do in that context. There is much space in which its role and competence are welcome.

So do not imagine that ICT put an end to teaching. More than ever, with new virtual learning spaces, as not all good nor all bad, what we need is exactly who fill them proficiently, with culture, with critical discussion. What we need is exactly who fill them with proficiency with culture and critical discussion. The machines, digital spaces, the info ways, social networks, banks access to information, all this new technology available need competent people to manage it appropriately.

Neither the teacher nor anyone operates alone. It can and should be called as an active participant of an interdisciplinary team to take care relationships between men and machines. This task will always be of a well-orchestrated team.

Why the delay to motivate the teacher to be more present at the environment where the Internet was born? Paraphrasing Penido(2011),why cogitate to capacitate a teacher only to deal with the Internet, instead of making it a key instrument for the construction of teams that can change the paths of Internet?

And yet, why not developed a way to teach that lead for a more secure network, which is prepared to ensure the frank freedom of speech and emancipatory processes, founded on humanistic principles and not in marketing plans?

Why distressing domination and marketing that certainly exists on the Internet which tramples over, scares away and even disqualifies other excellent experience involving any initiative in this field?

Still according Penido (2011), it is very convenient to guarantee freedom of expression on the Internet when in reality, what you do is just remodel and adapt digital terrain already established and not always of good quality, repeat and not doing so there is the creation of improved platforms, processes and protocols. Which freedom of expression is that? Penido

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[3] free translation

[4] it is an analogy here with one of fundamental concepts of Winnicott on human development - *good enough mother* . Winnicott (2000) refers to the sufficiently good mother to the baby one that allows the illusion that the world is created by him, giving him thus the experience of omnipotence primary, basis of make creative. And the creative perception of reality is an experience of the self, singular nucleus of each individual.

asks. And why the educator does not engage in these technical groups seeking for better solutions to platforms that support courses?

Certainly, in the technical groups, still miss the critical educator, competent in this field that has the capacity and strength to produce a new moment of education within a new design of the classroom. There is a lack of a "silver thread that connects devices to their users." (Penido, 2011s / p)

Perhaps at the very core of this gap, which lacks the teacher to be an effective and essential member of these teams is something that the whole society knows, but that the political education do not seem to be worried about letting go: feel the prestige of teaching; receive a decent income; empower itself really; feel, as a consequence, the motivation to improve always ,expand their contacts and share knowledge with colleagues from different places and from different areas in the corners of highways and social networks; enjoy the Internet space to create and recreate knowledge.

And above all, let yourself be taken by the utopia of being a teacher, not limited to their knowledge, but also by what is now also available on the Internet and will come. Be able to dive safely in the expanded world that Internet presents.

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Use of Tablets for Instruction and Learning in Microbiology Labs

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Abstract
In the Bachelor Programme of Biomedical Laboratory Analysis at University College VIA, the students work in a classified microbiology laboratory. This means that they are not allowed to bring their personal computers into the lab. Until now the students have used paper based lab instructions and taken notes by hand. Use of tablets in the lab offers new opportunities. In September 2012, nine tablets were introduced into one of the labs of the college. Groups of students use the tablets to access documents, watch video instructions, and to document results and procedures digitally. The objectives of this project are to develop a technological infrastructure to support students' work in the lab and to develop teaching and learning resources. Our research question is: How is teaching and learning in the laboratory influenced by the tablets and the following multimodal teaching and learning materials? The empirical part of the project has been documented through field observations in the lab (in writing and with photos). We have found the following to be characteristic of the work of the students: the students use the tablets collaboratively, take more photos than requested, use the video based instructions, use the internet access, and combine the use of tablets with paper based instructions.

1. Introduction

This project is relevant because of the political agenda in Denmark and the strategy for VIA University College (VIAUC strategy), which focus on an increase in the use of ICT in teaching and learning. Apart from the political agenda there were several other good reasons for implementing tablets into the microbiology laboratory:

- The students work in a classified microbiology laboratory on campus. In a classified laboratory the student has to follow certain regulations to minimise the risk of spreading infectious agents outside the laboratory. This means that the students are not allowed to bring their own laptops into the lab; a requirement, which in the past has made use of ICT in teaching and learning difficult. The introduction of tablets into the laboratory now makes that possible.
- Until now the students have used paper based lab instructions and taken notes by hand. Subsequently they have worked with their handwritten materials in the form of notes and drawings, when they prepared their group reports afterwards. The tablets enable the students to document various results and procedures digitally with photographs and video recordings.
- Until now the lecturer in the laboratory has given instructions to all students at the beginning of each lecture, e.g. "the procedure for the Gram stain". Picture 1 below shows a normal laboratory instruction. The lecturer sits at the desk demonstrating the different steps in the procedure. It is difficult for the students to observe the details because of the layout of the laboratory. The use of the tablets makes it possible to watch instruction videos when the students are about to perform "the Gram stain".
- The size and mobility of the tablets make it easy for the students to bring it to the different work stations in the laboratory e.g. the chemical fume hood. In addition the tablet is easy to disinfect compared to a laptop.
- When our students graduate, they will meet technology with a variety of interfaces in their workplaces since paper no longer is a part of the work in a hospital laboratory in Denmark. The use of tablet computers in the microbiology laboratory trains the student's ability to use other interfaces than the one they know from their personal laptop.

Figure 1. Instruction from lecturer to students in the lab

This paper deals with the following three questions, which will be used as the structure of the three main sections of the paper (Theoretical framework; Methodology; and Discussion):

- How to develop a technological infrastructure to support students' work in the lab?

- How to develop teaching and learning resources for the tablet?
- How is teaching and learning in the microbiology laboratory influenced by the tablets and the multimodal teaching and learning materials?

Mang and Wardly (2012) say about the use of tablets for learning purposes, "Because the technology had only recently become available, there is only a small amount of literature surrounding the academic applications of this technology" (2012, p. 302) and most of the literature has focus on the tablet as an individual device in the classroom. Orinn et al. (2011) found the following, "From our study it is clear that the number of applications developed to run on the iPad are principally targeted at the consumption of content within various media and not necessarily the creation or collaboration of that content" (2011, p. 48). In this study, we focus on the use of the tablet as a shared device, where students are expected to watch instruction videos and collaboratively create various products using different modalities (text, photo, video).

2. Theoretical framework

For the purpose of this study, we understand learning as an individual cognitive and psychological process, which takes place as an interaction between the individual and the surroundings, as described by e.g. Illeris (2006). By 'surroundings' the author means all the materials and people that the learners interact with as a part of the learning process (Illeris 2006). The students interact with the materials in the laboratory, including the tablet, and the lecturers and the other students.

2.1 Developing a technological infrastructure to support students' work in the lab

For faculties considering adopting tablets as a mandatory component in their classrooms, Colin et al. (2012) recommend that they should know everything about the tablet operating system and decide how the tablet is to be used by the students, and describe the features. They also recommend working closely with the Information Technology department in your institution, and considering how to distribute the tablets (Colin et al. 2012). In this project we were familiar with the iOS operating system used on the iPad. We decided how we wanted the students to use the tablet in the laboratory so that it could be a relevant part of the students' work there. Via the Internet connection of the tablet students had access to the college LMS, where they could watch instruction videos, pick up laboratory instructions and save a copy on the tablet. The students could then write and insert photos in their personal copies of the instructions. In addition, we wanted to make use of the built-in-video recorder in the tablet. We decided that the tablet should provide access to a camera app, a video app, and an editing opportunity. The tablet should also enable export of the students' results from the laboratory to their own laptops so they could continue the work with their results from the laboratory. The tablet also provided access to e-mail. We assisted the students with the tablets in the laboratory when they attended the first lesson, and we had written a one page document about the use of the iPad for the students to read before the first lesson in the lab. This document was also available in the laboratory. We did not involve the IT department for technical assistance because the tablets stayed in the laboratory, and we would assist the students ourselves with the few technical problems, which occurred during the lessons.

2.2 Developing teaching and learning resources for the tablet

Mang and Wardly recommend that the lecturer designs activities that make use of the Internet connection of the tablet and its ability to let the students share information and collaborate, because it will enrich the students' learning experience (2012). In this project we planned student-activities where the students had to work in groups of 2-4 around one tablet. We re-modelled the laboratory instruction so the students could write text and add photographs when they were in the laboratory.

In addition to this we produced two instruction videos. The instruction videos were produced with textboxes to explain the demonstrator's actions instead of a soundtrack, so that groups could play the videos without disturbing other students. The videos had to be accessible from the laboratory and from the students' laptops at home, so students could use them in preparation for the lessons in the microbiology laboratory[1].

3. Methodology

3.1 Research questions

- How to develop a technological infrastructure to support students' work in the lab?
- How to develop teaching and learning resources for the tablet?
- How is teaching and learning in the microbiology laboratory influenced by the tablets and the multimodal teaching and learning materials?

3.2 Setting the scene

The Bachelor Programme of Biomedical Laboratory Technology at University College VIA is a 3½ years programme, which consists of 14 modules. Almost all modules include teaching both at campus and in hospital laboratories. The students are typically between 20 and 30 years old, the majority being female. Attending the programme is free of charge, but they have to buy their own textbooks, and they are also requested to bring a laptop to college every day. Lecturers at VIA University College create study plans on the basis of the study regulations and the curriculum, and have a certain degree of freedom of choice in relation to which themes, books, resources, and students' learning activities they use in their teaching. The decision to bring tablets into the microbiology laboratory can be seen as one such pedagogical decision made by the lecturers.

In the autumn of 2012, twelve tablets were introduced into the microbiology laboratory at VIA University College. We provided the groups with a base model iPad 2 with 16 gigabytes (GB) of storage capacity.

In the lab

The students read the lab instructions as a home assignment before the lessons in the lab. The students work in groups of 2-4 persons in the lab around one tablet with digital access to

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[1] Link to the video instructions (in Danish).
Preparation for gram stain: http://www.youtube.com/watch?v=HY2kCr01Yxw&feature=youtu.be
Gram stain: http://www.youtube.com/watch?v=VRYqVK4-RsU&feature=youtu.be

lab instructions. The lecturer demonstrates various procedures to the students, e.g. plating of bacteria. The students watch instruction videos and work with various procedures, e.g. the so-called gram stain. During their work they take notes, document their results, and take photos. Some students may record videos. The tablets stay in the laboratory, which means that the students need to e-mail their products to their own e-mail addresses and upload their video to the Internet. After the lessons they prepare and hand in a group report.

Participants in the study

Two classes (60 students in total), one lecturer per class, and two observers participated in the study. Each group of 2-4 students received a tablet when they entered the microbiology laboratory. Anecdotal evidence and observations of students in the classrooms suggested that many of the students were already familiar with the iOS operating system from using iPhones. A few students owned an iPad prior to the course.

Research design

The students were observed in the laboratory during 12 lessons. The observations were documented in writing and with photos. To find out how other researchers had implemented and evaluated the use of the tablets for learning purposes, we used ERIC for our literature search. We read all abstracts and selected five articles that we found relevant for this study.

Keywords	Number of posts
iPad and learning, Peer review (2010-2012)	27
iPad and instruction, Peer review (2010-2012)	17
iPad and laboratory, Peer review (2010-2012)	1
Video and instruction and laboratory, Peer review (2007-2012)	51
Tablet and learning, Peer review (2010-2012)	50
Tablet and instruction, Peer review (2010-2012)	67
Tablet and laboratory, Peer review (2010-2012)	1

Table 1. Results from literature search

4. Findings

The analytical focus was on the students' learning experiences with the tablets, which meant that the observers focused in particular on the students' meta-communication related to the multimodality of the tablets and their roles as producers of material during the lab work.

4.1 The use of the tablet for reading the laboratory instructions

The students started using the tablets immediately, without prior training, and the tablet quickly became a part of the workplace (pictures 2, 3, 4). The students read the laboratory instructions and used the scroll and zoom functionality on the tablet. They used the tablets collaboratively, took turns, and helped each other. They talked about the procedures that they were about to perform. Picture 3 shows how the students bring the tablet to the various workstations. Photo 4 shows the students combining the use of tablet, paper based instructions, and paper for taking notes, indicating that they use a combination of modalities.
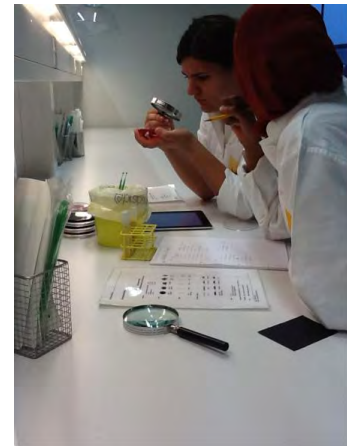
The students cannot bring paper into or out of the lab, which means that they have to take a photo of their notes and e-mail this to their own e-mail addresses.

Picture 2

Picture 3

Picture 4

4.2 The use of the tablet for watching the video instructions

The students used the video-based instructions: "Preparation for gram stain" and "The gram stain" to a great extent (pictures 5, 6). In the laboratory the students watched and paused the video in parallel with carrying out the procedures. Some of them said, "It is very clever with such a video, I hope they will make more", and "Where is the video for the next procedure?". Some students used the paper-based instructions in combination with the video instruction.
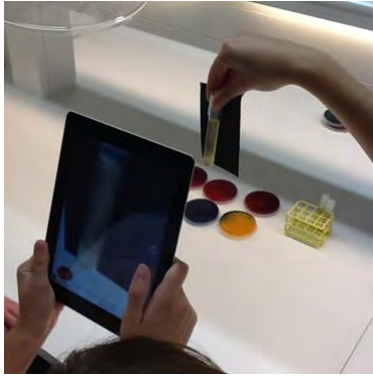

Picture 5

Picture 6

4.3 The use of the tablet for documentation of results

The students were asked to document some of their results with photos (pictures 7, 8, 9). They took more photos than requested, and some of the students said, "We should take a photo of it", "Just to remember", and "It's a pity that we can't take photos in the microscope – now we are getting used to taking photos". One student said while capturing a photo, "It is easier for us, when we can use the iPads ...".
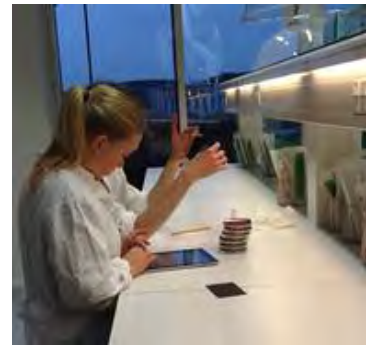
Picture 7

Picture 8

Picture 9

The students were also asked to write texts about their laboratory results on the laboratory instruction sheet (pictures 10, 11, 12). At the end of the microbiology lessons, the students e-mailed the instruction with their personal annotations and photos to their individual e-mail accounts for access outside the lab. The lecturer helped the students with this e-mail procedure the first time. Afterwards they were able to do it themselves. Problems arose when students had placed too many photos in the document that they wanted to e-mail or the Internet connection was off.

Picture 10

Picture 11

Picture 12

4.4 The use of the tablets for recording videos

Some students used the tablet for recording videos (pictures 13, 14, 15). They recorded each other performing a skill, and afterwards discussed the result, and occasionally they made a new video. Video recording was not mandatory, and only about 1/3 of the student groups captured videos. We had technical problems with the upload of videos from the iPads; a fact that may have prevented some students from engaging in this.

Picture 13 **Picture 14** **Picture 15**

4.5 General observations

We observed that students used the tablets more than asked to by their lecturer, e.g. to take extra photos and to look up technical terms on the Internet. In addition, they came up with ideas for improving the use of the tablets in the microbiology laboratory. Some students mentioned that they would like to capture microscope-photos, download a timer-app and a Dropbox app to their tablet.

The students' work in the laboratory took as long time as usual (meaning before the introduction of the tablets). The lecturers express that they are less busy than usual, especially around the gram stain procedure. Furthermore they observed that the reports they received from the student groups contained photos of a high quality, and the theoretical parts and analyses of results were better than usual, e.g. with fewer errors and at a higher professional level.

5. Discussion

5.1 How is teaching in the laboratory influenced by the tablets and the multimodal teaching and learning materials?

One result of influence on teaching is that the lecturer is less busy during the microbiology lessons. When the students can "help themselves", because they have access to the video instructions, the lecturer has an opportunity of differentiating teaching in the laboratory. The lecturer can teach more and guide the students who have difficulties in demonstrating the right skills, managing the different tasks, or even reading the instructions. When the laboratory instruction is available on the tablets, the lecturer does not need to produce updated paper-based and laminated instructions for every class. This means that the lecturer is less busy preparing for the lessons.

Teaching is also influenced in the way that students hand in reports with photos rather than their own drawings of lab results. It is easier for the lecturer to understand the formulations concerning the results in their group reports, which means better reports. This makes it easier for the lecturer to give feedback and to assess the students' work.

A third way the teaching is influenced concerns the quality of what the students e-mail from the laboratory to work on for the reports. When the students have time to write notes for their reports in the laboratory and also have the opportunity to ask the lecturer questions, the quality of their work improves.

A fourth way the teaching is influenced is by the videos produced by the students. The videos give them an opportunity to evaluate their own skills, when they watch the videos together and discuss their actions. Now, not just the lecturer is assessing the students' actions in the lab. The students can teach and evaluate each other as well, which means that the lecturer can spend more time with students who need further assistance and instruction. Some of the students watched their own videos and discussed them in the lab.

5.2 How is learning in the laboratory influenced by the tablets and the multimodal teaching and learning materials?

One of the ways learning is influenced is by the fact that students collaborated in the laboratory, they read the instructions together, talked about the procedures, helped each other, and took turns with the tablets for writing and taking photos. The students were generally positive about the use of the tablet. In contrast, other researchers found that "The main drawbacks of tablet technology include the difficulty of typing on the keyboard, which is simply projected on the lower portion of the screen, and also the difficulty of writing or drawing with one's finger-tip" (Colin 2012, p. 303). This was not a problem in our study, maybe because the students only had to write down results and notes during the laboratory lessons.

Learning was also influenced in the way that the students' work in the laboratory involved the use of different modalities. The students took photos, recorded videos, watched the instruction videos when they needed too, read instructions on the tablets, and took notes on the tablets. Some of the students even read the paper-based instructions and wrote notes on paper as well. This shows that the students use different and even multimodal approaches in their learning process when it is possible. The tablet can support these different approaches as well. In this way the students can choose their preferred way of working, and the learning process then becomes more student-controlled. These findings agree with Rossing (2012) who found that "when using the iPads, students can access visual material such as videos or photographs (...) in an activity that appeals to tactile, visual, and auditory learners" (Rossing 2012 p. 16).

We found that the students used the video instruction in the lab to a great extent, which meant that the students could "help themselves" in the lab and were not dependent on what they could see or remember from the live instruction at the beginning of the lesson. Crocker et al. (2010) came up with similar findings using instruction videos in connection with students' work in the laboratory. Crocker's students often arrived at practical sessions with no clear idea about the techniques, the skills, or the underlying scientific principles. So the lecturers created instruction videos and allowed students to preview the practical assignments beforehand, as we did. They found that the videos enabled students to become more autonomous and efficient learners in the laboratory, and that it allowed more time during the practical sessions for higher level interaction with demonstrators (Crocker 2010). We have similar findings, e.g. in the fact that the students were better prepared than usually for the "gram stain procedure". The students said that they would like to have access to more video instructions in the laboratory. We find that it will be a good idea to produce more video instructions for use both at home and inside the microbiology laboratory.

With the tablets, students can document their results in a more authentic way than before. One student expressed the opinion that the use of photos "makes it easier for us". The students do not have to make drawings or describe what was seen on the plates to document the look of the bacterial growth, and they can use the time they save on this to produce notes for the mandatory report, to discuss deviations from theory, and to ask the lecturer any

questions that may arise. When the students can write a part of the text in the laboratory, there will be supervision from the lecturer for this part, and also less homework. We observed that the reports were better than usual, e.g with fewer errors and with a higher professional level, perhaps because the students produced a more thorough rough draft of the group report in the laboratory than they did before the tablets was introduced.

The students' video productions give them an opportunity to have a conversation about how to perform a skill, and about what is important in connection with this specific skill. When watching the video afterwards, they see for themselves how they actually perform. They get an opportunity to reflect upon their actions in the lab. Pereira et al (2012) have used student produced audiovisual reports in a physics programme, and concluded that one of the advantages of this was the responsibility assumed by the students, since the video they produced would be watched by others. In future we will ask the students to produce videos for the digital *notes in laboratory techniques* and then lecturers will use students' videos in the teaching of the class in the ordinary classroom, e.g. for repetition. In this way, the videos produced will be used by other people. Pereira et al (2012) concludes that it is advantageous to use audiovisual reports rather than traditional reports because it may enhance the students' imagination and creativity, and may also have implicit cognitive aspects. The use of students' video production in the laboratory, maybe with speech and editing, will give students an opportunity to be more creative and autonomous in their learning process.

In general the students were positive about using the tablets, and they did not experience problems with the tablets that could not be solved immediately by the group of students or the lecturer. Typical problems would be that the tablet was not connected to the Internet, that the documents they wanted to e-mail contained too many photos, and that the students' mailboxes were too full to receive mail. The students brought the tablet to the different workstations, as we expected. We also found that the use of the tablet was not time-consuming, as the work in the laboratory took as long time as usual. This was an important finding because the work in the microbiology lab should primarily be about microbiology. In addition the students came up with ideas for improving the use of the tablets in the microbiology laboratory.

This study is limited by the exclusive use of the Apple iPad 2. We believe that our findings regarding mobile tablets are applicable to other tablets on the market. As this study used observation of 60 students in the laboratory for a limited number of lessons, the extent to which our results can be generalized may be limited.

6. Conclusion

Our overall conclusion is that the use of the tablet had positive effects on both teaching and learning, as summarised below:

The teaching is influenced in the way that the lecturer is able to differentiate teaching in the laboratory, because the use of instruction videos saves time that can be spent on students who need extra guidance.

The learning is influenced in the way that the students work in a collaborative way; the learning process is more student-controlled; the students can choose different approaches or multimodal approaches to learning in the laboratory, and the students' learning products (their group reports) are better with the use of tablets in the lab.

In this project it was not mandatory for the student to record a video. In future we will ask all the groups to record videos of different skills or procedures they perform in the laboratory, which can be shared in the LMS or the digital *notes in laboratory techniques* and used in the teaching of the theoretical part of the subject with the students in an ordinary classroom. In addition we will make it mandatory to capture and reflect on videos from the laboratory.

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Assessing students with media and technologies: opportunities and limits from teachers' point of view

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Abstract
The paper aims to investigate why, when and how media and technologies could be used in classroom to assess students' achievement and learning. It presents an evaluation case study of the Italian project "Cl@ssi 2.0", addressed to middle schools in order to innovate learning environments trough diffused use of technology and to verify the impacts on educational processes. The essay focuses on data collected from logbooks, a monitoring quali-quantitative tool, administered online, trough which teachers have described technologies' use in classroom, expressing judgments on their impact on instructional processes. The longitudinal data analysis shows how, how often and for which purposes teachers have applied technologies to enhance assessment practices and methods, collecting their opinions on occurred changes in the assignments and schoolwork and on the impact on students' behaviours. The research suggests the potential of technologies to realize a variety of effective assessment and evaluation strategies; at the same time, it shows how their availability in classroom doesn't imply an automatic teaching innovation and provides insights to go beyond a purely technological vision of media toward a deepening of their methodological and educational opportunities.

Keywords
ICT, student assessment, teachers, school innovation

1. Introduction

Assessment is a fundamental aspect of learning and teaching processes, since it can lead to improve educational practice which in turn can lead to enhanced learning (Lincoln, 2009). In the last years, due to the growing spread of Information and Communication Technologies (ICTs) in schools, new challenges to assessment in general, and to technology-enhanced assessment in particular, have raised. Besides an emerging broad consensus worldwide on the benefits of an appropriate use of ICTs in education (Eurydice, 2011), there is a lack of evidence on their actual classroom use for assessment purposes (Redecker, 2013). One of the key points seems to be teachers' roles and competences (UNESCO, 2011): they are more and more expected to use effectively ICTs to develop not just new approaches to teaching, but also new approaches to assessment. Such expectation has become more pressing after the publication of the European Key Competences Recommendation (Council of the European Union, 2006), that has implied a different understanding of the "competence" concept. Although the EU document recommends the ICTs' use to teach and to assess Key Competences, it doesn't clearly indicate in which ways, raising the question whether and how ICTs could be used in this context (Eurydice, 2011). Thus, take-up and implementation of technology-enhanced learning environments and ICTs as assessment tools in school is still low and their potential seems to be not widely or critically studied (Redecker, 2013). So, there is an increasing attention to explore how technologies could be effectively used to improve students assessment strategies and methods. The main key questions emerging are: how teachers could integrate ICTs' use into daily educational activities to support students' assessment? How can ICTs be used to support Key Competences - based assessment strategies? Which are the potential benefits for students and teachers? What hinders the more widespread use of ICTs for assessment?

2. Theoretical framework

The term e-assessment is used to denote «a wide range of activities where technology is used in the designing and delivery of assessments. It also includes the processes of reporting, storing and transferring data associated with assessments» (Callan & Clayton, 2010, p. 9). To summarize the development and trends in ICT-enhanced assessment in the last decades we can refer to the four generations of computerized educational measurement (Bunderson et al., 1989; Martin, 2008; Bennet, 2010):
1. Computerized testing: administering conventional tests by computer;
2. Computerized adaptive testing: tailoring the difficulty or contents of tests on the basis of previous examinees' responses;
3. Continuous measurement: using calibrated measures embedded in a curriculum to continuously and unobtrusively estimate dynamic changes in student's achievement trajectory;
4. Intelligent measurement: producing intelligent scoring, interpretation of individual profiles, and advice to learners and teachers, by means of knowledge bases and inference procedures.

The development path along the four generations marks the transition from Computer-Based-Assessment (CBA) approaches (also referred to as Computer-Based-Testing, CBT) characterizing the first two generations, to the "Generation Reinvention" or "Transformative" testing ones, embedded in the latter two generations. The CBA approaches focus on the notion of testing and on computers' use to improve the efficiency and effectiveness of testing procedures, improving the validity and reliability of test scores and making a greater range of

test formats susceptible to automatic scoring. On the other hand, generation 3 and 4 imply the integration of assessment into teaching and learning processes, so that students can be continuously monitored by the electronic environments which they use for their learning activities, providing instant feedback to learners and teachers, allowing them to assess performance, understand mistakes and personalize future learning strategies, based on students' individual learning needs and preferences, as displayed in his/her past and current learning activities (Redecker, 2013). To refer to the transition from the first two and the last two generations of e-assessment, the notion of "paradigm shift between explicit and implicit assessment" has to be used (*ibidem*, p. 12). It refers to the potential opportunities provided by "Transformative" strategies to assess skills that have been difficult to measure with previous traditional assessment formats following a test-approach (Binkley et al., 2012). While the latter tends to replicate traditional assessment approaches, based on the explicit testing of knowledge, the former ones have the potential to enhance the assessment of the more complex and behavioural dimensions of the Key Competences (Council of the European Union, 2006). The notion of Key Competences has required a paradigm change from transmitting a static body of pre-defined knowledge to a more dynamic and holistic development of competences (European Commission, 2012a), conceived as a combination of knowledge, skills and attitudes required for personal fulfillment, active citizenship, social cohesion and employability in a knowledge society. They are related to the "21st century skills" (Binkley et al., 2012), including "critical thinking, creativity, initiative, problem solving, risk assessment, decision taking, and constructive management of feelings" (Council of the European Union, 2006). Nowadays, almost all EU Member States have included Key Competences into national curricula and other steering documents (Eurydice, 2012). However, one of the open question refers to how to assess these competences, since it has to be noted that «most current assessment methods have a strong emphasis on knowledge and recall and do not sufficiently capture the crucial skills and attitudes dimension of Key Competences. Also the assessment of transversal Key Competences and the assessment in the context of cross-curricular work appear inadequate» (European Commission, 2009, p. 5). Thus, in the awareness of the importance to make Key Competences "assessment ready" by specifying them as concrete and tangible learning outcomes (Looney, 2011; Cedefop, 2012), the need underlined by European Commission is becoming a common thread in technology-based educational innovation processes occurring in all European education systems (OECD, 2010; Kampylis et al., 2012): «the potential of new technologies to help find ways of assessing key competences needs to be fully explored» (European Commission, 2012b, p.7).

Thus, recently, the efforts are toward the increasing use of e-assessment strategies leading teachers to conceive assessment as having more value than mere testing of knowledge. The aim is to make e-assessment much more than just an alternative way of "traditional" assessment methods. On this point, "assessment for learning" seems to be the appropriate framework to exploit ICTs' potentialities and to make them embedded in daily classroom activities. It refers to assessment that is ongoing throughout the learning process rather than at the end of it, with the main emphasis on motivating and improving student learning (Lincoln, 2009), consisting in «…all those activities undertaken by teachers, *and by their students in assessing themselves*, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged» (Black & Wiliam, 1998, p. 2).

3. Assessing e-assessment strategies: an Italian case study

The paper focuses on an evaluation case study of "Cl@ssi 2.0" project, launched by the Italian Ministry of Education in 2009 and lasted three years. It has financed the set up of

technologically advanced classes in Italian middle schools to innovate learning environments trough diffused use of technology in everyday school life (Schietroma, 2011). The project has involved 156 classes of Italian middle schools, selected and regionally distributed considering the number of active classes in 2008/09 school year and based on a project proposal designing a teaching, technological and organizational model to be implemented. The selected classes have received a grant to purchase the technological equipment needed to realize the proposed project, whose implementation has been entrusted to teachers involved in the classroom councils. On the whole, 3.432 students and 1.404 teachers have been involved.

The general aim of the evaluation project was to verify the ICTs' impact on educational processes and student's achievement. The following pages focus on data collected from a monitoring quali-quantitative research tool, administered online to teachers, in the form of logbook, in each of the three years of the project (Campione et al., 2012). Logbooks' aim was to collect documentary evidence on all project stages, monitoring its implementation in each classroom, investigating whether, to what extent and how the use of technologies could have changed teaching and learning processes.

The main questions addressed by this paper regard the ICTs potentialities to enhance assessment practices and methods; the challenges that teachers face in using technology for assessment purposes; the technological tools most suitable for the assessment and the consequent impacts on students' behaviors.

4. ICTs as assessment tools: putting teachers to the test

The sample consists of the classes who have completed the three logbooks[1]. The first one was compiled from 126 classes at the end of 2010 (response rate 80.8%), the second from 100 classes in the middle of 2011 (response rate 64.1%), the third from 113 classes at the end of 2011 (response rate 72.4%).

First of all, the project didn't indicate specific technological tools to purchase, but each class could decide which instruments to buy, or use among those already at school, according to project's objectives. Therefore, it's interesting to identify the most purchased technological tools (tab. 1).

technological equipment	N	%
tablet/pc/notebook	123	87.2
interactive whiteboard	104	73.8
camcorder	59	41.8
video projector	55	39.0
photographic equipment	50	35.5
Internet connection	48	34.0

Table 1. Most purchased technological equipment

Almost nine classes on ten (87.2%) have decided to buy tablet/pc/notebook and three quarter of the sample (73.8%) an interactive whiteboard. Camcorder (41.8%), video projector (39%), photographic equipment (35.5%) and Internet connection (34.%) are the other most purchased technological equipment. On the contrary, less purchased are e-book, Ipod/Ipad and mobile phones.

Looking at quantitative data on assessment methods (tab. 2), the prevalent students' learning assessment modalities are "traditional examination" (both oral, both written). We can also note a trend, in almost one third of the sample, to perform examination with pc.

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[1] For each class logbooks were compiled by the coordinator of the class council.

Analyzing teachers' open-ended answers, a lot of them have explained to use technologies to evaluate digital/multimedia materials (such as podcast, video, hypertexts, blog) realized individually or in group by students and presented to their classmates. In the "other" answer modality, teachers have declared to use sometimes online survey or tests and, less frequently, interactive whiteboard to carry out interactive exercises.

Students' learning assessment modalities	First logbook	Second logbook
traditional examination	48.7	42.6
examination with pc	33.5	34.6
observation	11.4	19.9
other	6.4	2.9
Total	100.0	100.0

Table 2. Students' learning assessment modalities (%)

Technologies have been used to perform class assignments in over 90% of classes (tab. 3), quota slightly increasing during the project implementation. The growing use of computer as assessment tool over the months emerge also considering that, while in the first project year class assignments have not been replaced by tests with computer in 60% of the sample, in the second year they have been replaced in over two-thirds of respondents (67.1%, tab. 4), particularly in some disciplines, like Italian, science, mathematics, geography and history.

Class assignments envisages the use of technologies?	First logbook	Second logbook
never	9.2	7.1
sometimes	85.3	88.2
always	5.5	4.7
Total	100.0	100.0

Table 3. Using technologies to perform class assignments (%)

Class assignments have been replaced at least partly by tests with the computer?	First logbook	Second logbook
no	59.6	32.9
yes	40.4	67.1
Total	100.0	100.0

Table 4. Using tests with computer to replace class assignments (%)

The third logbook data, however, outline an non homogeneous picture on at what extend the project has changed the way of performing class assignments: over an half of the sample (54.3%,) observes changes in this context, while the other classes declare "little" (almost one third of the sample, 33.7%) and "in no way" (a little further than one class on ten).

To what extent Cl@ssi 2.0 has changed the way of carrying out the class assignments?	N	%
in no way	11	12.0
little	31	33.7
rather	42	45.7
a lot	8	8.7
Total	92	100.0

Table 5. Using tests with computer to replace class assignments (third logbook data)

Besides, it was also interesting to explore if, and at what extend, the use of technologies has changed teaching practices and methods, and the resulting impacts on assessment strategies and students' behavior. It has emerged a predominant use of technologies to perform group or in couple works, promoting collaborative learning and discussion among students. Although still widespread, in the third year the use of methods favoring students' individual work seems to be less frequent. By linking the use of the most purchased technological instruments and applied teaching methods we can note:

- interactive whiteboard appears to have been the most effective educational tool to increase students' levels of involvement in classroom activities by improving physical interaction with the board.
- Camcorder and photographic equipment have been mainly used to realize multimedia materials, favoring group works and stimulating creativity and initiative students' skills.
- Internet has been mainly used to enhance students technological skills and competences of web resources to perform research on specific topics, realized especially in group, favoring knowledge sharing. Besides, teachers have focused also on teaching of appropriate strategies and procedures to deal with Internet safety issues.
- School platform and forum have been mainly used to promote collaborative learning and to stimulate virtual discussion among students, supporting inquiry and enhancing communication trough the use of such web-based collaboration and social environments.

Finally, opinions expressed by teachers in the third logbook allow to clearly identify the main advantages and obstacles related to ICTs' use for assessment purposes. First of all, Cl@ssi 2.0 project have developed among teachers an increasing attention to potential effectiveness of technologies' use for assessment. This has stimulated them to a deeper reflection on how to implement monitoring and evaluation instruments to be daily adopted in classroom. One example refers to an "observation form", considered an appropriate tool to gather information about students' learning on the basis of what they do with ICTs in class, allowing teachers to assess not just, of course, digital, but also "transversal" competences. On the other hand, however, some teachers have complained the lack of "objective" assessment criteria to effectively evaluate educational processes and students' achievements.

The main identified advantages of ICTs' use for assessment are related to the following opportunities:

- to obtain instant feedback on students' learning, making more ease and quick class assignments correction procedures;
- to enhance students' self-assessment skills, making them awareness of their own learning strategy and allowing them to prove its effectiveness and to determine their own learning goals and plans;
- to emphasize the application of knowledge to real world problems and authentic situations, focusing on complex problem solving skills and transversal competences, overcoming the risk of a mere abstract and instrumental students' learning;
- to create more flexible classroom learning environments, applying technology to support collaboration among students, inviting them to work in group "anytime and anywhere";
- to capitalize on students' inclination and enthusiasm in daily using pc and other technological instruments in order to make them tools to use not just at home and for recreational purposes, but also at school and for educational aims.

5. Step by step: going through technology-based educational innovation pathway

The research allows to focus the attention to some ICTs potentialities for assessment purposes, some of them explored and tested by teachers, others requiring a more in-depth practice to fully exploit them. Although our findings cannot be generalized on a large scale, considering the sample size, the research could provide elements to reflect especially for its longitudinal nature. The opportunity to monitor the project implementation over three years have limited the weak points connected to an analysis time-restricting, especially considering the importance of "time factor" to favor the effective use of technology in education. Besides, even if the general aim of evaluation case study was not just focus on assessment issues, the analyzed variables could be adopted in future researchers aimed to fully seize ICTs' opportunities for assessment.

Referring to students' learning assessment modalities, "traditional examination" seems to be still the predominant form of assessment in many classes, confirming recent research findings that have collected the opinions of almost 8.000 teachers from all over Europe (Cachia et al., 2010). However, generally, Cl@ssi 2.0' teachers have appeared motivated to experience the use of technologies to perform class assignments, even if this cannot be generalized to the overall sample, since the project hasn't changed the "traditional" practices in almost an half of classes.

Observing the prevalent ICTs-based teaching methods, teachers have showed a predominant use of technologies to achieve methods corresponding to a constructivist approach of learning, encouraging the active students' participation in classroom activities through the proposal of problems to solve, of real tasks as much as possible derived from reality (*problem solving*), and of activities promoting a real "doing" by the student and the learning through action (*learning by doing*). This leads to reflect on the potential change provided by ICTs to "traditional" teaching methods, favoring the shift from lectures for the transmission of information to lessons centered on active student involvement, stimulating learner-to-learner and learner-to-teacher interactions. Within such socially active classrooms, student is called to move from a mere passive receiver of knowledge to become increasingly co-producer of knowledge through the use of technological tools in first person. The co-production of knowledge requires a major peer-to-peer collaboration, as confirmed by the prevalent group works managed during the project.

Strictly referring to assessment issues, Cl@ssi 2.0 teachers seem to be in a starting step of a path promoting an effective use of ICTs for assessment purposes. Indeed, they are beginning to test their potentialities and they seem to be still left anchored to the first above described "two generations". Computer-Based Assessment (CBA) approaches seem to be the prevalent ones, while Transformative assessment approaches appear less adopted. Further work and practice have to be done to fully exploit ICTs potentialities, avoiding to replicate traditional assessment formats (as usually occurs using computer-based tests). However, considering the fast technology development and continuous arising of new interesting assessment formats and procedures, it is not surprising, nor worrying, that take-up in schools is still slow. Secondly, it has emerged a diffused trend to use technologies mixing them with "traditional" assessment methods. Such blended approach has emerged most effective whereas teachers have recognized the ICTs' usefulness to assess specified transversal competences, while "traditional" modalities are still considered the most suitable to assess the mere knowledge. Thirdly, it has emerged teachers' awareness of the "edutainment" dimension, frequently identified as the chief advantage of technology in the classroom (Ma et al., 2011). Usually, we can hear "digital technologies make learning fun", thus the question arises: could assessment become fun? A lot of teachers have recognized the opportunity to exploit young people attitudes

to daily use technologies for recreational and enjoyment activities, optimizing web-based setting features to make learning environments more captivating and enjoyable for students. Further research and practice on this point are needed.

Overall, the research has confirmed the key role of teachers within the technology-based school innovation, underlining their predisposition to be "reflexive practitioners" (Schön, 1983), able to critically reflect on his/her pedagogical vision and teaching practices to maximize ICTs' potentialities to create meaningful instructional experiences. An effective use of technologies in daily classroom activities, including assessment ones, may make the notion of "reflexive practitioners" fit both for teachers, both for students, since, as our research has showed, they could be stimulated to reflect on their own learning styles and on their group work capabilities to self-assessment.

6. Conclusions

Innovative assessment frameworks have to be provided to teachers reflecting the developments already taking place in teaching and learning as a result of using ICTs (Osborne & Hebbessy, 2003, p. 40). The gap between specification in policy documents and actual teachers and students practices in classroom has to be reduced, trough a more comprehensive shared understanding and evaluation of ICTs for assessment purposes.

Three main challenges could be identified: access to ICT equipment, teachers capacities and monitoring (UNESCO, 2011). The first one refers to the need to provide schools with suitable ICT infrastructures, since access to equipment and quality resources is a prerequisite for the deployment and utilization of technologies. On this point, our research data referred to Internet connection, purchased by almost one third of the sample, show the still underdeveloped Web access characterizing Italian scholastic context.

The second challenge lies in teachers' capacities to use technology effectively in the classroom, including not just their technical competences, but, above all, their motivation. This challenge, in fact, often requires a cultural change for teachers which cannot always happen rapidly. Such evidence has emerged also from our research, where the context was more complex considering the advanced average age of involved teachers (the majority of whom were older than 50 years), reflecting a characteristic of the Italian teaching staff and that, in many National technological experiments toward school-based innovation, has been an element of serious difficulty, highlighting the persistent digital divide in Italian schools. This factors, sometimes, has lead to a sort of cultural resistance toward the use of technologies in general, and, perhaps mainly, for assessment purposes. Thirdly, tools to monitor implementation processes and outcomes are needed. On this point, peer learning and teacher networks throughout their careers could be effective systems to favor knowledge exchange and good practice sharing, encouraging discussion on advantages and drawbacks of ICT-enhanced assessment strategies.

Finally, we have not to forgot that education is a relationship between teachers and students, so that technologies used effectively in education have to mediate this relationship. Any assessment of technology in the classroom must consider how these tools enhance, extend and enable such core relationship between teachers and students and the key role of "human factors".

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The role of representations for the development of a participatory culture of Learnng Design among educators

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Abstract
This paper proposes an analysis of current research research in learning design (LD), a field aiming to improve the quality of educational interventions by supporting their design, and in particular by focusing on the development, among educators and designers, of a participatory culture concerning the educational use of digital media. The paper draws upon the history of the field to advocate not only the importance of the objective of creating a participatory culture of LD, but also the need for a slight shift of emphasis in LD research, from the current approach focused on the quest for ways to represent the results of the design of an educational process to one where the focus is on supporting also the decision making process taking place during design.

1. Introduction

Todays' educators are facing many challenges. The objectives of education are changing, from the acquisition of a relatively stable set of competences to the need of empowering learners with the ability to learn and work in autonomy or with others in a fast changing world, where knowledge is dynamic and technology is pervasive. Learners are also changing, they live in a technology rich environment, they learn very fast how to handle new tools and media but often underestimate their power, both in the positive and negative sense, because they do not appreciate and take advantage of the full power of their affordances and do not always perceive the risks inherent in their use, as cyber-bullying and personal data dealing seem to demonstrate. Besides, learners need to be challenged by authentic learning tasks and cannot take advantage of teacher-centric approaches to learning. Parents, educational institutions and the education system itself are raising their expectations: teachers are expected to be able to orchestrate technology rich environments and facilitate processes where constructivist learning takes place, so that students become able to self-regulate themselves and become aware citizens of the digital society.

In spite of these expectations, educational systems and society in general are not helping teachers who try to integrate technology in education. Rather, in many countries, including Italy, educational institutions have rules and modes of working that do not support ICT integration: technology is not easily accessible neither is it available anywhere any time, sometimes its use by students is even forbidden, and teachers who try to use it are regarded with scepticism by parents and are not encouraged, let alone rewarded, by the school leadership. Last but not least, their career and social status does not depend on their ability or creativity in using ICT in their work.

Those teachers who make use of technology in education are driven merely by their will of improving their teaching, their relationship with their students, and their ability to engage them in effective educational experiences. Their mode of working is often heavily reflective, explorative, experimental. They are fully fledged researchers (Laurillard, 2008), besides being reflective practitioners. However, and in spite of the fact that new technologies have been proved to have huge potential for learning, best practice examples of technology use in the classroom are not so frequent and the teachers who make systematic and pedagogically informed use of technology are still a small bunch of early adopters (Rogers, 1995) and pioneers (Midoro, 2004), rather than an early majority of professionals. Some researchers in Technology Enhanced Learning (TEL) (Mor & Craft, 2012) claim that there is a gap between the promises of TEL research and the practice in educational institutions. They maintain that only the spreading of a participatory culture of learning design (LD) can support better and more widespread use of technology in education, and that the work that has been done in the field of LD in the last decade is headed towards this objective.

This paper aims to discuss aspects of research carried out in this field, pointing at the results obtained so far and putting forward proposals to achieve the aim of improving education through the development of a participatory culture of learning design.

2. Learning design: what is it?

The field of LD has gained attention among researchers and practitioners during the last decade, although it is deeply rooted in a much older research area: Instructional Design (ID). ID dates back to World War II (Reiser, 2001), when the US invested significantly to make the design of educational programs and courses more systematic, for more effective and efficient education and training processes, especially for critical skills and large target populations. The

ID field evolved hand in hand with the evolution of learning theories and technology. The aim of ID research was to develop methods and tools for making the process of designing and delivering instruction as systematic and effective as possible. According to most ID models, the design starts from the analysis of the learning needs and the learning context, moves through the definition of the specifications and the identification of suitable approaches and tools, down to the development of the needed educational resources and assessment tools. The delivery consists of the actual implementation of the instructional process and its ongoing evaluation and fine tuning. To this end, ID also studies methods for the definition and use of quality control measures aimed at collecting data to perform the formative evaluation of the instructional process being developed, before, during and after delivery.

While the results obtained by ID research have turned out very useful to optimize the development of large instructional programs, they are more difficult to apply to small scale, everyday education, so that the design of educational interventions, for individual teachers and designers, is still a craft, effectively compared by Conole (2013) to the performance of a juggler who needs to strike a balance between the educational aims, the features of the target population, and the affordances of available technology. The skills needed, in this view, are mostly developed through practice and field experience.

To stress the notion of learners' centrality in the current vision of pedagogical research, the expressions *Learning Design* or *Design for Learning* have replaced *Instructional Design*. However, the main difference between the two fields (Mor & Craft, 2012; Dobozy, 2011, Conole, 2010b) is not just a terminological one, neither is it only related to the learning theories embraced. The main difference, in the authors opinion, is on where the focus of attention is cast: while ID mostly focuses on methodological support to make the design process more systematic, LD researchers mostly work towards the objective of making already produced designs easier to share and reuse. In particular, the rationale of the line of work on LD is based on the following considerations. So far, educators have been mostly working in isolation while planning their own educational interventions, developing their (generally tacit) design competence through practice and building on their implicit tenets concerning technology affordances and criteria for media choice. Furthermore, the fast development of technological tools offering education ever new opportunities, is making very difficult for individual educators to be always updated on the potential of technology and its strategic use in education. Based on these considerations, research in LD assumes that the creation of a community of practice of educators and designers building upon each others' competence and experience would effectively contribute to overcome these problems (Walmsley, 2012). This vision has already brought about some significant results, in terms of studies concerning the way pedagogical plans and learning designs can be represented, and of methods and tools to support their sharing, reuse and enactment.

The origins of the expression "Learning Design" can be traced back to the work of two OUNL researchers of the OUNL (Koper & Manderveld, 2004) who developed the IMS-LD specification and, subsequently, an Educational Modelling Language aimed at enabling the expression of pedagogical plans embodying many different pedagogies. After this important effort, the same expression has been used with a much broader acceptation, mainly in Europe and Australia, by researchers who concentrated more on the importance of facilitating practitioners in the sharing, modification and reuse of their pedagogical plans. This idea of learning design requires less technical competence by its users, and leads to the belief that teacher professional development should heavily rely on the development of communities of practice of teachers and designers and the diffusion of a participatory culture of learning design (Laurillard, 2012, Conole, 2013).

The rationale for this approach is that the powerful ideas of each of these practitioners should be made available to their colleagues to the advantage of the whole community. Many

of these tools also aim to automate the enactment of pedagogical plans, in order to reduce the workload of teachers when they have to put into practice these ideas in a digital environment. At present, there is a multitude of different approaches and tools for LD (Persico et al, in print, Prieto et al, in print): from generic ones, that can be used in a very broad range of contexts, to others that are more specific and lend themselves to the development of a given type of pedagogical plans (such as, for example, online collaborative learning). In spite of the differences among the existing representations and tools, most of them seem to assume that the design is already there, in the mind of the designer. In other words, to use them, the designers should have already made their own decisions concerning the structure of the learning process and the technological tools that should be used. In these cases, the LD tools support the representation and sharing, more than the creation of the design and its decision making process.

As noted by Conole (2010b), the LD field in this acceptation intertwines with various other research areas, such as the Learning Sciences, studies about Learning Objects (LO) and Open Educational Resources (OER), Teacher Professional Developments (TPD) and Communities of Practice (CoPs).

3. How can learning design research support the integration of ICT in educational contexts?

The gap between the promise of research in TEL and actual educational practice has often been related to the well known resistances to innovation of educational institutions as well as individual teachers (Lloyd, & Albion, 2009; Wood et al, 2005). Undoubtedly, there is a need for repositioning of educators from the "sage on the stage to the guide on the side", as suggested by Alison King in 1993 (quoted in Mor & Craft, 2012). In this view, teachers, form depositary of knowledge, become designers or orchestrators of learning environments. Such shift can be facilitated by the systematic use of technology in educational contexts, according to the metaphor that sees technology as a Trojan horse for innovation. However, much research in TEL also points to the fact that technology *alone* does not do the trick: there must be a fertile ground for innovative practice to develop and such a fertile ground lies in the competences and beliefs of teachers. It is for this reason that researchers point to teacher professional development as the key for the solution of the problem. However, such a development should be focused on two main aspects: confidence with technological tools, on one side, and pedagogical competence concerning their use, on the other. According to Mor and Craft (2012, pp.85-86) there is a «lack of articulation of design practices and methods in education, the lack of a culture of teacher-as-designer among practitioners, and the shortage in tools and representations to support such practices». To this, we add, with Laurillard (2008), that teachers need to become an action researcher. In other words, there is a need to develop new learning design competences among teachers, and the most effective approach is a learning by doing approach: with teachers engaging in reflective practices of LD with the scaffolding of experts and in collaboration with other teachers. There is no recipe or strict procedure for LD: the only way to develop this competence is by building it on the shoulders of a strong community of professionals.

4. An overview of representations for Learning Design

Based on these premises, there is no wonder if one of the main directions undertaken by research in learning design has focused on the attempt to develop representations that

facilitate the sharing and reuse of the products of the learning design process (Agostinho, 2008; Conole, 2010a). The assumption is that making the product of the learning design process more explicit, easy to understand and better formalised is an important step towards providing maieutic support to the design process and facilitating sharing and reuse of pedagogical plans. The role of these representations has been compared (The Larnaca Declaration on learning design, 2012) to that of musical notation that allows musicians living hundreds of years apart to understand and reproduce compositions created by others. In music, performers have a significant role in interpreting music representation and the representation does not guarantee "quality" of the music. Notwithstanding this, musical notation contains enough information to convey musical ideas from one person to another. Similarly, the quest for a representation formalism in learning design is carried out in order to obtain mediating artefacts allowing teachers to understand, use and interpret good pedagogy ideated by someone else.

The use of formalisms in the design of educational interventions is a consolidated practice originated in ID and, more generally, heavily employed in knowledge management (Olimpo, 1995). Representation languages to support human communication need to be expressive enough to effectively communicate ideas, easy to be used by non-specialists and capable of simplifying complexity, abstracting concepts by omitting details, representing unrefined ideas, hosting different points of view. In LD, however, the focus has been on graphical representations or languages that allow to describe the pedagogical plan of an activity or a course or some relevant feature thereof (Pozzi, Persico, Earp, in print).

Such representations can vary in format and type. Broadly speaking, formats fall into two main categories: textual representations (languages) and visual representations. According to Conole (2012), textual representations are expressed in either artificial/formal or natural language (narratives), while visual representations are basically in a graphical format..

Textual representations in artificial languages describe the design in a highly formalized way, usually so that it can be processed by a computer. This makes it possible to deliver relevant components of a learning activity directly to learners or provide for automatic configuration of a suitable computer-based learning environment in which the activity can take place. Describing a design through such formal languages is usually a fairly technical matter. Consequently it may call for involvement of a professional with the necessary technical competences to act as a 'bridge' between teacher and computer, or for a high-level interface that 'masks' the technicalities and allows the teacher to focus on design considerations.

Textual representations based on natural language, instead, are largely 'narratives', i.e. descriptions of designs, plans or experiences based on words. As such they typically have a low degree of formalism. However, they are often based on a pre-defined skeletal structure, such as an organized schema of descriptors or fields, for expressing various aspects of the design. This provides the designer with guidance about the way the design is conceived and developed, the kind of choices she needs to make and hence the information that the description is to contain, and the level of detail required. In some narrative forms, basic and abstract information about the design is given greater emphasis than contextual details, which may even be excluded altogether. This facilitates instantiation of the design artifact in a specific context and thus increases the potential for reuse. Other kinds of narratives are intended to include more detailed information, which may be related to the pedagogical rationale behind the intervention and/or the details of the "enactment" phase. The latter may be considered to "flesh out" the design skeleton with tangible description of the way the learning activity has been or can be used, the context that the activity is intended for, the target population to be addressed, prerequisites, etc.

Visual representations, on the other hand, generally take the form of diagrams or graphs, conveying an overall view of the design or specific aspects thereof, such as the structure of the intervention, the learning objectives, the contents to be addressed, the roles of the people involved, etc. Diagrams or graphs are a means to represent the main entities within a design and their mutual relationships; they include the likes of flow charts, content maps and swim lanes.

Charts, on the other hand, are visual representations of quantitative data from the intervention; bar or pie charts representing features of the learning process, based on suitable indicators, are typical examples. These charts usually foster reflection on the design by focusing attention on the specific aspects represented. One example of these are pie charts showing the balance between different kinds of approach within the same course (San Diego et al, 2008).

Textual and visual representations may in principle be used autonomously, but often they are used in conjunction with one another. This is because the single format alone is often insufficient for effectively conveying all the essential information, especially when the main purpose of representing the design is to share it with others (Falconer et al., 2007).

From the above considerations it should be clear that, while different representation types have different advantages and drawbacks, there is no convergence yet on one type of representation that can play the role of music notation in the area of learning design. Some of them are better to support communication among individuals; others are more suited to automate the instantiation of a learning environment. Some were developed for specific types of pedagogical approaches, while others are claimed to be "pedagogy independent". Most of them, however, presuppose that the designer has already made his/her own decisions about what kind of approach should be used, what kind of tools are best suited, how to organize the learning community, etc. In addition, when the implementation of "runnable" learning environments is the prevailing aim, then user-friendliness and communicative power risk to be lower.

5. Conclusions

While we agree that the work that has been done in the quest for suitable representations of the products of the learning design process is very important, we contend that there still is much work to be done, in several related areas, if we want to succeed in developing the said participatory culture that is likely to favour the a wider and better use of technology in education.

First of all, as already mentioned, the availability of technological and methodological tools does not guarantee its uptake. If it is true that such tools and methods can play the role of aggregators for a community of teachers and designers that will use them for sharing purposes, and thus can indirectly support the development of the participatory culture we deem necessary, it is also true that more should be done to favour such development. As far as the educational system will not have built-in mechanisms that support, motivate and reward those teachers that seriously try to innovate, collaborate with colleagues and explore new ways to harness technology to the needs of education, the evolution of technology uptake from a small number of early adopters to a larger majority might not happen (Rogers, 1995).

Second, even if a significant bunch of work has been done to identify design principles to be applied to favour pedagogically aware use of technology in education, this effort cannot be considered complete, neither will it ever be, due to the fact that the very fast technological development and the slower, yet important, evolution of ideas about how learning happens will never come to an end. Presently, much of the methodological and technological tools that

are being developed seem to assume that the designers are able to take all of these decisions and do not need any support, that they can distinguish between good practice and bad practice and reuse the designs that best suit their contextual requirement on his/her own. However, this isn't always true and, in particular, it is certainly not true in initial teacher training. So, more work is needed to provide support to the decision making process, which is one of the most critical phases of learning design.

Third, if teachers' communities of practice are one of the best approaches identified so far to achieve our aims, then the provision of tools for storing, sharing and reusing learning designs should be accompanied by the availability of tools that support the social component of these communities. Some positive results in this line of work have already been achieved (Conole, 2010b) and others are being pursued within the framework of the METIS projects (http://metis-project.org/index.php).

Acknowledgements

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An Artifact for Assessing Students' collaborative and Individual Activities

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Abstract
This paper is motivated by an analysis of results gathered in the last years in Italy from OECD-PISA tests, especially in Mathematics, that is one of the key competencies for an active citizenship. Investigation on the reasons behind these poor results highlighted, among other problems, the increasing number of students in a class. Tutors wishing to improve students' performance in Mathematics, with a Constructivist educational approach, based on real problems as described by Vygotsky, or with a heuristic approach as described by Polya, face time problems related to managing a high number of students. In this scenario, the adoption of a technological support for monitoring and assessing students "at a glance" shall help tutors by leaving them more time available, to be spent in improving students' understanding of Mathematics.

1. Introduction

In the last twenty years there has been a change in the educational scenario, such as, the diffusion of the Constructivist Educational Approach described in (Bruner, 1973; Bruner, 1976; Jonassen, 1994; Piaget, 1976; Vygotsky, 1962; Vygotsky, 1978). Accordingly with this educational methodology the teacher adopted a new role. He/she will become a tutor, accordingly with the Constructivist terminology.

Two basic requirements for a tutor are: supporting students in their experimentation and discussions about problems and research path based on real problems and encourage students' interactions in order to develop their "soft skills" (Andrews et al., 2008; Crosbie, 2005).

The technological progress and the diffusion of computers and Internet or generally speaking the technological innovations do not create obstacles to the Constructivist Methodology, rather, they offer to both students and tutors new and increasing opportunities of interacting and sharing concepts and comment them. Tutors are required to examine students' performance in cooperative activities (CA) on top of assessing their results in class tests. These "soft competencies" are key elements of the new didactic methodologies described above.

My research project is focused on designing methods and building tools for evaluating students, working in a Constructivist educational environment. The sample was made by a class of 30 teenage students that has been monitored over three terms, starting from the second term of 2nd year of Liceo Scientifico (Italian high school with specific reference to Mathematics and Physics) till the end of their 3rd year of study. The subject area involved was Mathematics (In details, students worked on Euclidean Geometry for the first part of the activity, and on Analytical Geometry for the second part of the activity). Section 2 will describe the theoretical Basis and the Methodology adopted. Section 3 will describe the experience. In Sections 4 and 5 how to use the software artifact and a brief analysis of results gathered, will be described. Section 6 will briefly describe future developments of this work.

2. Theoretical Basis and Description of Methodology

The motivation for this experience are those established from OECD-PISA (OECD-PISA, 2006; 2009), concerning reflective citizens and the increasing need of skills in Mathematics w.r.t real-life problems.

Quoting OECD "Today and in the foreseeable future, every country needs mathematically literate citizens to deal with a very complex and rapidly changing society. Accessible information has been growing exponentially and citizens need to be able to decide how to deal with this information".

OECD also provides the guidelines and theoretical basis for the assessment process of the level of knowledge achieved by students. The list of the evaluation criteria from OECD is in Table 1, and the full description of each criterion can be found in (OECD-PISA, 2006; 2009).

(a) Thinking and Reasoning
(b) Argumentation
(c) Communication
(d) Modeling
(e) Problem posing and solving.
(f) Representation.
(g) Using symbolic, formal and technical language and operations.
(h) Use of aids and tools

Table 1. OECD PISA criteria for Evaluating Mathematical Competencies

The adoption of a socio-constructivist educational methodology requires in addition to the above, the evaluation of "soft skills" acquired by students. In this new educational scenario, each student should be evaluated referring to the grasp on Mathematics and the level of proficiency reached in CA.

A proposal for an assessment methodology was outlined in Romano (2011) and its focus was to identify the level of participation in CA and the level of knowledge achieved by each student, composing data retrieved by three sources:

1. Results from interviews with students, and Social Network Analysis (SNA) of their collaboration patterns, emerging from students' exchange of information.
2. Results achieved by students on short tests, passed to them without previous advice. These tests are common practice for preserving students' attention, and as intermediate evaluation, known as Pop Quizzes, (Cicirello, 2009).
3. Results achieved by students at the midterm and final tests, done in the regular class time.

All the information gathered from the activities described in points from (1) to (3) above, has been analyzed in order to gather the assessment parameters, introduced in Romano (2011) and listed in Table 2.

(a) LOCW: level of collaborative work
(b) LOR: level of result
(c) CCOP: Creation of a CoP (inside each team)
(d) GCCOP: Global Creation of a CoP (inside the whole class)

Table 2. Evaluation criteria from Romano (2011)

Quantities listed in Table 2 are defined as follows:

1. LOCW (Level Of Collaborative Work) provides information concerning the contribution of each student to group activities inside his/her own team
2. LOR (Level Of Results) measures the level of understanding of each student on a proposed topic
3. CCOP (Creation of CoP) is used for monitoring the creation of a CoP (Community of Practice) inside each team of students
4. GCCOP (Global Creation of CoP) monitors the creation of one CoP inside the whole class

Results from points (3) and (4) listed above, (based on the results of both interviews and application of SNA), and their balancing with information retrieved from (1) and (2) are still under investigation and will be handled in a next paper.

Concerning LOCW, the author decided to adopt a metric deduced from Polya (1945) and Wenger (1998). Polya described a series of steps for supporting students in their heuristic process of mathematical analysis. The roadmap is listed in Table 3.

| |
|---|
| Understanding the problem |
| Devising a solution plan |
| Carrying out the solution plan |
| Looking back to the results achieved |

Table 3. Polya's Roadmap for Problem Solving

Criteria in Table 3 define guidelines for interviews with students, i.e. the level of understanding of the problem should be a shared result for each member of the team, and similarly for the others.

The author decided to adopt an interpretation of "Look Back" slightly different from Polya's one. The idea is that each student in a team should be able to justify each step performed by his/her team in solving the problem. So, students are required to think back to their solution path, and to explain each step.

Accordingly with Wenger (1998), each team with a common goal and with a good level of collaboration among its members, shows a common level of understanding of topics, and they should show a good level of agreement about the devising of the solution plan, until creating a Community of Practice. Concerning LOR, its results were evaluated applying criteria listed in Table 1, i.e. parameters from OECD-PISA were used as metrics for students' level of knowledge. In Romano (2011) was made a proposal for a software artifact for assessing LOCW and LOR via an evaluation graph. The proposal is described in figure 1.
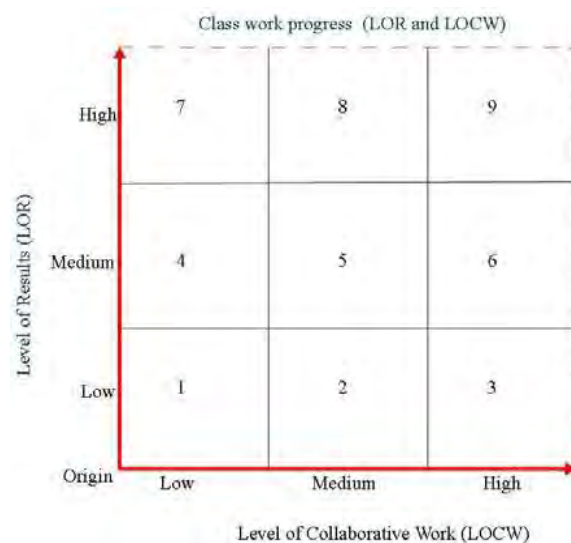
Figure 1. Evaluation Graph

Its meaning, quoting the author, is: "The Evaluation Tool is an artifact that will suggest to the Tutor a graphical representation of ¨how well¨ a single student is progressing. The tool helps Tutor to have at glance an understanding about students' performance. The Diagram is interpreted in this way: the tool plots a point in the graph showing the positioning of each student with respect to his evaluation metrics. Boxes (1) (and (9)) represent clearly identified, extreme situations. Students listed in such boxes are very poor (resp. excellent) both in their CA and personal understanding of topics. Boxes (3) and (7) are showing students in intermediate situations: excellent in CA, but really poor in understanding of the topics, and the opposite. Similar considerations will hold for the analysis of the behavior of students falling in the remaining boxes".

We then analyzed if a software artifact might be helpful to perform, up to a certain level, automatic assessment and grading of the above process. However, we reached the conclusion that a software artifact that fully automate the quality evaluation process might risk to loose information on the level of knowledge reached by each single student. These data are under the responsibility of the tutor, who has a direct interaction with students. On the other hand, a partial automation, given by a synthesis of available data, would greatly help the evaluation of the tutor, and this kind of approach will be the main assumption of this experience that will be described in the following.

3. Description of the Experience

The experience started at the beginning of the 2nd year in a Liceo Scientifico (Italian High School with specific references to Mathematics and Physics). It finished at the end of the 3rd year, involving always the same class.

The sample was made of 30 teenage students, in one class. At the beginning of the experience, all students were trained about how to perform an effective team-work, and how to handle the E-Learning platform adopted.

Students were divided in small groups (maximum 4 students) at the early beginning of the experience (and the same teams, when possible, continued till the end). The activities were performed both in class and at home using an online platform (it was decided to adopt DIEL (Di Cerbo et al., 2009) as platform, a customization of Moodle (moodle.org) with a 3D graphical interface) for exchanging information, suggestions, questions etc.

All the investigations, accordingly with OECD-PISA requirements, were based on problems strictly connected with the real world; some examples of them are listed in table 4.

Students were required to provide solutions, describing accurately how they built them, referring to the "evaluation criteria" described in Table 1, e.g. they had to describe their "thinking and reasoning", explaining which data of the problems was useful for the solution and how they have been used, which questions/problems students faced during the analysis of the problem, and so on.

In order to evaluate the contribution of each team member and his/her level of knowledge about the topic, some additional interviews took place, concerning topics strictly related to the experience. These results were part of the assessment, together with periodical individual tests that the entire class took simultaneously.

At the end of each activity, students were evaluated by tutor w.r.t. guidelines highlighted in Table 1, and then such data was stored in a software artifact, that was designed for supporting tutor in LOR evaluation of both each team and each single student.

Some Examples of Problems Proposed to Students	
First Year 2011 – 2012	Second Year 2012 - 2013
How to calculate the length of the walls surrounding a castle	How to build the arcs in Casa Battlò (Casa Battlò, Wikipedia) in Barcelona (an approximate model)
How to park a car using minimal number of maneuvering	How to find the highest point of a Cubba (Cubba, Wikipedia)
How to identify the best trajectory for shooting a basket	How to calculate the length of shadows during the day, for a better farming of a kitchen-garden

Table 4. Some example of Problems proposed

4. Using Software to Speed Up the Analysis of Data

The amount of data, generated by the above approach, that needs to be taken into account by a tutor, even in a small class of 30 students, could be overwhelming. A software artifact to support tutors in storing and handling those information has then been developed. This artifact, as discussed in Section 2, does not provide a final grade of students' activities, but it supports tutors in the assessment process.

The main idea is to build a Database (DB), where data gathered both from team activities and from individual student test has to be stored. The data is then visualized in graphic reports, to provide at a glance the situation of each student and of each team. The DB schema is shown in figure 2; data includes both marks gained by teams and those gained by individual

students. Screenshots of reports related to students' Team A extracted from the database are in table 5.
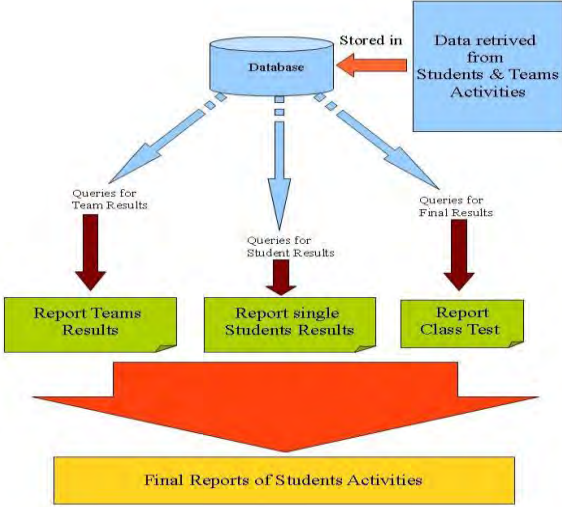

Figure 2. System framework

Results in table 5 could also be displayed graphically, as shown in table 6.

TEAM A LOR			
Results Exp. 1 Year 1		Results Exp. 2 Year 1	
Parameters	Mark	Parameters	Mark
Think & Reason	6	Think & Reason	6
Argument	7.5	Argument	6.5
Communication	5	Communication	6
Modeling	6	Modeling	6
Problem Posing/Solving	7	Problem Posing/Solving	5
Representation	7	Representation	7
Symbolic etc.	7	Symbolic etc.	5
Use of aids and tools	5	Use of aids and tools	7
AVG Exp 1 Team A	6.31	AVG Exp 2 Team A	6.06

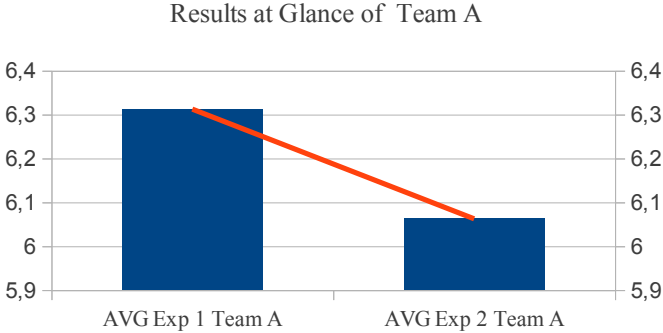**Table 5.** Level of Results for Team A

Table 6. Diagram of Results of Team A during Year 1

For instance in Table 6 we see immediately that Team A got slightly better results during the first experience, in comparison with the second one. By default results are shown per year, but the reporting function can be customized for building a variety of reports, for groups and for each student results. Concerning LOCW, the evaluation of TEAM A during the first year, is listed in table 7. The graphical final report for LOC and LOCW is listed in Illustration 3. This layout is also named dashboard.

Level of Collaboration LOCW Year 1 Exp. 1				
TEAM A				
Parameters	Student 1	Student 2	Student 3	Student 4
Understanding the probl	7	6	5	6
Devising a solution plan	5	7	5	8
Carrying out the sol. Plan	8	7	7	8
Look Back	7	6	7	7
Average of Results	6.75	6.5	6	7.25
Average of LOCW	6.63			

Table 7. LOCW of Team A First Year Exp.1

Team A results at the end of the 1st and the 2nd experience are listed respectively with T1 and T2. Here we illustrate results related only to team A, but any result, for each student and for each team, for both years, is stored as well, and it can be similarly visualized.
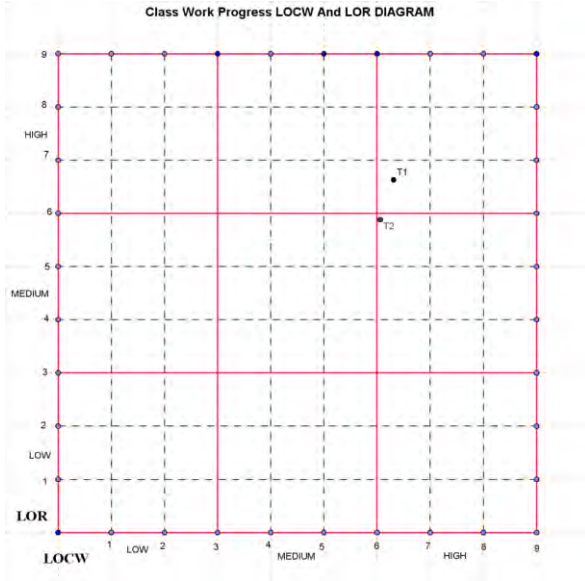
Figure 3. Dashboard: Tema A LOR and LOCW Graph

5. Data Analysis, Findings and Discussion

The results of the experience have bee analyzed w.r.t. two distinct points of view: the first one is related to advantages obtained by a tutor involved in the evaluation process with a support of an artifact for speeding up students' evaluation. The second one refers to the assessment of results obtained by students working on an E-Learning platform and their level of collaboration.

About the first point, the advantages acquired by tutors are self-evident: the opportunity of monitoring at a glance each team, thanks to the direct correspondence between the assessment results and the placement of each team and student on the dashboard, allows tutors to focus immediately students who need additional support.

The evaluation of the time saving was made in this way: I measured the amount of time spent for the evaluation of the results, for all the experiences proposed, both manually and with the support of the artifact. The average time spent for assessing each experience without technological support was almost three hours. The corresponding analysis, adopting the artifact, required on average approximately two hours, it means almost 33,3 % of time saved.

Concerning the second element, student assessment consists on averaging LOR and LOCW, as shown on the dashboard in Illustration 3, where a team is placed accordingly with its results. The author decided to avoid to set up the artifact in order to perform an arithmetic mean of the two values and call it "team final grade", because it seemed a too simplistic evaluation of the activities made by students, that involved so many expertise. The right weight to be assigned to LOR and LOCW, in order to set the final result of each team and each student, can be fixed by the tutor, accordingly with his/her experience, strengthened by the interviews and a long period of direct interaction in the classroom with students.

6. Conclusion and Future Works

This paper described a methodology, and a software artifact supporting it, for the evaluation process of activities performed by students, individually and in teams, during collaborative activities. The methodology evolved from Romano (2011) and was built accordingly with the definition of Mathematical Literacy provided by OECD PISA (OECD-PISA, 2006; 2009), integrating with milestones by Polya (1945). The methodology is supported by an artifact, which assists tutors in their evaluation process. This artifact provides at a glance a feedback of the whole class situation. The artifact does not provide an automatic assessment of each team/student, since only the tutor has a direct feedback of students' behavior and learning path. However it provides a graphical synthesis of students collected data, comprising both disciplinary knowledge and soft skills in team activities, which helps the tutor in saving approximately one third of grading time, at the same time letting the tutor free to concentrate on educational issues and problems.

In this perspective, as future development, the analysis of data stored in the DB could be strengthened, integrating it with results coming from SNA performed on each team.

This analysis might use dedicated software. This will allow a straightforward integration into the software artifact of the evaluation of CCOP and GCCOP.

Results of these analyses shall allow early identification of students with difficulties, giving tutors enough time for preventing school drop-out.

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Digital Learning in classroom: diffusion, use and evaluation of digital learning environments in Apulian schools

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Abstract
This work is part of researches about Learning Management System as support to didactics. A clear and careful analysis of the context is important to favour and improve the use of technologies as support to didactics. The purpose of this inquiry is to represent the stage of the preliminary analysis, showing the current situation of the analyzed context . Then, it wants to highlight the most important problems in order to find possible solutions. This work can be considered a census of the schools of the region, so that the widespread of digital learning in the situation analyzed could be identified.It wants to understand how scholastic institutions use these tools and evaluate their efficacy. The inquiry has been carried out with a multiple choice questionnaire and which has been released online thanks to "Ufficio scolastico Regionale" of Apulia. Considering the results of the first 160 questionnaires, it is clear that the widespread of Learning Management System in Apulian schools is not broad, but it could be considered an achievement. In fact 20% of the sampled schools use LMS, but in High Schools the rate reaches almost 50%: this data shows that the attention given to technologies as a support to didactics is high. Even if the widespread is quite satisfying, the data about the use of Learning Management System are less positive. Sometimes there is more attention to the storage and sharing features rather than to collaborative learning features. In summary, a positive evaluation of this inquiry is possible: this work could be considered the beginning of possible actions to raise public awareness towards the Pedagogical Potential offered by Digital Learning.

Keywords
E-learning, Learning Management System, Apulian schools, digital learning environments, survey

1. Introduction

The widespread use of the Internet and the growing affinity of masses with personal computers have led to an increased attention in the scientific literature for issues related to online learning.

Alongside with a greater theoretical attention, there has been a substantial development of open source or property platforms which have enabled e-learning courses to flourish.

Due to its great spread, to the particularly active community which supports and updates it continuously and to the attention given to cooperative learning, we have chosen to conduct a more detailed analysis of the Learning Management System (Moodle). However, Moodle is not the only open source platform available: Docebo, Atutor, Claroline and Ilias also deserve to be mentioned.

This study may be considered as part of those researches on the utilization of Learning Management Systems as elements that support didactics, and, more specifically, this research intends to represent a purely explorative first step towards understanding the actual diffusion of these tools throughout the studied territory.

As far as the issues herein discussed are concerned, there are many surveys within the current literature that are close to the research presented in this article. Among the most recent contributions, a special mention goes to the "Survey on schools: ICT in Education" [1], a very recent survey on the diffusion of information technology within European educational systems.

Besides due differences, the results of the European Commission's study are comparable to those of the survey herein presented, especially with regards to the request of specific training for an optimal use of the new didactic technologies on the part of those teachers interested in the new technologies. In view of the scope of the survey, at a lower level we find the research works conducted in previous years by the CNIPA[2] These studies analyse the e-learning phenomenon within the entire Italian territory. Furthermore we have the 2012 Isfol[3]survey which shows how the training action addressed to teachers and related to an aware utilization of the new technologies in teaching can encourage a thorough revision of didactic models, improving, though at different levels, student's learning processes.

2. The objectives of the research

In order to analyze the spreading and the current state of e-learning within Apulian coursers, this research aims primarily to 3 macro-objectives:

- *Analyzing the actual diffusion of the e-learning platforms within the Apulian educational system and revealing the reasons why an educational establishment decides whether to utilize or not these tools*
  A fundamental requirement for any type of analysis is, precisely, to obtain the most relevant as possible data regarding the actual presence of schools, within the Apulian territory, utilizing teaching phases aided by technology and specifically by LMS platforms.

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[1] European Commission DG Communications Networks, Content & Technolog (2013), *Survery of schools: ICT in Education. Benchmarking access, use and attitudes to technology in Europe's Schools.*
[2] Centro Nazionale per l'Informatica nella Pubblica Amministrazione (Centre for Computing in Public Administration)
[3] ISFOL, MIUR, Infante, V., L'e-learning nell'education: indagine ISFOL - Ministero dell'Istruzione, dell'Università e della Ricerca, Roma, 2011.

Likewise interesting and of great importance for any future research, is the analysis of the representations that educational establishments (represented by school leaders and teachers in charge) have towards e-learning and the reasons behind the choices made in this field;

- *Highlighting the actual use of e-learning platforms in school.*
  A second series of particularly relevant data are those related to the actual use of platforms and the way educational establishments use them.
  As a consequence, it is surely of interest to mark whether, and to what extent, the potentialities offered by modern appliances are truly exploited and to what extent the supports to cooperative and meaningful learning are actually utilized or whether, on the contrary, the Learning Management System is merely reduced to a deposit of supportive material to the classical frontal lesson;

- *Identifying the main tools in use paying particular attention to the ones that put students in the position of active stakeholders of the learning process.*
  Moodle waves the pedagogical flag of social constructivism and, as a direct consequence, aims to the promotion of activities that give the students an active role.
  With reference to this particular LMS, the third objective of the research is to analyse how much the most innovative and cooperative tools (the so-called *activities*) are actually used. With reference to the results of Lopez *et al*'s[4] research, the more these activities are used during a course the more the underlying didactic approach is actually focused toward the cooperative aspects.

Besides these main objectives, attention shall be given during the data analysis phase to possible differences between the various Apulian provinces and between the different levels of education within the approach to the e-learning phenomenon.

3. The Tool

To reach the purposes shown in the previous paragraph, we decided to use a questionnaire created by means of the Google Drive tool "Module", the web platform of Google Inc., that enabled the realization and the distribution of the questionnaire via the internet.

The decision to realize the questionnaire through this type of web platform allowed to reduce the time for data collection, a greater distribution of the questionnaire on a regional scale and lesser time in answering, due to the fact that respondents were able to visualize only the questions appropriate to their profile.

The questionnaire was divided mainly into 3 parts:

- The first part provided the collection of "biographic" data related to the type of school; it also provide a first cataloguing of the schools that use or do not use an e-learning platform;

- The second part, thanks to the functionalities of Google Drive, changes according to the reply given by the respondent to one of the questions in the first part. More specifically, if the respondent answers he did not use a platform, the questionnaire will terminate and he will only be required to give the motivation that led to his kind of choice. On the contrary, however, if the school is provided with an e-learning platform as a support to the ordinary frontal lessons, the school representative will have to answer a series of questions on the actual use and representations in respect of e-learning. Some of the items in this section were adapted from those in the

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[4] Lopez, X., Margapoti, I., Pireddu, M. e Sapuppo, F. (2010*), Quale didattica per l'e-learning? I risultati di un'indagine empirica a livello internazionale*, Educational, Cultural and Psychological Studies, n. 2, December..

questionnaire of the Lopez research *et al.*: *"What kind of Didactics for e-learning? The results of an empirical study at an international level"*[5];

- The last part of the questionnaire was only required to those schools that use Moodle as a platform for e-learning. This section shows all the functionalities provided by the latest version of Moodle in its several possible forms (For example, it was decided to indicate "Teaching Forum" and "Off Topic Forum") and the respondents were asked to indicate the frequency of use.

The widespread circulation of the questionnaire was granted by the Apulia Regional Educational Office that was willing to spread the link[6] to the questionnaire within the newsletter addressed to Apulian schools. Moreover, a specific public notice referring to the questionnaire was available on the institutional website[7] of the office itself.

4. The Sample Schools

There were 162 Apulian Schools which chose freely to take part in the research by filling in the online questionnaire.

According to the analysis of the first items of the questionnaire, it is possible to divide the sample as follows:

- From a geographical point of view there is a clear relative majority of schools located in the province of Bari and a small number of respondents belonging to the provinces of Barletta, Andria and Trani .

Province	Frequency
Bari	58
Barletta – Andria – Trani	9
Brindisi	24
Foggia	27
Lecce	23
Taranto	21

Table 1. Subdivision according to the province of the schools. Absolute values.

[5] ibidem
[6] The questionnaire can be found here: http://tinyurl.com/elearning-puglia
[7] The public notice of the Regional Educational Office can be found at:
http://www.pugliausr.it/default.aspx?Page=Documento&code=1732

Figure 1. Subdivision according to the province of the schools. Percentage values

- As for as the types of school, there is a significant balance between primary and secondary schools (secondary schools level one and higher secondary schools) both on a regional scale and, to a lesser extent, on a provincial level, except for the province of Lecce from which we received only two answers from primary schools.
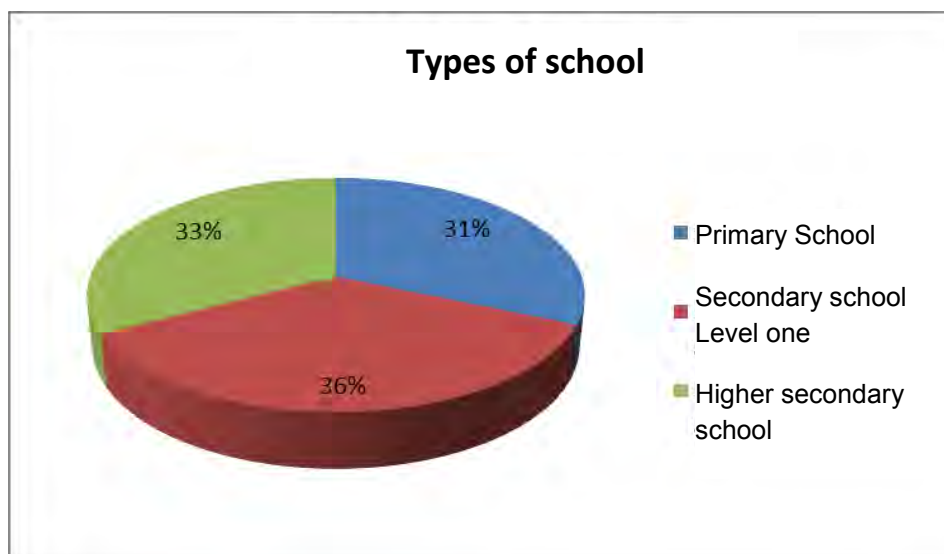
**Figure 2.** Subdivision according to the types of school. Percentage values.

Province	Types of School		
	Primary School	Secondary School level I	Higher Secondary School
Bari	22	18	18
Barletta – Andria – Trani	3	3	4
Brindisi	7	7	10
Foggia	10	9	8
Lecce	2	13	8
Taranto	8	8	5
	51	58	53

Table 2. Subdivision according to the province and the types of school. Absolute values.

5. Data analysis

5.1 The spreading of e-learning

The first, and probably one of the most important subdivisions to be made with the sample of a research, relates to the presence or the absence of any type of platform supporting traditional teaching.. Although the sample may not be very large, it is possible to get a first impression of the actual spreading of e-learning in the Apulian schools. On a regional scale, data show that only 21% of the sample (34 schools) claims to use an e-learning platform; on a provincial scale, however, this proportion is not perfectly respected.
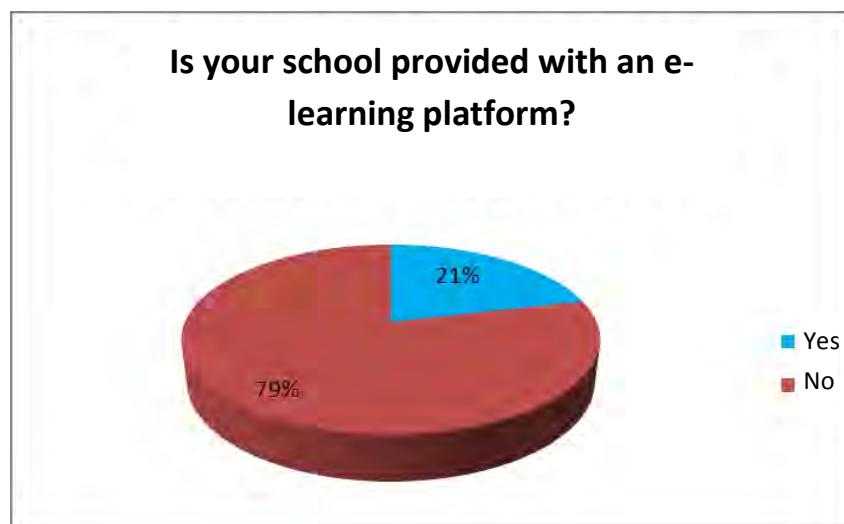
Figure 3. Presence or absence of an e-learning platform at school. Percentage values**.**

There is a great majority of schools which do not use this kind of digital learning, however, in the provinces of Bari and Lecce this percentage decreases to values around about 70% (-9%

compared to the regional average); on the contrary, in the provinces of Taranto, Brindisi and Foggia schools which do not have a platform respectively present 85.7% (+6.7% compared to the regional average), 87.5% (+8.5% compared to the regional average), 88.9% (+9.9% compared to the regional average).

Province		E-Learning Platform	
		Yes	No
Bari	Total	16	42
	%	27,6%	72,4%
Barletta – Andria – Trani	Total	2	7
	%	22,2%	77,8%
Brindisi	Total	6	21
	%	12,5%	87,5%
Foggia	Total	3	24
	%	11.1%	88.9%
Lecce	Total	7	16
	%	30,4%	69,6%
Taranto	Total	3	18
	%	14,3%	85,7%
		34	128

Table 3. Subdivision of e-learning platforms according to provinces. Absolute and percentage values.

If we consider the variable "types of school", it is evident that in secondary schools (whether level one or higher) e-learning is much more evaluated. In this part of the sample we can find LMS installed in 23 schools (43.4% of the under sample). The percentage value is double compared to the entire sample taken into consideration..

Types of School		E-Learning Platform	
		Yes	No
Primary School	Total	3	48
	%	5.9%	94.1%
Secondary School Level One	Total	8	50
	%	13,8%	86,2%
Higher Secondary School	Total	23	30
	%	43,4%	56,6%
		34	128

Table 4. Subdivision of e-learning platform according to the types of school. Absolute and percentage values.

5.2 The reasons why an e-learning platform is not used

Since a considerable number of schools are not provided with an e-learning platform, analyzing the reasons why this occurs becomes an issue of great importance.
In this respect, the test implied a multiple choice item with 4 options and the alternative "*Other*" which allowed the respondent to choose an answer not included in the list. Out of the 4 pre-determined options, only 2 answers were related to structural reasons, not directly connected to the school itself ("There is no appropriately trained school staff" and "There are no funds addressed to e-learning"). On the other hand, the other two reasons were more connected to a lack of will to adopt e-learning due to pedagogic or economic aspects ("The costs of an e-learning platform, in terms of time and resources, will not bring adequate benefits" and "E-learning is not considered useful"). Observing the frequencies of the given answers, it is possible to identify an absolute majority of answers connected to structural reasons whilst a really small minority sustain that e-learning is not useful (3 schools) or not capable of producing adequate benefits (5 schools).
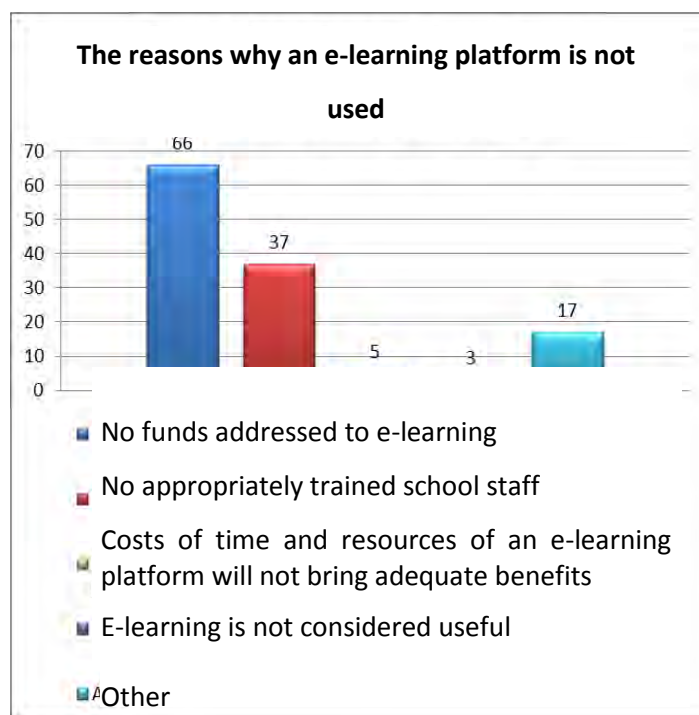
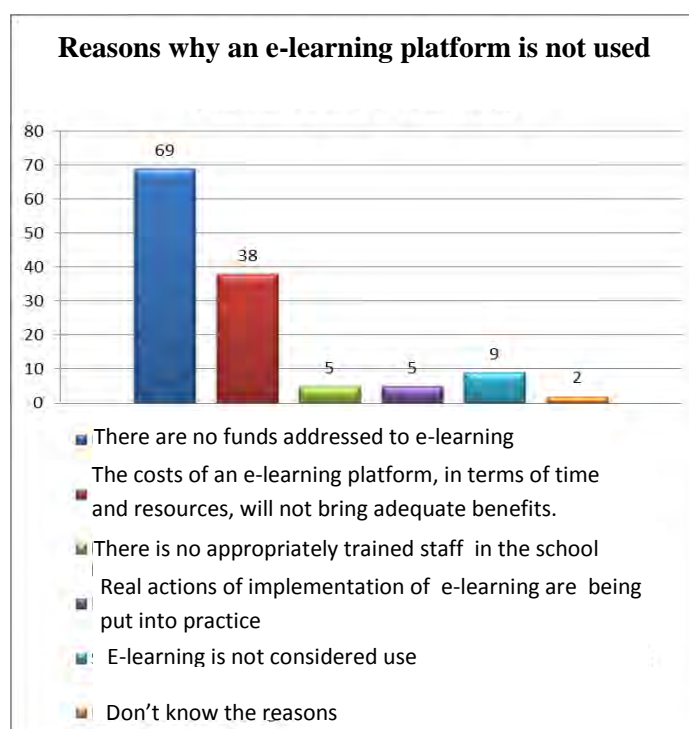**Figure 4.** Reasons why an e-learning platform is not used

As follows, a summarizing table of the given answers to the item is provided, in order to highlight even those answers gathered in the graphic above under the caption "Other".

Answer	
There are no funds addressed to e-learning	66
There is no appropriately trained school staff	37
The costs of an e-learning platform, in terms of time and resources, will not bring adequate benefits.	5
E-learning is not considered useful.	3

At present there is no plan to realize an e-learning platform.	1
E-learning is still in its implementation phase.	1
An LMS (Interactive and multimedia Whiteboard) within the "INDIRE –Digital School -LMS" project has recently been set up, and we are waiting for the test and the training course of n.1 teacher.	1
The training of the school staff is in progress, in order to achieve the goal as soon as possible.	1
The teaching body prefers to set up traditional educational plans.	1
The planning of the e-learning platform is in progress.	1
The school is not provided with computers and the Internet in the classrooms.	1
The majority of teachers are not interested in the subject.	1
I don't know the reasons.	1
The project is not shared by everybody yet, but the most motivated teachers are working hard to make their colleagues aware of it.	1
I'm not sure there is a reason.	1
Not all teachers will take advantage of it.	1
Although believing in the e-learning method, we have never found either the right moment or the resources for this type of project.	1
All the didactics environments are being currently provided with LMSs.	1
The hypothesis of creating a platform on the school's website is under examination.	1
We are interested, therefore we will work on it.	1

Table 5. Reasons why an e-learning platform is not used

Focusing on the answers recognized as "*Other*", it is possible to gather some of them into one of the first answers included in the test. For instance, the answer "The teaching body prefers to set up traditional educational plans" is linked to "E-learning is not considered useful" ; moreover, "Although believing in the e-learning method, we have never found either the right moment or the resources for this type of project" is connected to "There are no funds addressed to e-learning". It is also possible to put together other answers under the following tag: "Real actions of implementation of e-learning are being put into practice".
The answers related to the implementation alone of the LMS in schools will also be gathered under this tag. Although these schools have not shown a particular concern to LMS platforms, we chose this option considering the current interest in digital learning. For this reason, one can argue that other types of funds or resources could be employed towards such an approach.

Figure 5. Reasons why an e-learning platform is not used

Furthermore, in the analysis of the answers distinguished according to the provinces of the schools, no big "structural" changes in the selected reasons appear.

Province		Explanation					
		Costs do not bring adequate benefits	Not useful	No trained staff	No funds	Actions in progress	Don't know
Bari	Total	0	1	11	24	4	2
	%	-	2,38%	26,19%	57,14%	9,52%	4,76%
Barletta – Andria – Trani	Total	1	0	2	4	0	0
	%	14,29%	-	28,57%	57,14%	-	-
Brindisi	Total	0	1	6	12	2	0
	%	-	4,76%	28,57%	57,14%	9,52%	-
Foggia	Total	2	2	6	14	0	0
	%	8,33%	8,33%	25%	58,33%	-	-
Lecce	Total	2	0	6	7	1	0
	%	12,5%	-	37,5%	43,75%	6,25%	-
Taranto	Total	0	1	7	8	2	0
	%	-	5,56%	38,89%	44,44%	11,11%	-
	Final Total	5	5	38	69	9	2

Table 6. Reasons why an e-learning platform is not used. Separation into provinces

Similarly, dividing the sample studied into school typologies does not alter the general average observed. It can be stressed, this way, that the majority of schools do not use a supporting platform mostly because of a lack of resources rather than because of pedagogic reasons.

Type of school		Explainations					
		Costs do not bring adequate benefits uati benefici	Not useful	No trained staff	No funds	Actions in progress	Don't know
Primary School	Total	1	3	14	25	4	1
	%	2,08%	6,25%	29,17%	52,08%	8,33%	2,08%
Junior High School	Total	2	1	18	27	1	1
	%	4,00%	2,00%	36,00%	54,00%	2,00%	2,00%
Secondary High School	Total	2	1	6	17	4	0
	%	6,67%	3,33%	20,00%	56,67%	13,33%	-
Tot		5	5	38	69	9	2

Table 7. Reasons why an e-learning platform is not used. Separation into school typologies

5.3 What type of platform is used

In order to investigate the second part of the present work and its objectives, it is necessary to explore the answers given by the sample, even though limited, represented by those schools which do include an e-learning platform in their didactic activities.
The first relevant data to be emphasized is the type of platform employed.
The test provided a list of 5 out of the most widespread open source platforms (*Atutor*, *Docebo*, *Claroline*, *Ilias* and *Moodle*); the possibility to indicate the use of a private platform (suggesting that a property platform means a platform realized specifically for the school or acquired by a specialized informatics company) and the possibility to indicate the employed platform if not present in the list offered.

What type of platform is used ?

Atutor 1, Docebo 5, Moodle 16, Private Platforms 10

Legend: Atutor, Claroline, Docebo, Ilias, Moodle, Private Platforms, Other
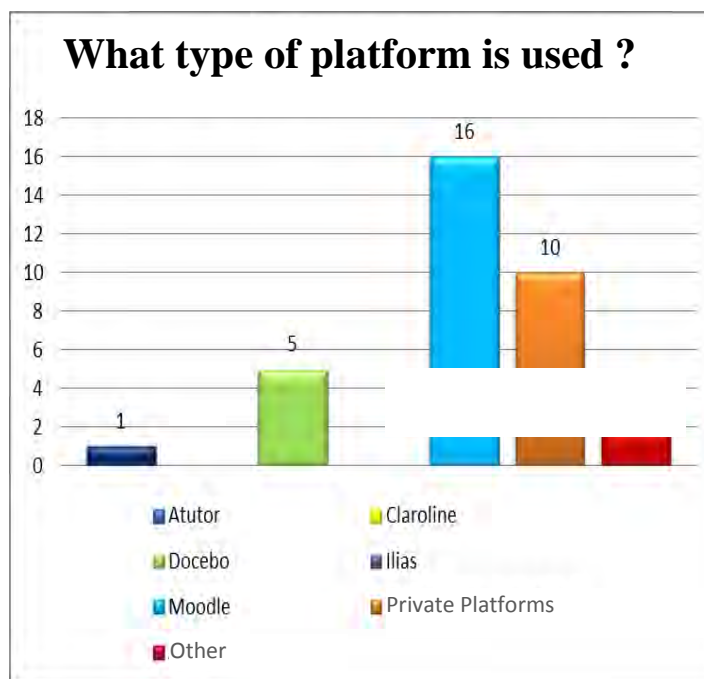
Figure 6. E-learning platforms employed

The results reveal that the majority of schools opt for an open source platform preferring *Moodle*, the absolutely most used platform.

It is to be noticed, anyway, that property platforms are heavily employed by more than the 45% of the schools using e-learning.

Matching these data with the different types of schools, it can be observed how *Moodle* is the most used LMS within higher secondary schools, probably due to the multiple opportunities offered in its different versions.

Typology		E-learning platform				
		Atutor	Docebo	Moodle	Private Platforms	Others
Primary School	Total	1	0	0	1	1
	%	33,33%	0%	0%	33,33%	33,33%
Secondary school level I	Total	0	0	2	6	0
	%	0%	0%	25%	75%	0%
Higher Secondary School	Total	0	5	14	3	1
	%	0%	21,74%	60,87%	13,04%	4,35%
		1	3	9	7	2

Table 8. E-learning platform employed. Separation into typology

5.4 E-learning strong points

In order to indentify the considerations that Apulian schools have about e-learning, let's focus on the answers to the question: "What do you think the strong points of e-learning are?".

The answers observed show an absolute and quite common relevance to the easiness through which the didactic material is distributed thanks to a digital platform, and to the reusability of the same material that can be saved and submitted also to future students. A big part of schools also mention the chance to render the students "active participants" to their own education as an important strong point, as well as the opportunity to ensure them a flexible learning process. At the same time, the schools that mention as strong points the possibility of opinion-sharing and the availability of working tools are less than the 40% of the limited sample that uses a digital platform. Even fewer are the schools which believe that setting up and managing an online course could really guarantee less work to the teacher; these assumptions are shared only by 10% of the sample.
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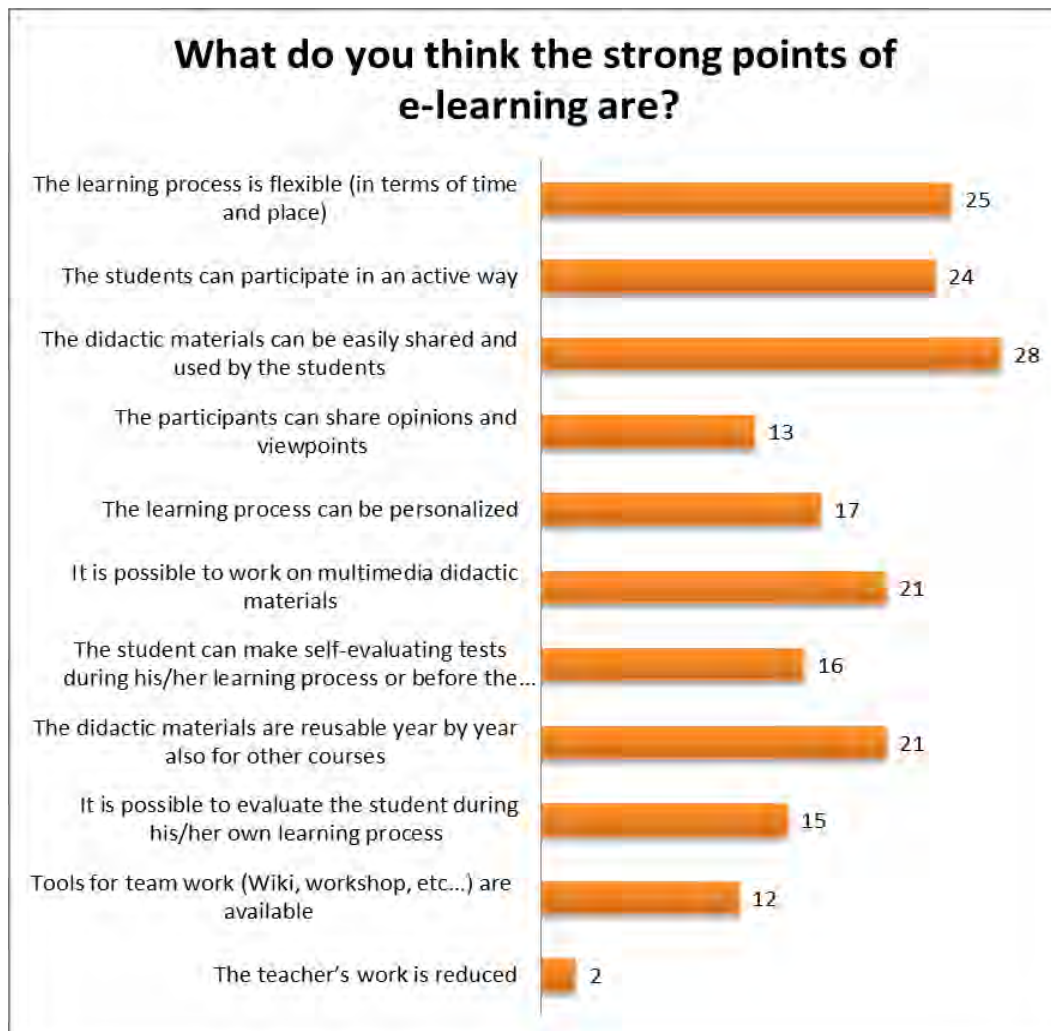
Figure 7. Strong points of e-learning

On the other hand, devoting attention to the variable "E-learning platform used", it is interesting to observe that the schools adopting *Moodle* recognize as a strong point the easy access to the distribution of didactic materials, whilst options like "It is possible to evaluate

the student during his/her own learning process" and "Tools for team work (Wiki, workshop, etc…) are available" obtain higher results. This is linked, to some extent, to the functionalities offered by this LMS, since they are deeply based on the aspects of cooperation and evaluation tools.

5.5 How long has the platform been used

Although data shows a reality in which the development of the Learning Management System within Apulian schools is slow, the answers related to the use of e-learning platforms as a support to traditional teaching confirm a positive trend even if in the last year there has been a slight decrease probably caused also by those schools that are working for the development of the platform but have not yet implemented it.

From a geographical point of view, we can affirm that it is the province of Bari the area that has remained constantly committed in this field;. indeed, data show a peak of new installations during the last three years, whereas in the province of Foggia, the attention on the subject has decreased in the last three years, whilst in the provinces of Barletta, Andria, Trani, and even more in the provinces of Taranto and Lecce, data shows an increasing interest in e-learning, especially in the last year. Finally, the cross-check of temporal data and data related to the type of platform used shows an increasing use of property platforms and a greater differentiation among open source platforms. Moodle boasts leadership as the most used platform in the periods taken into consideration except for the installations of the last year in which leadership is owned by property platforms.
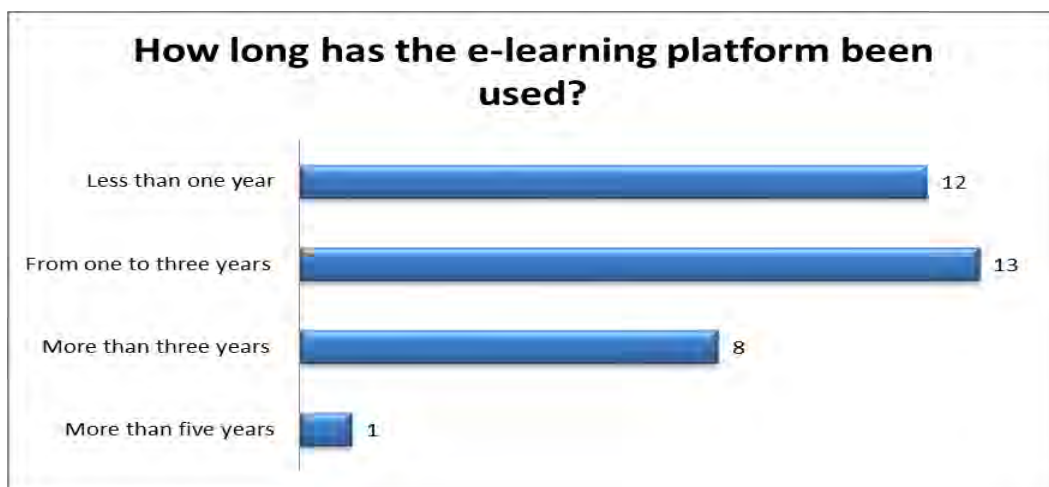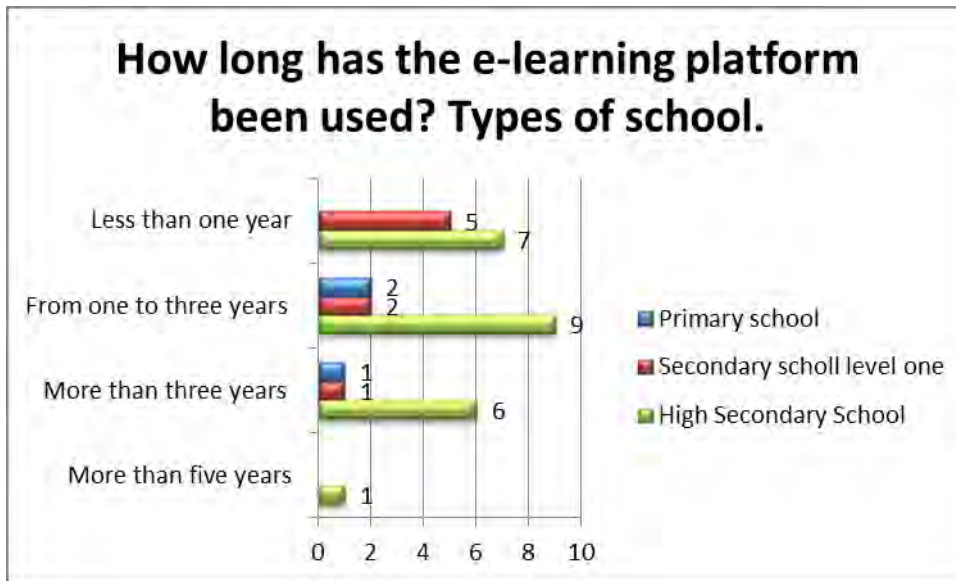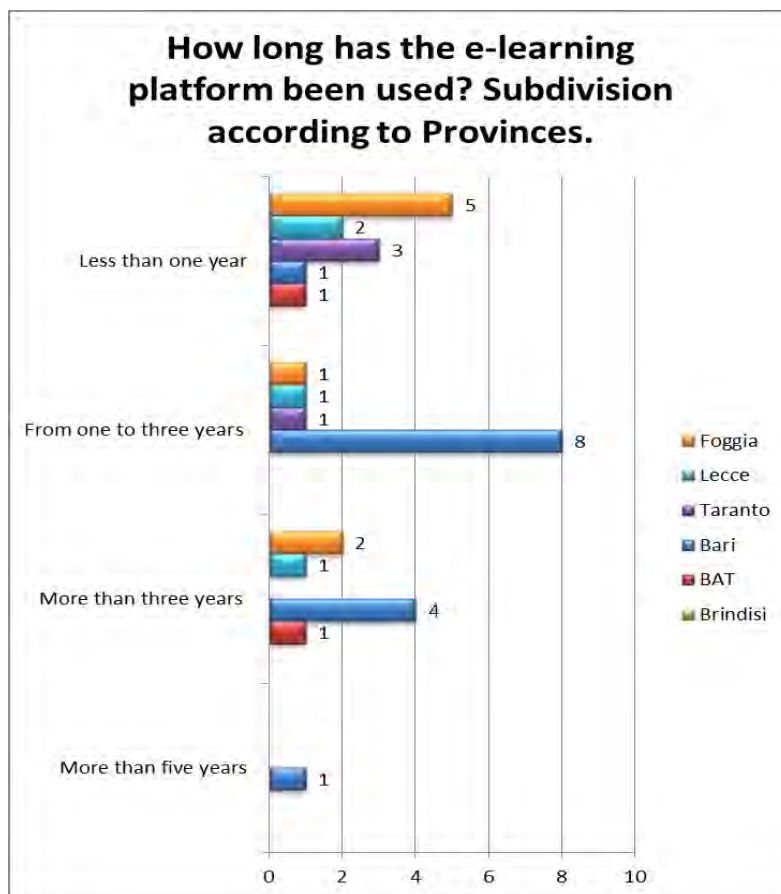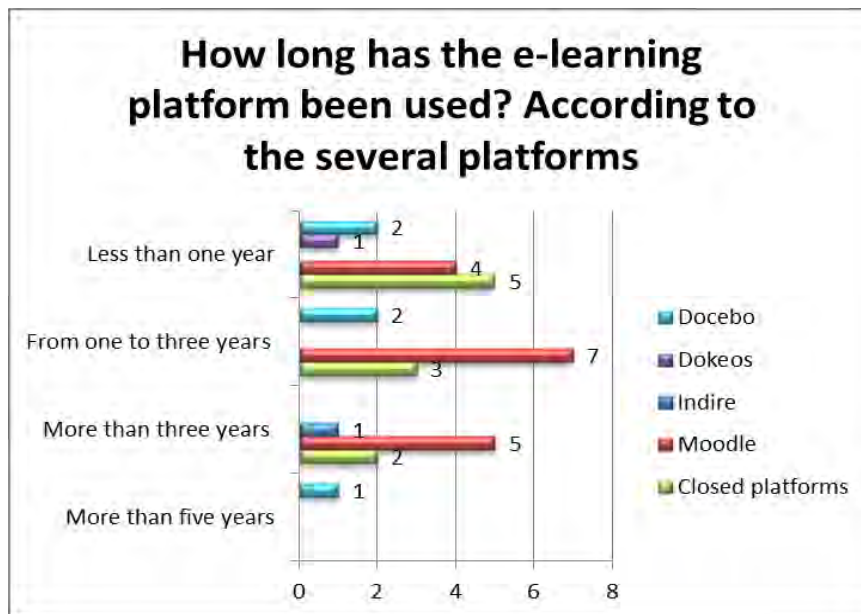

Figure 8. How long has the e-learning platform been used?

Figure 9. How long has the e-learning platform been used? Subdivision according to the types of school.

Figure 10. How long has the e-learning platform been used? Subdivision according to Provinces.

Figure 11. How long has the e-learning platform been used? Subdivision according to the platforms used.

5.6 E-learning support to educational activities

An in depth analysis of the questionnaire can reveal how schools provided with an e-learning platform use it to practically support traditional didactic activities.

For this inquiry, just as for the questions related to the strong points, respondents were given the possibility to supply more than one answer in order to fully cover the actual use of Learning Management Systems in schools. A first-hand analysis of data shows that platforms are mainly used as 'archives' of didactic materials. Indeed, almost all of the educational establishments (more than 80% of respondents) answered: 'It provides teaching material availability' and 'It creates archives of reusable teaching materials'. On the contrary, according to the analyzed under sample, platforms are hardly resorted to as tools for assessing and for intermediate or final evaluations, notwithstanding the fact that, as we will see later on, in more than half of the schools evaluation admittedly relies, at least partly, on the suggested platform tools.
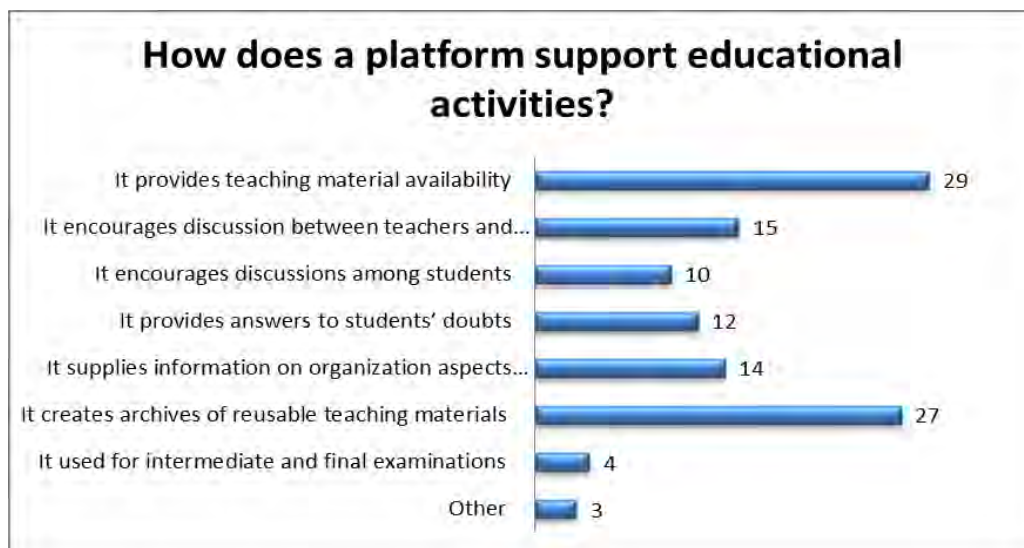
Figure 12. E-learning platform uses

Among the answers classified as 'Other', and apart from 'We are about to begin', it is worth mentioning one answer supplied by a Technical high school in Lecce, that is, related to 'Cooperative learning by Wikis and Forums'. It is the evidence that e-learning platforms (specifically *Moodle*) can actually promote cooperative learning.

Another section in the questionnaire offered the opportunity to investigate to what extent the different uses of platforms were able to satisfy the needs of schools. A 4-point scale with a progressive score from 1 to 4 (not at all satisfied – not very satisfied – rather satisfied – very satisfied) was used for this purpose.

The table below shows that for each usage the average score is quite high, particularly in the usages closer to the concept of "material archive" which obtain the highest average scores.

Platform uses	Number of schools	Average of satisfaction
It provides teaching material availability	29	3,31
It creates archives of reusable teaching materials	27	3,56
It encourages discussion between teachers and students	15	2,87
It supplies information on organization aspects of the activities	14	3,29
It provides answers to students' doubts	12	3,08
It encourages discussions among students	10	2,70
It used for intermediate and final examinations	4	3,25
Other	3	3,67

Table 9. Average of the satisfaction level related to the platform uses.

5.7 Students evaluation

An important target of the survey, and the last area of investigation related to the schools resorting to platforms, concerns the evaluation of students involved in educational activities also by means of e-learning. Schools were asked to show the criteria by which students' performances are graded. Moving from the assumption that the analysis is based on the frequency of the answers, it is possible to identify, within the qualitative criteria, those which were mostly signaled, whilst the criteria relating to the mere fact of being in the platform, or to the number of interventions, are represented by a minority of the sample.
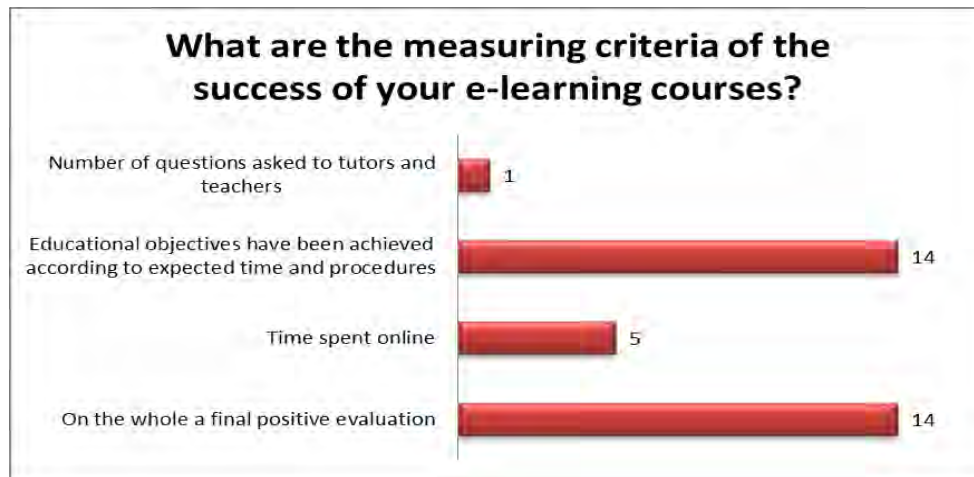

Figure 13. Evaluation criteria.

Moreover the questionnaire included an item related to evaluation procedures. The results reveals that, unlike the ones related to the ways in which e-learning supports teaching activities, most schools (though partly) use the platform to evaluate students.

Whereas only two schools claimed to evaluate the results of online course by using exclusively the tools provided by the platform itself, 14 schools (.41% of the schools that claimed to use e-learning) said to evaluate students by using both the classical frontal method and the functions suggested by the platform.
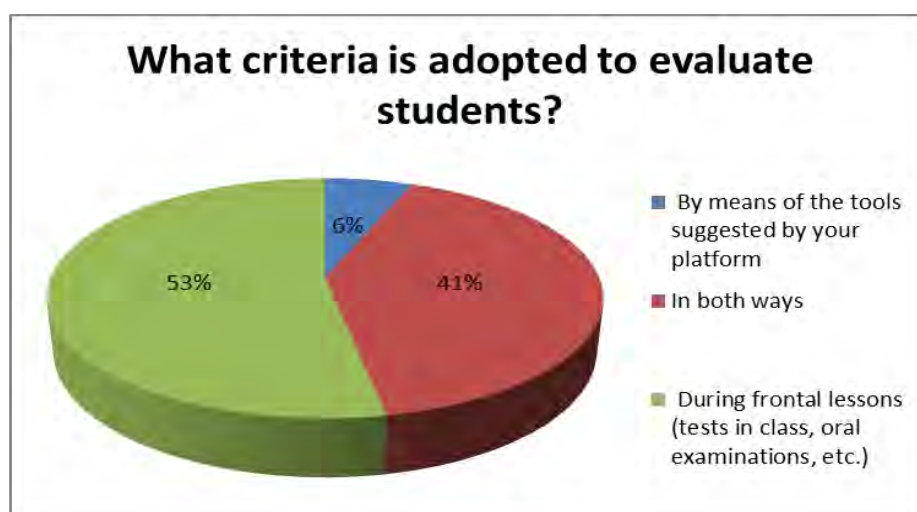

Figure 14. Evaluation criteria

The observation of the data in relation to the specific platform used reveals that most of the schools that claim to assess and evaluate their students with blended procedures, are mostly Moodle users.

5.8 The use of Moodle

Within the objective of this survey we could also include an understanding of whether schools resort to special tools to make their students actors of their own education or whether they are regarded as passive addressees of information, in obedience to traditional procedures.

In order to answer this question an analysis of how often schools resort to Moodle activities and resources is required.

If on the one hand limiting the analysis to those schools which utilize this specific LMS, further reduced the sample, on the, Moodle's pivotal point is the idea of cooperative learning, therefore it includes "activities" created to promote such an education on the part of students.

More precisely, by means of a 4-point scale (Never, Sometimes, Often, Always) schools were asked to show how much they make use of the various resources and activities of Moodle's last version.

Data shows that some of the most used functions are related to inserting external links or uploading files other than the ones pertaining the lesson.

These first results confirm the data on the use of e-learning in school: as discussed many schools use platforms as a mere archive of teaching materials. As for the evaluation functions and educational forums, data reveals that platforms work as binding agents between students and teachers.

Focusing on the "activities", that is, on those functionalities supplied by Moodle and conceived to favour cooperation among students, data shows a modest use.: indeed workshop, but even more Wiki, are being used, though not so often, by nearly half of the schools.

Activities - Resources	Never	Sometimes	Often	Always
Off-Topic forum	12	4		
Glossaries created by students and teachers	12	2	2	
Glossary created by teachers	12	2	2	
Workshop	11	4	1	
Scorm – AICC	11	3	1	1
Glossary created by students	10	4	2	
Free chat	10	4	2	
External tool	10	4	2	
Survey	9	7		
Chat for meeting discussions	9	6	1	
Building knowledge forum	9	5	1	1
Wiki	9	4	2	1
Technical forum	8	5	1	2
Choice	8	3	4	1
Database	5	7	2	2

News forum	4	6	5	1
Quiz	4	6	3	3
Lessons	4	4	7	1
File upload	4	3	5	4
Self-evaluation tests	3	7	4	2
Educational forum for questions to the teacher	2	7	5	2
External links	1	5	8	2

Tabella 10. Frequency in the use of Moodle functions.

6. Discussion

Though collected data reveals a not so encouraging situation, a more detailed analysis shows some hope for the future of e-learning within the Apulian educational system.
Going back to the objectives discussed in the first part of this chapter, we will summarize briefly the results and relative interpretation as follows:

- Analysis of the actual diffusion of e-learning platforms within the Apulian educational system and identification of the reasons why any given school may or may not take use these tools.
  - Data reveal distinctly that e-learning is currently conceived as a niche solution in the Apulian educational system. The schools that support their traditional teaching activities with the use of an LMS are around 20%, though this figure is doubled when considering higher secondary schools alone. Indeed, the latter are the most interested in this kind of didactic experience also thanks to the fact that students can more easily exploit the opportunities offered by this type of platforms. The investigation of the reasons underlying the reluctance towards e-learning educational tools reveals that it is the lack of funds and trained staff rather than skepticism to account for the actual state of facts. Moreover, it is worth adding that in some cases the installation of platforms is currently in progress. Provided that investments are increased in this area, the situation is likely to change also considering that open source platforms are not so expensive. In the last three years schools concerned with e-learning have grown in number in nearly all of the provinces and this is significantly representative of the trend towards the diffusion of digital educational tools as a support to traditional teaching.
- Understanding the actual use of e-learning platforms in schools
  - The emphasis then is on wide and easy spread of materials: as a consequence, LMSs are used as outright archives for the recovery and the sharing of materials, which no doubt is advantageous also in terms of costs abatement. As a consequence, it interesting to observe how an LMS meant to sustain cooperative learning is the most used in Apulian schools, even though, in reality, deprived of most of its functions. Though very few schools claim to use the platform for evaluation, at another point of the questionnaire a great percentage of respondents claim to use, at least partially, the tools offered by LMS to evaluate their students. However, these contradictions, which certainly deserve a further analysis, may shows us, if anything, the awareness that

platforms are supplied with specific evaluation tools that can successfully be associated to traditional evaluation criteria.

- Identifying the main tools, with regard to those enabling students to be active participants to their learning process.
    - As specified above, in order to answer the latter objective, we have chosen to exclusively analyze Moodle, since it is the most widespread platform of the subject matter, besides being the most widespread on a global level. Once again data confirm that Moodle is used mainly as a storage and sharing point for teaching materials. The "activities are definitely not constantly used by a vast number of schools, yet their use (however minimal) in more than 50% of the analysed educational establishments gives hope for the future. This date may be explained by the fact that a class group has no need to socialize in an off-topic forum or in a virtual classroom. Another function which is not very much used concerns the implementation of SCORM materials, that is, the learning objects discussed in the first chapter of this work. This result can be explained taking into account two aspects: the technical knowledge necessary to create an effective learning object and the role of a platform by supporting and not substituting the traditional frontal lesson. It is interesting to notice how many of the results specifically discussed in this last point are comparable to the findings of the research conducted by Lopez, Margapoti et al[8]. This further proves the necessity to train staff for the use of e-learning. On the whole this research has provided us with a snapshot of the Apulian school in which the use of e-learning platforms is struggling to gain speed not so much in terms of quantity as in terms of quality. The figures, especially those concerned exclusively with the higher secondary school, are significant and, above all, increasing, yet there is still resistance, probably due more to cultural than economic or technological reasons. Because of this resistance schools end up using platforms simply to spread teaching materials rather than create an active education "tailored" around the learning group, as would be desirable.

7. Research limitations and future prospects

The research presented in this chapter is to be considered as an explorative research, a starting point that does not claim to offer an exact picture of the Apulian educational reality, but intends to clarify and understand which possible interventions may change the current situation.

Following this necessary preliminary statement, it is possible to identify the limitations of the research within the following elements:

The sample: although we had more than 160 respondents, we are still far from covering most of the Apulian educational establishments. Furthermore, the not completely random sampling procedures may not have produced completely reliable results. When considering the sample, it must be reminded that this research is intended to be – for certain aspects – a proper census of Apulian schools and therefore there is hope that the researches to come will cover the whole universe considered;

The tool: the choice of a structured and widespread questionnaire by means of the tools offered by the web meant a more rapid and simple management of a greater amount of data; however, it may have also been useful to analyse, by means of a more in depth interview,

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[8] Lopez, X., Margapoti, I., Pireddu, M. e Sapuppo, F. (2010), *Quale didattica per l'e-learning? I risultati di un'indagine empirica a livello internazionale*, cit.

specific stakeholders in order to obtain a more elaborate picture of the situation that would not be limited to single data based on answer frequency;

Reason analysis: following the analysis of the collected data, the reason analysis according to which the e-learning platform was not chosen may appear to be limited. Only one question may not have completely clarified the reason of the school's choice and it would have been interesting to analyze these reason by means of an open question.

Baring in mind the above mentioned limitations, it may be useful, in view of a further revision of the current research, to revise the questionnaire and add a series of interviews that would enhance certain specific realities.

A further element of interest for the future may be to extend this research to other local realities in order to comprehend to what extent our region is or is not aligned with the other Italian or foreign territories or even with the university and business' reality, so to understand whether the school can be a driving force in this evolution towards a more and more digital learning system.

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Sustaining innovation: a research on the variables that enable ICT-based educational innovation

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Abstract
The article examines the impact and sustainability of ICT-based innovation in the secondary school. The work is based on an empirical research conducted in Italy, between the years 2009-2012 in 12 middle-schools in Piedmont, which were members of the Cl@ssi 2.0 national project. The paper focuses on verifying which variables have favoured, not fortuitous, but long-term sustainability of these innovative practices within schools. This research has identified four pivotal factors for the sustainability of ICT innovation: light and easy-to-use technologies; well balanced redistribution of work and incentives among all teachers; empowerment arising from digital competences and good relationships with the wider stakeholder system. Teachers play a central role in ICT based innovation at school therefore, more investment is needed in the "human factors" than on technology.

Keywords
Sustainability, learning technologies, human capital, innovation factors, ICT

1.The monitoring of the Cl@ssi 2.0 experience: a framework for investigating the long term sustainability of ICT projects

The "Cl@ssi 2.0" programme in Italy is part of a broader programme, based on the "Digital Classroom of tomorrow" (DCOT) concept.

The goal of "Cl@ssi 2.0" was to the check if, and how, technologies can modify the learning environment and support relevant changes to teaching practices.

The project started in 2009 in 156 Italian secondary schools.

The present paper focuses on the experimentation carried out in the Piedmont region, in which 12 classrooms were involved, in conjunction with other research analysis carried out by the authors, in the last two years, on digital innovation, the relationship of schools with the web 2.0 culture and the changing relationship between students and teachers (Taddeo & Tirocchi 2012a; Taddeo & Tirocchi 2012b).

The aim of this contribution is to analyse the long-term sustainability of such an ICT project, trying to empirically highlight, from a sociological point of view, both the individual and systemic factors that were the driving forces behind the best results achieved in the classrooms.

The project was part of a longer experimental path, which has brought about an evolution in the idea of school innovation. In fact, as Mosa underlined (2009), compared to the first initiatives, such as the "forTIC" project in 2002, and then the "Apprendere digitale", "Digiscuola", "Innovascuola" projects right up to the DCOT initiatives ("Isole in rete", "Piano diffusione LIM" and "Cl@ssi 2.0") the approach has changed, passing from a technology-centred approach, in which the main investments were on hardware and on the introduction to generalist software, to a user-centred approach, in which more attention is paid to the single users (teachers and students) and to the specific, didactical contexts of usage.

The need to work more on "human factors" within the projects of digital innovation is also underlined by the European Digital agenda 2020: a recent survey conducted by the European Commission (EU, 2013), which collected and benchmarked information from 31 European countries, on the access, use, competence and attitudes of students and teachers regarding ICT in schools, highlighted how an integrated approach to ICT teaching in schools is needed. This means not only investing in infrastructure but also, and to a greater extent, in teachers' training, in rewards for teachers that use ICT in the classroom, and creating ICT coordinator posts.

This study also underlines that Italy is still behind in the European process toward the digitalisation of schools: in fact, while Scandinavian and Nordic countries (Sweden, Finland, Denmark) have the best equipment, students in Poland, Romania, Italy, Greece, Hungary and Slovakia are most likely to lack the right equipment.

However, the same study claims that good technological equipment is not the main factor in true digital innovation: the survey shows how often lack of equipment does not mean lack of interest: in fact, some countries with the highest use of computer equipment are the ones with the lowest scores on equipment provision (e.g. Bulgaria, Slovakia, Cyprus and Hungary).

Research evidence shows that simply putting computers into schools is not enough to impact student learning.

According to the research "Monitoring and Evaluation of ICT in Education Projects", (Wagner et al., 2005), three main issues must be considered in terms of the impact of ICTs in education:

- student outcomes such as higher scores in school subjects or the learning of entirely new skills;

- teacher and classroom outcomes such as development of teachers' technology skills and knowledge of new pedagogical approaches, as well as improved attitudes toward teaching;
- other outcomes such as increased innovativeness in schools and increased access of community members to adult education and literacy.

In this framework, the impact of digital innovation must not be considered only in relation to measured and circumscribed effects, but also to a more systemic and global capability to involve and renovate the whole school, intended as a system of intertwined stakeholders: students, teachers and also parents and local communities, and to impact on a rich system of attitudes, capabilities and values in the long term.

Another important factor in evaluating the impact of ICT projects is to their ability to respond to long term sustainability, during and beyond the scheduled funded project and to produce broader effects than those foreseen in the initial phase.

In accordance with this approach, we wanted to measure what were the factors that, starting from a given level and similar investment in classroom technology, really influenced the success of the various projects and impacted on the long term change of each school.

In order to achieve this, the research was conducted with a multi-method, qualitative investigation approach, based on:
- analysis of the annual self-evaluation reports, produced by teachers, related to the perceived success of the implemented initiatives and to the factors that contributed to greater or lesser success;
- monitoring of the long term activities and of the main educational products that had a continuous and consistent use;
- direct interviews to 10 teachers.

These materials were coded according to a multiple grid based on the following elements:
- perceived success and failure factors related to the adopted technologies ("state of the art" technologies, internet connection, continuity of access);
- success and unsuccess factors related to teachers' previous attitudes and digital skills;
- success related to organizational factors, relationships among teachers and type of teamwork;
- success and unsuccess factors related to the wider context and to the schools' stakeholders.

In particular, with regards to these technologies, we wanted to explore if the quality, quantity and updatedness of the adopted technologies in each classroom was perceived as a determining factor for the success of the project.

Furthermore, we investigated teachers' attitudes taking into account their "technological style" and preliminary level of digital competence, as well as their general attitudes towards being "innovators" and "early adopters" (Rogers, 2003); we also examined the presence of "leaders" and tried to identify the structure of teachers' networks, in order to link the success of the project to specific social and professional patterns.

By using longitudinal monitoring and the teachers' self-evaluation reports, we finally acquired an in depth understanding of the relationship that each classroom created with the "external world": the aim was to investigate whether the ability to create positive relationships, both within the school and in the wider stakeholder system, could be considered an influential factor for the sustainability of the projects.

Taking into account of all the above-mentioned factors, we attempted to draw a more rich and complex scenario of the multitude of human, technological and organisational factors that determine "the success" of an ICT project in schools.

2. Theoretical framework. Innovation and sustainability at school

The "Cl@ssi 2.0" programme, therefore, is part of a broader frame of interpretation related to school innovation and educational use of ICT. In this respect, before illustrating the research data, it could be useful to better define the concepts of innovation and sustainability in schools, trying to explain the peculiarity of our theoretical approach.

According to several references (Mioduser et al, 2004; Biondi, 2012) school innovation can be defined as a process, which implies schools are using ICT:

- to implement innovative teaching and learning methods, also showing evidence of significant changes in teachers' and students' roles;
- to re-organise school learning spaces and time management;
- to support personalisation of the teaching and learning process;
- to develop close relationships with the local environment (other schools, companies, associations, parents and families).

So, a real innovation could be defined as a significant paradigm shift where substantive changes take place in the school system as a whole.

The concept of sustainability is probably more complex to define, because it has different meanings depending on the context to which it refers. Generally, the definitions of sustainability are related to sustainable development and so have to do with: living within the limits, understanding the interconnections among economy, society, and environment or equitable distribution of resources and opportunities. From another point of view, sustainability refers to the ethic dimension of the adoption of technologies and, finally, it could refer to the possibility to maintain innovations in a long-term perspective. So, sustainability is a very important issue for school innovation, also because many promising innovations disappear when project funding ends, so in such cases the concern is how might the innovation be sustained. According to Adelman and Taylor, sustainability is «in terms of institutionalizing system changes» (Adelman & Taylor, 2003, p. 2).

Besides, «despite the growing body of knowledge about school reform and special education practices, researchers know little about the extent to which innovations are sustained over time and what factors influence their sustainability» (Sindelar et al., 2006, p. 317). For this reasons, research should address more systematically the factors and processes that support sustainability, to avoid that technologies come back to lie in laboratories and that teachers continue to carry out a traditional way of teaching. In studies on classroom reforms, researchers have identified three main factors related to sustainability: district (referred to the American context) and state policy, leadership, and teaching/classroom factors. In research on the sustainability of school-wide reform, an important factor in the sustainability is school culture: «schools with shared vision and cultures of communication and shared decision making, and schools that involve teachers in the design of an innovation, are more likely to sustain innovations» (Sindelar et. al, 2006, p. 318).

An OECD study about the adoption of ICT at school, demonstrates that external project funding, links with universities and the presence of impressive technology all place additional pressure on a school to make good use of ICT (OECD/CERI, 2001). But this conclusion raises a question about whether this change can be sustained once these external factors are withdrawn. The concept of sustainability applied to the "Cl@ssi 2.0" programme mainly concerns the possibility of preserving the innovations set in place in the three year project: holding on to all the changes in the physical learning environment, maintaining the changes in the teaching and learning methods and preserving the new way the relationship between school and extra-school environments is conceived. Briefly, sustainability means ensuring the survival of the innovation model, even without the funds provided and even facing the replacement of most of the actors involved.

3. Sustainability factors: an overview

3.1 Is the medium the success?

Due to the high value that the ministerial Cl@ssi 2.0 guidelines attributed to the role of technology, we examined, first of all, whether some technologies were considered more strategic and useful than others in driving innovation and causing a deep paradigm shift.

In order to do so, we started with an overview of the technologies adopted in each classroom at the beginning of the project, and compared it with the final technological landscape of the classrooms at the end of the project. Furthermore, we asked teachers to tell us precisely not only what they used more frequently, but also about their process of "domestication" (Silvertsone & Hirsch, 1992) of technologies and the progressive path of discovery, personalization and adaptation that they accomplished in order to fit these technologies in their daily didactic scenario.

Several interesting considerations can be shared on this point.

All the classrooms started from a technological landscape based on a LIM (interactive multimedia dashboard) plus a notebook, netbook or a PC for each student, according to an approach which stressed, at the same time, the "spectacularization" of the didactic method (Taddeo & Tirocchi, 2012a), to gain students' attention and engagement, and personalization, allowing each student to work autonomously.

From this general and shared scenario, we noticed that not all digital innovation had the same long-term impact on the experimentation: open software (platforms, in particular) and mobile technologies have been considered more strategic and useful in the long term transformation of schools, compared to proprietary and "stand alone" media.

Irrespective of the specific technology, tools that were able to adapt to the context and change over time, were considered more suitable in the context of school innovation.
Examples of such type of tools, software and contents were, for example:

- Google Drive and other cloud computing tools (e.g. Dropbox) for sharing contents and creating dynamic and smart exchanges of resources;
- Facebook for managing and supporting student engagement, instead of closed communities and Learning Management Systems;
- Basic and easy-to-use mobile devices (e.g. I-pad, tablet) instead of more powerful stand alone dock stations.

Light, modular and easy to use technologies and software also reduced the cognitive and ergonomic effort, allowing a more flexible approach and the possibility to experiment with less cost and fear of failure compared to powerful and complex multi-purpose technologies (such as PCs) and didactic tools (such as the traditional Learning Management Systems).

In conclusion, the classrooms that adopted these types of technologies had a more dynamic, flexible and adaptable approach to innovation, showing a better capability to change over time and to support the project according to their needs and contexts.

3.2 The role of human networks versus digital ones

Another goal of the research was to investigate the type of relationships, group dynamics and organizational contexts that teachers experienced during the project: we wanted to analyse what kind of relationships developed among teachers and which model of teamwork characterized the activities of each school, identifying the social patterns that led to better results and satisfaction during the project.

According to our observation and the results of the interviews, we can affirm that in almost all -schools only a handful of teachers pull the whole group.

There was no real network and peer to peer distribution of the daily innovation work, rather a "scale free" network (Barabási, 2012) in which few nodes centralized and managed the main part of the cognitive, cultural and motivational resources of the project.

This situation, detected at the beginning of the project, remained essentially unchanged during the three years of the project: technologies did not modify the power relations between teachers and the team structures, so the earliest nodes in the network became the biggest innovation hubs of today. This is often called the "Matthew Effect" from Merton's famous paper (1969), and is also sometimes called "cumulative advantage". The bottom line is that there is a bias toward more connected nodes.

This phenomenon, which Barabási detected in the structure of the Internet, as well as in the social networks, is recognizable also in the teacher's network in our schools: teachers who at the beginning constituted a "hub" for their colleagues, delivering contents, sharing competences, managing web resources such as blogs or simply proposing experimentations at school, continued to cumulate importance and detain a strategic role during the Cl@ssi 2.0 project, despite the common technological habitat, and that communication technologies introduced by the project could leverage the advantages and favour a more distributed circulation of resources.

In this manner, the network of knowledge, online resources as well as skills and competences supported by the Cl@ssi 2.0 project, has replaced the human, cultural and social network previously present in the group, maintaining also the same "hubs" and leadership roles.

We can also underline that leadership in digital innovation is likely to be positively associated with a larger interest and proactive approach to school innovation and that the role of "hubs" and "leaders" tend to be static in such contexts due to the substantial unattractiveness of this role for teachers.

In fact, teachers do not consider being a leader and "early–adopter" as a real added value in improving their actual professional condition:

- they don't obtain money or economic benefits;
- they must be responsible for the whole network;
- there is no balance and reciprocity among the colleagues: the workload due to being a "hub" in the network of digital innovation is often cumulated with the other work, and it's not compensated by the effort of colleagues in other fields.

Thus, being leader in one's school is an anti-economic choice and it is non sustainable in the long term: we can conclude that technology by itself is not sufficient to drive new organizational set-ups in schools and to create a more dynamic and balanced teamwork among teachers, but specific incentives and social intervention must be planned to boost the creation of additional leaders.

3.3 Digital competences: a key skill to promote

A key factor that affected the sustainability of the "Cl@ssi 2.0" project concerned teachers'-technological skills, and in particular the issue of digital competences, in relation to constraints and opportunities in the digital scenario, particularly that of the web 2.0 environment. According to Calvani, Fini, Ranieri «digital competence consists in being able to explore and face new technological situations in a flexible way, to analyse, select and critically evaluate data and information, to exploit technological potentials in order to represent and solve problems and build shared and collaborative knowledge, while fostering

awareness of one's own personal responsibilities and the respect of reciprocal rights/obligations" (Calvani, Cartelli, Fini & Ranieri, 2008, p. 186).

These skills have become strategic because of the increasing importance of digital technologies in the knowledge society and the consequent attention given to Media Literacy and to Digital Literacy also in school projects and curricula. The issue of digital skills was, therefore, treated already with reference to the 1.0 digital environment, and even more so in relation to the convergence culture and the so-called participatory web.

Firstly, there is a deep gap between the digital skills of students and those of teachers (although this does not mean that kids use technology in a more conscious way). Secondly, not all teachers use digital technologies in the same way, because "access" is not the only element which affects digital competence.

The subject of teachers' digital skills is related to four other important issues:

1. the issue of digital divide. Has the "Cl@ssi 2.0" programme helped to increase or decrease the digital inequality among teachers?
2. "Materials" factors (time availability, support of the head teacher). Have these factors had an impact on teachers' willingness to innovate?
3. the "human" and emotional factors: the interest of students and the "fun" of teachers in making lesson;
4. the importance of being a "leader" in the project.

With reference to these factors, the analysis showed that teachers already proficient in the use of new technologies increased their competence, while those who were on the edge of innovation, maintained their lack of competence. An important element was, however, the "peer to peer" channel activated by the more competent teachers to teach these technologies to colleagues.

In addition, teachers with greater availability of time and with the support of the head teacher more easily developed innovation.

The motivation of young people and their positive reactions to change in the learning environment were key factors, as well as the enthusiasm and the desire to have fun while teaching, which all contributed to turn a challenging enterprise into a pleasurable one.

3.4 The role of stakeholders: schools talk to the local community

The presence of local community stakeholders in the school was a fundamental factor for many classes. In some cases, the constant contact with local government and the activation of partnerships with local companies proved to be a big factor of sustainability because it allowed schools to:

- enhance the symbolic role, visibility and prestige of the school (and of the reference teacher) by advertising the project within the local community;
- emphasize the importance of fundraising as a source of additional funding for the project;
- support the project by means of peer-to peer local community involvement (mayor, councillors, cooperatives, etc.).

The role of stakeholders is strategic for school enhancement in the local community as well as vital in ensuring that teachers are seen as strategically important for their entrepreneurial, policy making and planning capabilities.

4. Conclusions. Not only technologies: the importance of human factors

The research data discussed in this article highlights the importance of assessing the validity of innovation processes on the basis of their durability and persistence in the long term. The "Cl@ssi 2.0" programme represents an important occasion of innovation for Italian schools, but, as with many other projects, it runs the risk of nullifying its positive effects, after these three years of work.

So, what are the factors that could favour the sustainability of this project in the long term? We can summarize the results with reference to the four above-mentioned factors:

1. investments in digital technology must play an ancillary role compared to the investments in the human and social capital of the school: above all, they should be flexible and fit the needs of teachers. For example, the level of broadband and Wi-Fi connectivity was more important than "updating" the device. 'Innovativeness' in terms of mere presence of advanced technology is not the issue that significantly affects the impact and sustainability of technology-based innovation;

2. more distributed networks need to be created, by increasing the desire of teachers to engage themselves as leaders. This could be done by encouraging (with symbolic incentives, but also material ones) teachers to become "hubs", that are able to push and disseminate the innovation. Innovation had a slow degree of diffusion in the teaching staff and followed an exclusive peer-to-peer model based on a few strong nodes;

3. digital literacy must be spread among teachers, promoting the acquisition of digital skills, trying to level the "competitive advantage" of the more competent, through specific training paths;

4. teachers must be motivated to play a central role in the system of local stakeholders, through the construction and maintenance of positions of centrality. The link between teachers and the wider system, both physical and "virtual", of educational institutions, private stakeholders and students' parents is a determining factor when embarking on the journey towards innovation.

So, the element that emerges most strongly from the results of our analysis is the importance of the human factors, opposed to the centrality of technologies, considered as the most important driver of social and pedagogical change. Human factors are related to the notion of human capital. The term "capital" implies a usable productive resource and the concept of human capital involves a person's knowledge, skills, and expertise and is acquired through the development of skills and capabilities that enable people to perform in new ways.

From our point of view, therefore, human capital is represented by all the human resources involved in the project: first of all the teachers, but also the schools head teachers, the students, the families and the local administrators, involved in the project in various ways.

Among the factors related to human capital, certainly, teachers represent the most important resource. The role of teachers in Italian schools, as shown also by IARD surveys (Cavalli, Argentin, 2010) has always been a difficult one. Teachers think their role is characterized by a lack of professional prestige and their public image (even the one built by the media) is not particularly positive. Nevertheless, some researches show that teachers have expressed a positive attitude towards technological innovations related to ICT, despite their traditional resistance to innovation. This same spirit of openness was also evident with respect to the "Cl@ssi 2.0" programme.

Teachers, in fact, have been shown to play an important role in all the phases of the project:
- in the design and start-up activities;
- in the early stages of implementation in individual classrooms;
- in the monitoring activities required by a self-assessment support group;

- in the closing phase of the project;
- in the transition to the next teaching cycle (teachers take classes from year 1 to year 3 and then start again with a new class), to ensure the continuity and thus the sustainability of the project.

Of course, we must consider-teachers as part of a larger network of human factors (such as school staff, local administrators, principals, universities, and so on), but they probably represent the most important hub. All these factors interact and the teacher's possibility/ability to act, also depends on the context and on its individual characteristics.

We hope that, in the future, policy makers will develop policies for schools that will take into account the centrality of the human factor, reducing the deterministic vision and the symbolic importance that has historically been attributed to communication technologies.

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Redundant and scrambled information on presentation manager

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Abstract
Many technologies used in the classroom have the main objective to provide the teacher with support tools, for the extension and integration of the lecture. And also the objective to provide the class with a shared presentation and a tool that would improve the quality of the teaching/learning processes and the delivery of information that are produced.
We report the results of a survey conducted with 163 University students who were asked to listen to a lecture accompanied by a PowerPoint presentation, prepared according to the most frequent formats. The written presentation had 3 degrees of concision/redundancy: it was fully redundant with the oral message, partially redundant (main points were selected), or had a different linguistic form (paraphrase of the message). The focus of this paper is therefore on the following question: What happens when the on-screen presentation does not correspond to the oral presentation of the lecturer, because the linguistic formulation is different and the order of presentation of the information does not match?
The situation requires constant attention and concentration, giving little time to retrieve information not fully heard, understood or analyzed. In this situation, each element of disturbance is truly such, it interferes with the construction of a mental representation of the message.

Keyword
PowerPoint, Redundancy, Conciseness, Paraphrase, Scrambling, Learning.

1. Introduction. Similarity between spoken-written text: scrambling and changes of linguistic formulation

In our expectations, the concise text which presents an outline of main points is the preferable presentation, because it shows which pieces of information are most relevant and how they are structured. Furthermore, a fully redundant deck of slides (like a prompter) is a format that does not create interference between listening and reading and so it may have some advantages compared to the third format – non verbatim sentences – which could be the worst condition, because it requires the elaboration of two interfering sources of information. Finally, processing may be negatively affected by a different ordering of topics between ppt and message.

We are accustomed with this kind of request: a speaker may in fact decide, during the oral presentation, to give a different emphasis and priority to some pieces of information by changing the order of presentation of topics. The same happens when the author of a book tells the story with flashbacks and changes in perspective (Kintch et al., 1977). However this may be a factor that makes it difficult to perform search and match activities in order to integrate message and text, especially when the text is verbose. The listener may try to shift attention from one source to the other. We guess that this attempt can only succeed up to a certain limit that is up to a certain amount of information.

When text and message are similar and redundant, because the same information is given in two formats, one can assume that one is supporting the other and that the double processing is not burdensome, indeed is beneficial (Principle of Multimedia Learning, most often verified with text and figure, Mayer, 2001).

But what happens when the text and the message do not look similar because they don't have the same linguistic formulation and / or the same order / sequence of presentation? In our empirical observation we found that these changes in the spoken presentation (Paraphrasing and Scrambling) are frequent and are caused by many reasons - the ppt was prepared in advance, for other circumstances and reasons, it was prepared for distant students, who could not listen to the oral message - none of which is concerned with ease of processing.

Paraphrasing and scrambling are likely to be two factors which impose a cognitive load and prevent a smooth processing. In both cases, it is required to perform a search on the information displayed on the screen, while listening, to find the corresponding information (i.e. looking for the segment of the text corresponding to the spoken segment, evaluating the correspondence, etc.) and then a match between sources.

It is not impossible nor infrequent to carry out these multiple processing and indeed in other research settings these are text manipulations intentionally used to improve retention. For example, it has been suggested that changing the order of information could be a factor that prevents the superficial processing of the text, because it increases deep processing and then memory (Lockhart, Craik, and Jacoby, 1976). However this request seems to have a negative impact on the understanding of the less skilled readers and of those who have low prior knowledge (Mannes & Kintsch, 1987).

Changes in the linguistic formulation (paraphrasing) demand the learner to process two stimuli with the same content but with two different linguistic forms. We know that we can do it, because during the processing of a text, we normally lose its surface form and retain the cognitive content of the text, the mental representation of its meaning (Castelfranchi and Parisi, 1980). Recalling this content we cannot reproduce it verbatim: with the exact words, the exact syntax. The problem is that in a situation in which the learner wants to process a sentence (heard) and its paraphrase (written), he/she is located in front of two stimuli that compete for his/her limited attentional and processing resources and interfere.

The processing of scrambled and of paraphrased information is generally feasible, but it requires cognitive resources. It is possible that there is a breaking point, a threshold, beyond which the ppt presentation no longer favors listening and beyond which trying to use the text on the slide while listening to the message makes it more difficult to process the information.

What we will try to assess is whether conciseness can at least partially reduce the processing difficulties, due to processing of paraphrased information and of scrambled information. By reducing the size of text segments that must be analyzed during listening, and therefore the amount of written text, conciseness might increase available working memory space and reduce cognitive load.

2. Hypothesis and expectations of the research

In our expectations, the concise text which presents an outline of key points is the preferable presentation, because it shows which pieces of information are most relevant and how they are structured. A fully redundant deck of slides (like a *prompter*) is a format that does not create interference between listening and reading and so it may have some advantages compared to the third format – non verbatim sentences – which could be the worst condition, because it requires the elaboration of two interfering sources of information. Finally, processing may be negatively affected by a different ordering of topics between ppt and message.

We are accustomed with this kind of request: a speaker may in fact decide, during the oral presentation, to give a different emphasis and priority to some pieces of information by changing the order of presentation of topics. The same happens when the author of a book tells the story with flashbacks and changes in perspective (Kintch et al. 1977). However this may be a factor that makes it difficult to perform search and match activities in order to integrate message and text, especially when the text is verbose. The listener may try to shift attention from one source to the other. We guess that this attempt can only succeed up to a certain limit, that is up to a certain amount of information.

The focus of this paper is therefore on the following question: What happens when the on-screen presentation does not correspond to the oral presentation of the lecturer, because the linguistic formulation is different and the order of presentation of the information does not match?

3. Method

Subjects. 163 undergraduate students attending to 5 courses for the third year of two Faculty (Psychology and Education Studies) in northern Italy participated to the study. Every class/course was assigned to one of 5 experimental conditions. This procedure explain the slight differences between group numbers. Participation to the investigation was requested as a course assignment.

Material. The subjects listened to a lecture (the spoken message remained constant in every condition) that reported a research on the requests of teenagers with respect to online newspapers (*Teens know what they want from online news: Do you?* Media Management Center, University of Illinois, 2009). The message was accompanied by a series of slides in one of 5 different conditions:

1. Fully redundant ppt (prompter condition).
2. Concise ppt (main points in bullet) with the same order of the message.
3. Concise ppt but with scrambling.

4. Non-verbatim sentences in the same order of the message.
5. Non-verbatim scrambled sentences.

4. Measures and procedure

Immediately after the presentation of every slide, subjects were asked to assess its comprehensibility. The purpose of this question was to have information on the learner's ability to identify the conditions of difficulty and to identify those learners who might require a higher level of concentration.

After completing the reading/listening of the deck of slides, a distractor task was performed: the reading of one text on an unrelated topic. Students were asked to read a short text on *Zoology* and to answer to 10 comprehension questions (prove MT, Cornoldi, Pra Baldi, Rizzo, 1991).

Next, through a questionnaire, students underwent a test of:

recall (open questions, 0-15 points) - the first test required the participants to recall the relevant elements mentioned in the presentation and the related advices on how to make a web page more readable,

application/transfer: (open question, 0-15 points) - the second test required that the participants used the learned advices to evaluate 2 homepages of online newspapers .

The total duration of the experiment was 40 minutes (20 minutes for the ppt presentation).

Evaluation was performed by the 3 researchers, who previously established common criteria. Doubt cases were solved by discussion.

5. Results

We refer once more to our initial hypotheses, in which our expectations were that different types of presentation slides have varying levels of facilitation of understanding.

This is especially the case as:

- the "Key Points" presentation is preferable, because it reduces cognitive load, shows which pieces of information are most relevant and how they are structured;
- the "Fully Redundant" deck of slides (*prompter*) is a format that does not create interference between listening and reading and therefore could have some advantages for online information recovery;
- the "Paraphrase" is the worst condition, because it requires the elaboration of two interfering sources of information.

We have also proposed the two formats (key points and paraphrase) in a scrambled form. In this case there was no correspondence in the order of presentation of the topics between the written text on the slide and the oral presentation. These conditions (scrambled) could create further problems for elaboration and understanding.

The first aspect examined concerned the perceived comprehensibility in the different conditions. Comprehensibility was examined by asking participants to judge the clarity of each slide immediately after its presentation using a 'yes or no' response.

Because the three decks differed in length (there were 10, 13, 16 slides in the concise, sentence, fully redundant decks, respectively), the length of the decks was taken into account by using averaged judgments or scores (Mannes et al. 1996). Therefore, for each deck, the judgments could range from 1 (perfect comprehensibility) to 0 (insufficient comprehensibility).

A more detailed examination shows that the group who was given the slides in the form of the Scrambled Key Point (SKP) claimed to perceive the slides as less understandable.

The analysis of variance when applied to differences between groups gave highly significant results ($F4,158=10,888$, p.>0,000001). The significance is due to the presence of the above mentioned group (SKP). This fact is confirmed by the post hoc HSD per disequal N analysis: this group perceived the deck of slides as less comprehensible compared to all the other groups (p>.0,001).

This indicates that, as far as we consider the initial subjective judgment provided by the learners, the presentation SKP (Scrambled Key Point: concise material that does not respect the sequential order of the message) is considered less understandable.

Next, we tested the efficacy of the different kinds of presentations with a Recall test, and an Application/Transfer test. Table 2 displays the average and standard deviation of the number of elements that have been recalled and the elements that were used to evaluate the layouts of the online newspapers during the transfer test.

	Recall		Transfer		Tot. sub.
	M	Sd	M	Sd	N
Scrambled Key-PointP	12,2	1,39	11,7	2,41	25
Key point	11,3	3,22	11,1	4,28	32
Fully redundant	11,1	3,65	10,5	4,91	33
Scrambled paraphrase	6,2	3,11	5	2,64	32
Paraphrase	5,9	2,44	4,7	1,82	41
All	**9**	**3,97**	**8,2**	**4,61**	**163**

Tab. 2 - Performance in test of "recall" and test of "transfer"

At first, it should be noted that the same trend was found in all groups in the Recall and Transfer tests.

The data that emerges is the one of the best performance, which was given by the Scrambled Key-Point group, closely followed by the Key-Point group.

These data allow us to support the hypothesis that a concise written presentation helps the learners, causing them to get the best results out of all the groups tested.

The Scrambled Key-Point version reveals a slight contradiction between the poor judgement given in the previous comprehensibility test and the results.

A possible interpretation of this is that the Scrambled Key Point condition initially requires an effortful reworking of material (short written main points that must be integrated with oral ones), that appears the most complex. However, integration was carried out and a deeper processing was performed as Lockhart et al (1976) suggested. The results are evident in Recall and Transfer tests.

At about the same level were the results of the Fully Redundant presentation group. These students showed a good performance in the post test, along with a positive judgement of the comprehensibility given during the evaluation of the slide.

Instead, those who were given the Paraphrase submissions obtained the worst results both in the phase of Recall and of Transfer. Table 2 shows their inferior results as compared to the other groups. These data are in contrast with the initial judgements of comprehensibility. It is possible that the students have not perceived a greater difficulty than the one they perceive in their usual class experience. Evidently, the threshold beyond which the ppt is no longer a help and it becomes an obstacle was encountered.

The anova confirmed the existence of significant differences between the 5 groups. The differences between conditions were significant both for the test of recall ($F (4.158) = 36.041$,

p.> 0.00001) and for transfer (F (4.158) = 34.768, p.> 0.00001). The factor that has affected the quality of the performance was found to be the difference between the spoken-written linguistic formulation.

Groups with text paraphrased have obtained results statistically lower than all others, both in the case of the test of recall (p <0.00001) and in the one of transfer (p.<0, 00001). No significant difference due to changes in order of the information was found.

6. Conclusion

In this study we explored the effects of submitting a text written with PowerPoint along with a spoken message which could be redundant or with a different linguistic formulation, in order to find under what conditions a spoken-written presentation could favor the processing of the information presented during a lecture.In fact, teachers increasingly use ppt presentations to accompany their lessons. Students increasingly expect it, and it is important to understand which type of presentation can be useful and which ones can pose obstacles.Literature (Adesope & Nesbit, 2012) presents us with a certain type of ppt as optimal: the concise, ordered, organized one.

The concise text - characterized by low redundancy with the verbal message - should have many advantages: it selects and highlights the most important information and the organization of topics in a concise Advance Organizer (Ausubel, 1962), it allows the learner to immediately identify the important information, distinguishing them from the details (Mayer, 2005; Sweller, 2005).

In a face-to-face presentation the concise text should be more effective than a fully redundant text, which can be useful only in special circumstances, such as when listening is made difficult by reading or hearing problem or by the use of a foreign language (Clark & Mayer, 2002). The concise text should also be more useful than a presentation that paraphrases the linguistic form of the spoken message.

Sometimes ppt presentations do not follow the message sequencing and organization, use different wording, are not concise but dense of information and verbose. We hypothesized that, when one or more of these characteristics were present, it was effortful for the reader/listener to elaborate and integrate the two sources of information (Farkas, 2005; Paoletti, 2012). Audiences may find it disconcerting when presenters bypass points or when it is unclear which point is being glossed (Farkas, 2005).

We posed the question how burdensome and costly, in terms of cognitive resources, it would be to try to process an oral message while processing a non identical written segment. We know from research on dual task and multitasking that we can learn to perform multiple tasks simultaneously, but that the double processing has a cognitive cost.

As we have seen in the results sections, some of our expectations were confirmed and some were contradicted.

This paper focuses on learning outcomes. However, it seems interesting to mention the judgments of comprehensibility made by the students during reading/listening the deck of slide. We wanted to know whether students knew how to distinguish the conditions under which the ppt favored the processing and understanding from those in which ppt made them more difficult. The first aspect examined concerns the comprehensibility perceived in different conditions, obtained by requesting to judge the comprehensibility of each slide immediately after its presentation.

As we have seen, all kinds of presentations were judged highly comprehensible by students, who were unable to anticipate the conditions that would lead to a bad performance (condition paraphrase) or to a good one (key point condition).

Moreover, analyses showed that the low–redundant condition (outline of key points) is the most effective with all the subjects, regardless of the correspondence in the ordering of the message/text. In concordance with the meta–analysis di Adesome e Nesbit, we found that, in comparison with verbatim, spoken–written presentations, presentations displaying key terms extracted from spoken narrations were associated with better learning outcomes and accounted for much of the advantage of spoken–written over spoken–only presentations. Paraphrasing had a negative effect. Scrambling had a negative effect when matched with paraphrasing.

We believe that the conclusion that can be drawn from this experience (although still in progress) is that, for a whole class presentation, it is advisable to take care of the linguistic correspondence between written text and spoken message in order to help processing and understanding of new and complex ideas.

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Section 3

Games, Videos and Simulations for Learning

Tell a Story. Became a lifelong learner

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Abstract
In this contribution we intended highlight a particular teaching method that encourage both a constructivist learning, learner control, collaborative due to its ability to set up processes of construction of meanings, as a trasformative learning (Mezyrow, 2003).
The digital storytelling becomes an active element and bearer of real and experiential content of society (Mc Drury & Alterio, 2003). Locate and reflect on what has been learned, encourage "active learning" through learning by doing , role-playng, problem-solving, in which intentionality, understood as the will to achieve motivating goals, play s an important role because it gives meaning to all the process (Jonassen, 2000); also, offers the opportunity to make visible some aspects of knowledge and relate it to everyday life allowing greater involvment, reflection and motivation to study, to getting ahead from multimedia component which seems to be closer children's comunication method, increasingly linked use of new tecnologies.
The research involves children of primary school in the Province of Bari. After a first phase of teaching/learning strategies for the production of digital storytelling , has follone a second phase of creation and development of a real digital storytelling. According to the model of Mc Drury and Alterio we have observed some design constraints: Story Finding, Story Telling, Story Expanding, Story Processing, Story Re-Constracting.
The research proposal of digital storytelling in primary school proves to be exciting and interesting teaching approach above all it comunicate in a systemic content, processes and emozional and experiential contexts. Digital storytelling has the potential to be a complementary teaching tool to other more traditional teaching.
The results reveal that the product carry out by the students are most effective in the educational and training settings as much as they can mediate true stories, rich in personal thoughts and lived experiences.

Keywords
Digital storytelling, experiential, trasformative, reflective learning

1. Narrative method and digital storytelling

Telling and listening stories are at the heart of human experience, are an integral part of their lives and make up the fabric of cultural and ethical subjectivity. Stories can be found inseparable encounter between tacit knowledge and practical action which flows from the construction of social identity group and the community (Bruner, Feldman, 1995). The stories give life to complex relationships within the different moments and actors experience in which you are to overlay decisions and actions, uniforms visions of reality to subjective interpretations that could hardly be explained by the only rational component (Bruner, 1997). Thanks to the narrative is possible to construct and deconstruct observational perspectives that reflect the idea that the subject has of himself as an individual immersed in a global existential structures in which competing social, cultural, ethical considerations that govern the foundation of a community. Taking advantage the potentialities of pedagogical-didactic narrative, both as a tool of communication of experiences and as a reflective tool for the construction of meanings of reality (Kaneklin, Scaratti, 1998), the digital storitelling is at heart of this dimension in which the multimedia, characterized precisely by the linguistic complexity, contributes to an enrichment of the communication. In this context, the narration act is mixed and blends deeply through multiple forms belonging to the cultural plot (Barthes, 1987).

There are a lot of studies that show the importance of such a methodology for developing the empowerment of every people (Mark Drury, Alterio, 2003; Petrucco, De Rossi, 2009, 2013). The digital storitelling, for this, it is not only a multimedia product, but a real process of teaching and learning that it is part of a tissue made up of actors, technological artifacts and precise educational intentionality (Petrucco, De Rossi, 2009 2013).

2. Storytelling and learning

Several studies have been conducted to prove the importance of storytelling in teaching and learning process, in fact, has always been an important element in teaching. If we consider the relational aspect of teaching practice, we can say that the narrative and dialogue are based on the cognitive and emotional involvement of the participants in the communication (Cisotto, 2005). It follows, on the one hand, the attempt to construct meaning through continuous negotiations, on the other hand, the focus on motivation to learn through active and experiential teaching based on the development of skills (Scank, 2011). The effectiveness of the process The effectiveness of teaching and learning process in this context, is all the greater because the narrative modes that live into it are linked to the actual experience. Mc Drury and Alterio (2003) intend to storytelling as an active element and bearer of real content and experiential reality and with a sense because it helps to contextualize what is learned and reflect on it. Jonassen (cfr. Varisco, 2002) identifies three poles around which the learning process is understood as meaningful construction: the context that determines the interaction between the actors based on a partnership intended as a cognitive process, and finally the inner negotiation. The narrative paradigm qualifies reflection as an opportunity to rework the experience and the knowledge about their cognitive and emotional processes. Through this process takes place not only a meaningful learning, the so-called learning by doing, based on the experience (Kolb, 1984), but also a transformative learning (Mezirow, 2003) because at the end of the reflective process happens a transformation of thought and subsequent action. Howar Gardner in his *Sapere per comprendere* (1999), argues that the narrative approaches to teaching harmonize and develop the various forms of intelligence (especially linguistic, interpersonal, intrapersonal). The storytelling itself as unconscious communication strategy because it is part of the way we communicate, in fact some authors as Abrahamson (1998) and Egan (1989) claim that the

teacher, of course, adopt narrative strategies and they become much more effective if they bind discipline to real events.

The narrative perspective is found in Problem Based Learning (Barrow, 1996; Woods, 2005; Gasser, 2011) where the teaching is anchored to pratical problems related to children daily life, to make it easier , To make it easier learning of abstract content related to the content, because they are resized in the emotional and act as a stimulus for learning motivation of a specific content. The basic elements that characterize a story is being told in an active, engaging and as Schank claims need to be told when it recognizes the existence of a problem and the necessity of explicit the meaning. The digital storytelling embraces both the cognitive and the emotional dimension of the learning process, to become an instrument through which education can be provided in the final end of the whole teaching process.

3. The experiment

To check the validity of theoretical premises a research was conducted with the use of digital storytelling in a third class of primary school site in Rutigliano (BA). The research objective was to stimulate the student to critical reflection and conscious use of new technologies, through a methodology that can be adapted to the interests of children and somehow it was interdisciplinary. The problem that arises is purely technycist related to the use of the instrument and to encourage the development of this competence in students from primary school onwards. It is considered a narrative methodology as was observed when treated with the same subject in another discipline, that not all children have a fluency that express their thoughts with completeness. The lack of a firm linguistic competence produces a limitation in the expression of the content of thought. The idea was to create a visual artifact with a history lived in common to all the children in the class. An important element of the trial was the playful dimension that has played a key role during all phases of the development of digital storytelling.

4. Research design

The design of the research involved the use of digital storytelling as a tool that motivates to collaborative work , sharing and construction of meanings. We tried to check if the DST is a tool that improves the factors in understanding the contents, attention and memory. The study conducted on a small scale, involving a class of 21 children of a third class of primary school Rutigliano, in the province of Bari and a teacher of Technology. The instruments used by the students were the following four: digital camera, freeware software to perform editing operations such as Picasa, an audio editor Audacity and finally Photostory 3 to animate, create effects and add titles to photos. The result is a video with pictures taken in class, drawings created by children and audio commentary. It is made up of a single working group has identified a specific topic known to them because they lived in first person. The theme was the creation of a diary of school life has already been treated in another discipline, so the experiment has been designed to review and cognitive reinforcement. The protagonists of the story and the setting were real ones in which the characters represented personified themselves in the situation. The most significant aspect was the teacher role, who has become a cultural mediator, facilitator and support (Jonassen, 2002) of the whole teaching and learning process. The content of the narrative is characterized by reflection on real action that has been created. This allows us to reflect on the solution to the potential problems in order to explain their thought processes and practice to metacognition. The reference is to experiential learning theorized by Kolb (1984) for which the learning is significant if it is characterized by the reflection from the experience. It follows that learning is constituted by a sequence of

steps or activities which culminate in a reflective change in the concrete. The key element of this process is the emotional component that makes the story interesting and worthy of attention.

On the basis of the digital storytelling structural elements identified by Jason Ohler (2008) intertwined to the model of learning with DST Mc Drury and Alterio (2003), the research consisted of the following phases:

1. presentation of the project to the class;
2. conduct of the written part;
3. collecting material and single composition with the use of the PC.

After the presentation of the project has followed the course of the written part that has seen the following elements intertwine with each step:

1. account of the history and construction of a concept map: raising activities of the stories (Story Finding) and identification of the key parts;
2. discussion of stories with common elements (Story Telling);
3. correlation with other stories to enrich the content (Story Expanding) and storyboard (Story Processing);
4. reconstruction of the final story with possible solutions through a reworking that points to a positive change in thought and action (Story Re-constructing).

Element for the planning of digital Storytelling (Jason Ohler)	Model for learning with Storytelling (McDrury & Alterio)
1. Storytale and construction of story's conceptual map.	1. Story finding: identify of story.
2. Feedback from other about their story with additional comments.	2. Story telling: debate of story.
3. Writing and registration of story.	3. Story Expanding and Story processing: correlation with other story and change on thought
4. Listening and possible review, explanation of the end and digitalization of story	4. Story re-constracting: change in action through reconstruction process

Figure 1 Overview of the elements for the planning DST J. Ohler intertwined to the learning model of Mc Drury and Alterio

After the digitization of history has administered a questionnaire to test the effectiveness of digital storytelling as a suitable instrument for a particular teaching method that motivates the construction of meanings and learning. Specifically, the questionnaire was used to get an idea on what the narrative methodology with the use of DST is as close to the way they learn. It must be noted that there are other variables that may affect strongly dependent on the goodness of the results, such as the "quality of teaching", prior knowledge and technological literacy of children (De Rossi, Petrucco, 2013, pp.131-148). The trial was held in the school in an environment that children already knew.

5. Data analysis

The data analysis concerns both the questionnaire administered five days after the end of the project and the analysis of the observation in the classroom. The latter was carried out by the teacher who has followed the trial by writing a diary. Report what was written in the diary: "the articulation of the work in three phases was characterized by a common trait: the enthusiasm and the general fun. Presentation of the project was met with curiosity as proposed by the teacher of technology, in fact, the application of any exercise of the PC is always welcomed. The diary page elaboration written in preparation for the copying the program and the opportunity to be the protagonists of a film was made with joy and fun. The hilarity that characterized these early stages of the work was the key to a comparison of the companions and the search based on the antagonism of the error as very often happens in the classical exercises that teachers routinely assign, but based on curiosity to know how the other had done. The classroom reading of each page of diary recorded with a camera has been very interesting from several points of view:

1. each had described a time of community life: the school day for which the interaction was high and everyone was interested because it became part of the description of the other in the knowledge that it was not possible comment on the point of view of others as something personal.
2. The pleasure of being the protagonist of a story unknowingly has produced extreme curiosity shown by silence "surreal" while reading the pages.
3. The recording and the idea of being in the final movie actors played a crucial role in self of everyone. Everyone, in fact, they were pretty focused on the novelty of the game on the concern of making mistakes. This has shown that learning in a game situation unpredictable and unknown of which were known to a few simple rules, has created that situation desired by any teacher learning: motivation, participation and protagonism positive and non-competitive, compliance with the rules hard to reach ordinary everyday life in which the fame and usuality of the instruments used in the way."

6. Analysis of the questionnaire

The analysis of the questionnaire aimed to detect the effectiveness of the methodology used and the comprehension and memorization of the content, but also on communication and awareness of the experience. The questionnaire consisted of 14 questions prepared treated with four-level Likert scale. The results show that, as regards the effectiveness of digital storytelling on the content storage (figure 1), the tool proved to be very efficient in storing for 38% of children, on the other hand a similar percentage considered, however, the DST an effective tool. A consideration arises about the fact that there were a high percentage of children who have declared as the instrument is not very effective in storing and others who have stated that it is a highly efficient tool in the storage. Among those who said "a little" and who said "a lot", there is the factor "a lot" who instead had a non-negligible percentage (23.80%). What does this mean? That those five points of difference will be affected by the dependent variables described in the previous paragraph that it could not find, and they still are negligible compared to the total recorded. Regarding the effectiveness of digital storytelling on understanding of the content (Figure 2) most of the children considers having understood the objectives and the content (47.62%). However, as regards the effectiveness of the DST as a tool that facilitates communication of the lived experience, the 47.62% stated that served to communicate a lot of personal experience
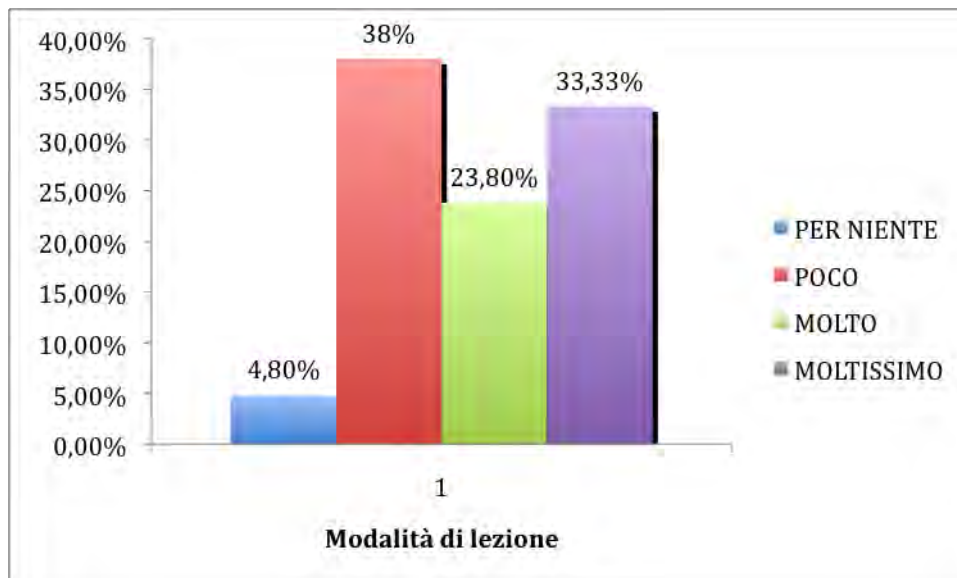
Figure 2. Children conception on the effectiveness of the DST relate to the storage of the content experienced in the classroom.
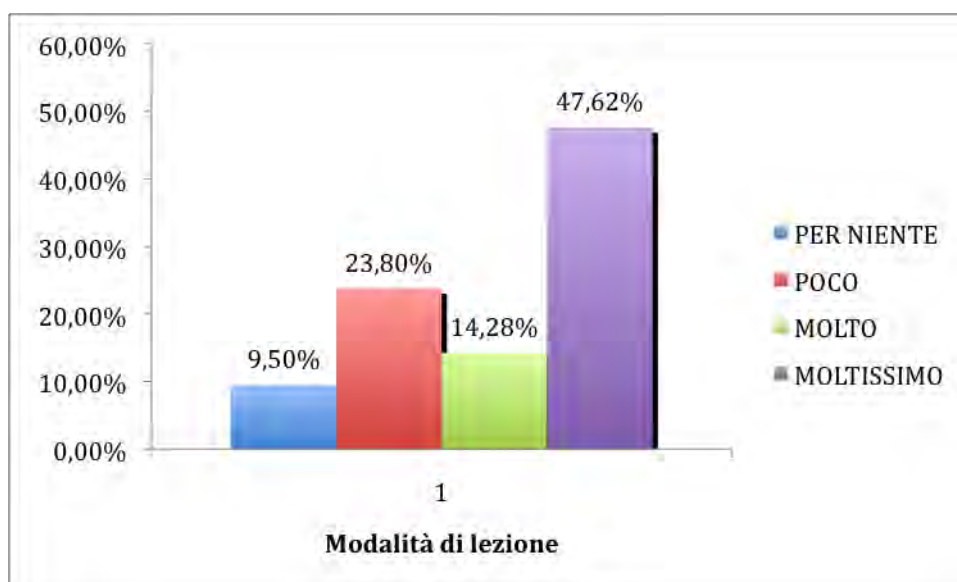
Figure 3. Children conception on the effectiveness of the DST on the understanding of the content.
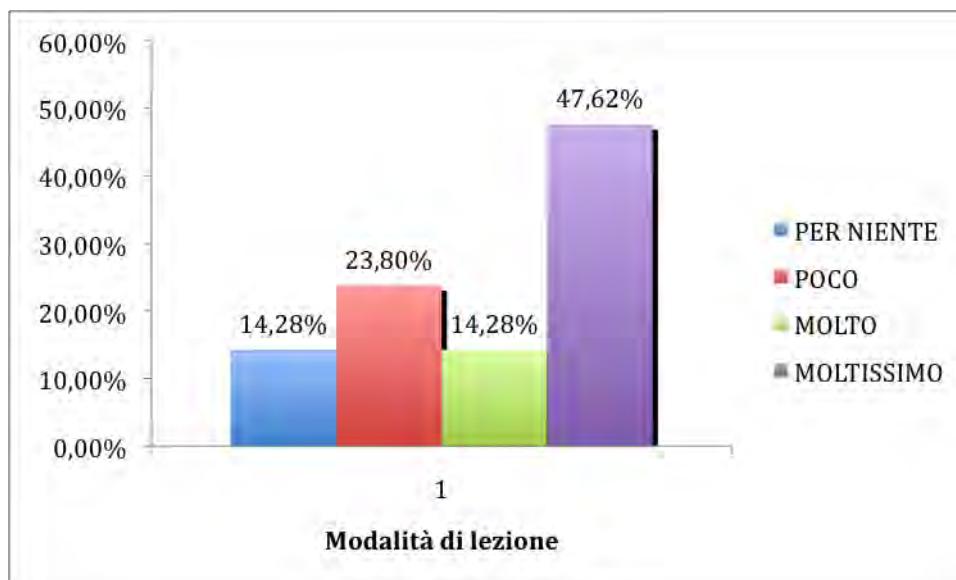
Figure 4. Children conception on the effectiveness of the DST on the communication of a lived experience.

7. Conclusions

In the light of the results obtained can be shown positive applicability of digital storytelling to teaching, because pupils are prepared to accept innovative teaching methods in multimedia. The images, sounds, increase the levels of comprehension, memory and attention and predispose them positively to the learning situation. The narrative method increases the positive effect because most emotionally engaging. The ultimate effect that results is an explosion of creativity, collaboration, motivation to study. The educational potential measured with the digital storytelling show being a tool that offers a wealth of stimuli when considered as a way to communicate abstract content through concrete experience. Its use reveals major implications:

- as collaborative work of community of practices that construct meanings;
- as a connector of interdisciplinary knowledge;
- as a cultural artifact that has value for themselves and for others;
- as an instrument implies that the ethical dimension.

Although research has been conducted on a small number of children, it could be the impetus to address and expand further research on a larger sample. Of course, this small sample has been observed that the digital storytelling could facilitate the teacher in the use of a teaching tool complementary to the didactics, to rethink the new conception of the teaching profession in view of two dimensions become indispensable: research and development.

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Empathy and intercultural games

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Abstract
The paper presents an intercultural game used for teacher training: *Digital Empathy*. The game involves two steps. The first step consists in students choosing a photographic portrait among several displayed and are then asked to write one or more sentences in the first person identifying themselves with the portrayed character. The second step requires students to publish their sentences in a Flickr album from the perspective of alternate reality games.

Keywords
Intercultural games, Emphaty, Simulations, Alternate Reality Games.

1. Empathy and games for intercultural education

Within the Italian educational context, intercultural education practices often involve the risk of stopping either at a cognitive level or at a proclaiming level. The first is the case of such practices as the ones aiming at describing other cultures; the second is the case of those making rhetorical appeals to sets of values, though shareable and sustainable ones.

In this respect using games as tools of intercultural education is viewed as an interesting prospect. Students of various ages as well as teachers involved in training courses may experience meaningful learning triggered by active involvement in games. The fact that whole repertoires of intercultural games are made available in the North American context (Fowler & Mumford 1995; Fowler & Mumford 1999), and also in the Italian context (D'Andretta 1999; Staccioli 2004; Castelnuovo 2007), shows how such approach is getting more and more attention.

We can pinpoint two different perspectives within these games. One perspective, the *pars destruens* according to Bacon, involves questioning those stereotypes that make it difficult for us to understand the others. Resuming Bateson's studies about gaming, according to which a game is a message that somehow defines a context or a frame (Bateson 1956), playful activities can help effectively understand how limited some ways of thinking and usual frames of thought are.

Among the first and most well-known examples, there is the one developed in the Nineteen Seventies (Watzlawick, Weakland & Fisch 1974) and later resumed in the Italian context (Sclavi 2003): it consists of connecting nine dots arranged in three parallel lines with only four segments without lifting your pen from the paper. We can obviously resume alongside with this all the games that foster creative and problem-solving skills. Another perspective, the *pars construens*, is linked to the development of communicative skills which enable us to get to know and understand others. In the same perspective we can place the theme of empathy and of games fostering its development: «among educators, empathy is emerging as an especially disposition for global citizenship because it enables us to perceive the world through others' perspective, experience the emotions of others, and communicate and act in ways that consider others' views and needs» (Bachen, Hernández-Ramos & Raphael 2012, p. 438).

The concept of empathy is in many respects ambiguous and misleading and is often confused with liking and compassion. By empathy we may mean «the act through which we become conscious of the existence of other subjects and of their own inner life, developing and intensifying the way we used to live our world together with others» (Boella 2006, p. 87). In this sense empathy:

1. puts us in touch with the emotions felt by the people we meet therefore «it is the condition that enables us to feel a whole range of emotions such as liking, love, hatred, pity, compassion as well as various ways of understanding others» (Boella 2006, p. 12). Therefore empathy does not coincide with emotional participation or with forms of identification.
2. it doesn't simply connect two persons but it also implies understanding of a mutually shared context (Costa 2010, pp. 190-192).
3. it is neither an intuition, nor an instinct to imitate (Costa 2012, p. 183) but a motion, a process implying an encounter with a living body, a face, followed by a phase connected to imagining and understanding, where imagination and simulation typical of empathy imply a reference to a situation well defined in terms of time and space (Costa 2010, p. 197).
4. its final outcome is self-reflection along with reshaping and reconstructing one's own identity: «meeting the other is not the mystery of soul to soul communication. First of

all it means realizing what has changed inside me and what I have discovered about myself, from the moment in which the joy or suffering of another person triggered» (Boella 2006, p. 73).

5. empathy can be subject to learning therefore we may consider it possible to educate to empathy: «empathy requires exercise, commitment, and needs to be developed as an essential human capacity» (Boella 2006, p. 91, Rivoltella 2012, p. 120) .

6. empathy has a few limitations: «the other, in whose mental shoes I put myself, is not the real other-than-me, but my own personal representation of the other» (Monceri 2006, p. 108). When we arbitrarily ascribe feelings and emotions to the other, empathy becomes unreliable.

In short, there is a paradoxical aspect to empathy. On the one hand it plays a fundamental role making it possible to understand the others, moreover enabling us to communicate even in the affective dimension in an ethnocultural context (Wang et al. 2003). On the other hand it can easily lead to misunderstandings. Some types of games help train empathy, precisely because they take on some aspects of empathy underlining its own potentialities and limits: when we play we turn into someone else, we feel different, we take on and experiment different identities both in traditional games (Caillios 1981, pp. 36-40) and in videogames (Gee 2007, pp. 45-69). A game is a simulation where time and space are not the same as in reality.

2. The game Digital Empathies

The aim of the game called *Digital Empathies* is to let people experiment empathy through simulations in an intercultural perspective. The game addressed students enrolled for a degree in teaching primary school children. The question is: how to develop empathy in prospective teachers within a university course with limited time and scanty tools available? The solution consisted in an easy game that needs only a short time to be performed: a few hours in the classroom and a follow-up online activity.

Following a brief introduction focusing on the theme of empathy and intercultural - related competencies, students view a slideshow with fifty-seven photographs portraying people and faces, with very little information about each photo. After the presentation several reproductions of the photographs are laid down on the floor. Participants are asked to walk about the pictures and to pick out one on the basis of purely personal criteria. Having made their choice, each participant putting themselves in the portrayed person's shoes, is asked to write one or more thoughts in the first person thus giving voice to the photo. In the course of the first debriefing session held in the heat of the moment students are free to express and share what they have experienced. The game is completed with an online activity: students add their thoughts as comments to the photos published on Flickr. The published thoughts are later discussed in the course of a second debriefing session which takes place in the following meeting.

The photos have been selected bearing in mind the necessity for students to be able to choose among different conditions, at the same time avoiding too strongly different conditions as is the case of disabilities. Thirty-three of the photos portray single individuals: from an advertising portrait of a cinema actress to portraits of people belonging to different social classes or images of young African women which have most probably been extorted. Thirteen are portraits of couples: traditional wedding photos, fiancées, a mother and her son/daughter, brothers and sisters. Finally twelve are group photos: working people, families, immigrants. The images are scanned reproductions of old photos taken between the end of 19th and mid 20th century. The reason why such photos have been chosen is that the context

in which they were taken is definitely unusual: places and times are purposely different. Though feelings and relationships are similar across cultures, there is a difference between those times and everyday experience that had to be underlined.

Some information as to the photographer's name, date, caption and dedication is given for each photograph. This is followed by a few remarks about the contents, then students are invited to reconstruct a likely context and the underlying stories before starting to write what the game requests.

Students are given a rather short time to choose their image and jot down their ideas: between twenty and thirty minutes. The purpose of the debriefing session that follows almost immediately is to share the reasons underlying the choice and the emotions felt. More specifically a set of four questions has been used to facilitate the debriefing session: 1. What was the reason that inspired your choice? 2. What difficulties did you meet with while you were trying to voice the person portrayed in the photo? 3. What did you feel? 4. Do you think emphatic attitudes come easily?

Figure 1. The portraits used in the game
(http://www.flickr.com/photos/giovanni_neri/sets/72157626707434677/)

The next step in the game involves the use of digital instruments. First of all the Flickr digital album containing all the photos, numbered from one to fifty-seven, is presented and the following task outlined. This consists in publishing what has been written as a comment to a photo as a whole or to just a part of it. The original comment may also be modified. The online publishing, besides documenting the game, implies further thinking and allows participants to get to know all the published comments.

A special blog post in *Giocare in Unimol*, already used in the gaming workshop, was posted in order to summarize all what had been done and outline tasks, times and scoring system.

«As already agreed upon I ask you to:

1.   make a Flickr account (http://www.flickr.com/). It isn't at all difficult, you are already quite experienced. 2. Access the   album   where   the   portraits   are   published (http://www.flickr.com/photos/giovanni_neri/sets/72157626707434677/), find your portrait

(they are numbered from 1 to 57; earlier I told you to write down the number of the one you want to single out) and comment upon the photos with the sentences previously formulated.

Once finished, please report adding a comment to this blog post including your nickname, year/group, portrait number and possibly the portrait address. This way you score 300 points. The post deadline is Sunday October 21st at midnight».

(http://giocareinunimol.blogspot.it/2012/10/giuni-missione-sei-empatie-digitali-ii.html)

The second debriefing session besides allowing participants to look over what has been accomplished (Figure 2) makes it possible to analyze the written sentences more deeply and systematically. The following set of questions was used: 1. Who of you modified the original sentences? 2. Who of you chose other photos to play? 3. On what grounds did you make your new choices? 4. Thinking about the game again, do you still feel the same? 5. Do you reckon having had an empathic attitude and why? 6. What do you mean by empathy? These questions focused on the following aspects: the differences between the simulation offered by the game and empathy, potentialities and limitations of empathy, the ways in which the game can be redesigned in order to be used with different age levels.

Figure 2. Example of a piece of writing
(http://www.flickr.com/photos/giovanni_neri/5783603878/in/set-72157626707434677)

3. Use of the game and results

The game *Digital Empathies* has been used for two years in a row (2011/2012 and 2012/2013) within three workshops on game and animation methodology held by the University of Molise. A hundred and fifty-two comments were published; only seven photographs out of the whole lot weren't commented upon.

It should be borne in mind that in a game emphatic processes can only be simulated. Empathy implies meeting with real people, living bodies, not just photographs (see point 3 first paragraph). This was made clear by the comments of two participants who obviously refused to play the game. One didn't actually refuse outright and this can be inferred by the fact that he posted a comment though it was not in the first person. (PaziEnza1, photo n. 55, http://www.flickr.com/photos/giovanni_neri/6183125360/in/set-72157626707434677). The other comment contains an analyses of the facial mimicry of the person portrayed and the

conclusion is: «I would describe his/her emotion as anger but I don't want to explain my reasons, I realize I would only say things based on prejudice» (edoardovale, photo n. 3, http://www.flickr.com/photos/giovanni_neri/5771790592/in/set-72157626707434677). As the game requires participants to write their own thoughts in the first person, it obviously can't be expected to reproduce what the portrayed persons actually thought in any way. From an educational perspective it requires a process of projective identification that is altogether different from empathy.

Once all the comments had been collected the second debriefing session was held, in the course of which it became apparent that the same photo may be given different interpretations; for example photo n. 19 is associated with silence, tranquility, solitude but also with marriage and maternity, with relaxation but also with waiting. It is obvious that a game activates an identification process, quite different from empathy, and one projects one's own thoughts on the person portrayed. The comment to a photo portraying a little girl sitting on a stool said: «If I go on eating junk food, the bench won't support me anymore» (Antonville2011, photo n.31, http://www.flickr.com/photos/giovanni_neri/6178943101/in/set-72157626707434677). Obviously here's an adult who worries about his diet and he is projecting his thoughts. In terms of training this allowed us to highlight nature and limitations of empathy (see point 1 and 6 first paragraph) .

If, on the one hand, the game made it possible for us to understand what empathy is not, on the other hand it fostered a way to approach empathy, for example through the retrieval of one's own memories, in the light of which the photo can be interpreted. Similar contexts are reconstructed in which the other's imagined experience will be set: «this photograph reminds me of so many times spent with my family. We used to go to the countryside to celebrate any memorable event. I see myself in the little girl standing in the foreground next to a woman who may well be her grandmother» (danivar75, photo n. 13, http://www.flickr.com/photos/giovanni_neri/5783603878/in/set-72157626707434677).   What happens is that a mutual context is being rebuilt, even through imagination and a whole world is being shared (see point 2 first paragraph). It becomes apparent that empathy is not a matter of intuition but a process (see point 3 first paragraph) involving a reflection on one's own history and identity (see point 4 first paragraph). In the course of the second debriefing session a thorough analysis was carried out beginning with the high percentage of rather hasty and more stereotyped comments to end with the most structured and meaningful ones and it emerged that the game or exercise undertaken constitutes a first modality to approach empathy (see point 5 first paragraph). The debriefing session, rather like a group discussion, is open to anything unexpected or unwanted. These are two dimensions pertaining to the practice of empathy that cannot arise simply from a photograph.

4. Discussion

In order to gain a deeper comprehension of the game but also in view of further possible developments we can consider three approaches. The first approach consists in working on identities in a playful vein. Our game was used within an educational pathway in the course of ten meetings. The first underlying theme was what we call ludobiography, that is «the way people narrate themselves through multifaceted ludic tools» (Staccioli 2010, p. 9). Through a number of games/exercises, focusing on the gaming dimension Caillois defined as mimicry, linked to mask and disguise (Caillois 1967), we worked on the topic of portraiture and avatar creation. Photographs, portraits and avatars worked as a mirror allowing participants to rethink about and put their own identities in a different perspective, even though in a lesser tone than is the case with empathy, thus completing one's perception about oneself.

The second approach focuses on alternate reality games. The idea underlying the use of Flickr was to combine an activity carried out in a physical reality with an activity carried out in a digital reality in order to find out forms of mutual reinforcement (McGonigal 2011). The entire workshop, of which *Digital Empathies* is part of, was organized as an alternate reality game where, though the typical interactive dimension of videogames was lacking, every single mission carried out in the physical reality was scored in the virtual dimension, thus arousing a form of competition among participants.

Figure 3. Classification of gaming-simulation approaches by Armstrong (1995, p. 215)

The third and last approach focuses on simulation games. Intercultural simulation games have been defined as «instructional activities that engage and challenge participants with certain experiences integral to encounters between people of more than one cultural group» (Fowler & Push 2010, p. 94). Obviously not all simulations are games and not all games are simulations; competition is seen as the element allowing for an overlapping of the two (Landriscina 2009, pp. 19-20). A further common element between game and simulation is role-taking: «gaming-simulation is s synthesis of some elements of a game, and a simulation, or analog, of some aspect of reality. The game elements consist of people playing roles and taking decisions appropriate to these roles» (Armstrong 1995, p. 214). The classification suggested by Armstrong (Figure 3) provides a further element of comparison using two conceptual pairs. The first conceptual pair deals with the diversity of meaning attached to the objectives: they may be well-defined, that means related to a specific theme or otherwise open. The second pair refers to the roles to be taken up, which may be either realistic or abstract. This makes it possible to divide simulation games into four categories. Some level of competition is rather extrinsic to *Digital Empathies*, while role-taking is integral to the game, though in an embryonic stage. As the game is rather simple, the goal to pursue, fostering empathy development, is meant in terms of gaining a certain degree of self-awareness and is

not connected to any specific subject. Moreover, no matter how realistic the portraits are and bound to historically determined social contexts, they constitute a purely symbolic reference, as we do not know anything about the people portrayed. However easy *Digital Empathies* is – it might help set the ground for more structured games – it bears the elements simulations typically include.

5. Conclusions and further perspectives

Gaming as an instrument of intercultural education presents a rich opportunity for future research. Within the scope of this perspective the question of adequately evaluating the efficacy of games in terms of learning remains open. The outcomes of *Digital Empathies* are yet to be strictly evaluated, even though a few positive conclusions have been reached. In this respect we could make use of the Global Empathy Scale (Wang et al., 2003), already employed in similar experiences (Bachen et al., 2012). This scale is a useful comparative instrument. It measures empathy in eleven levels which correspond to as many stages of development, from simple being aware of how social and political rights change from country to country to feeling responsibly involved in the global context.

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Learner Collaboration in Digital Game Making: An Emerging Trend

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Abstract

Twenty-First Century skills like creativity, problem solving and collaboration are acknowledged as fundamental in the technology-driven knowledge society. Increasingly, education is being called on to support the development of such skills from the earliest years. This paper examines a promising methodology for this purpose, Learners' Digital Game Building (LDGB) and more specifically the design and construction of digital games by learners working together in collaboration. Advocates of Game-Based Learning (GBL) have long espoused its wide-scale adoption as a pillar of modern, learner-centred education. LDGB takes this a step further: when students design and make games rather than just play them, they invest themselves holistically in the learning process. The authors believe that setting LDGB within an explicitly collaborative framework will not only enhance educational affordances, but will also prove an effective way to nurture learners' capacity to collaborate fruitfully, which itself is a key Twenty-First Century Skill. The paper discusses the theoretical basis for LDGB and describes its actuation in a European research project called MAGICAL. The project aims to generate tools, resources and teacher know-how for implementing collaborative LDGB activities, and to verify the validity and applicability of the methodology in primary and lower secondary school.

1. Introduction

In the past decade the push for widespread adoption of Game-Based Learning (GBL) in education has been gaining momentum (Garris, Ahlers & Driskell, 2002; Gee, 2003; Egenfeldt-Nielsen, 2006; Sandford et al, 2006; Van Eck, 2006; Van Eck, 2010; Whitton, 2010). Researchers have increasingly argued that the meaning-making that occurs when people play digital games defines a form of literacy that is better suited to the needs of 21st century learners (Gee, 2003; Squire, 2008; Games, 2008). Twenty-First Century skills (21CS) are considered a crucial part of future learning and curriculum innovation and are seen as something children should adopt from the earliest stages of their school career (e.g. Simanowski, 2009). However, current schooling tends to produce passive consumers of media instead of creative problem solvers, critical thinkers and producers of media. School systems need to introduce innovative learning practices and solutions that support the development of 21st century skills. Research in GBL has begun to look beyond just the playing of games to consider the potential of making games as a better way to address learners' needs (Brennan & Resnick, 2012; Games & Squire, 2008). It has been argued that game making supports development of competencies and transversal skills like creative problem solving, collaboration, digital media literacy and systems thinking, and also has a beneficial effect on engagement in STEM subjects (e.g. Zimmerman, 2007; Clark & Sheridan, 2010). This paper considers the emerging learning-by-making-digital-games (LMDG) approach (Kiili et al., 2012) as a possible future learning method that can prepare students for the challenges of the 21st Century.

2. Learning by making digital games

In recent years LDGB has been gaining increasing attention in the fields of educational research and Technology Enhanced Learning (TEL) (Kafai, 2006; Lim, 2008; Prensky, 2008; Robertson & Howells, 2008; Games, 2008; Vos, Van Der Meijden & Denessen, 2011; Robertson, 2012). As a pedagogical strategy LMDG is theoretically founded on Dewey's learning by doing (Dewey, 1938/1997) and Papert's learning by programming (1980) approaches. The pedagogical idea relies on the assumption that construction of artifacts helps children to reformulate their understanding of the subject and to express their personal ideas and feelings about both the subject and the constructed artefacts (Kafai, 2006). Although the artefacts motivate children a lot, they can be regarded only as by-products of learning. At its best the design and development of artefacts is attained through creative teamwork, which supports reflective thinking, collaboration, problem solving and co-construction of knowledge (Roschelle et al., 2000).

While the amount of scholarly work on serious games and educational games has grown steadily over the last decade (e.g. Gee, 2003; Squire, 2008; Ketamo & Kiili, 2010; de Freitas et al, 2012, Devlin, 2011), a literature review we performed revealed that LMDG-related studies are still uncommon. We reviewed almost thirty research papers in order to investigate what kind of evidence exists about the usefulness of LMDG in terms of 21st century skills.

2.1 Learning by making digital games and 21st century skills

The white paper "Defining 21st century skills" published by The Assessment and Teaching of 21st Century Skills project proposed a KSAVE framework that includes 10 important skills necessary for the 21st century (Binkley et al., 2010). The KSAVE framework classifies these skills in four groups as presented in Table 1. In this paper we use the first three skill groups as lenses to classify the results of previous LMDG research in terms of 21st century skills development. The aim is to evaluate the approach's usefulness and identify existing research gaps.

Ways of Thinking
Creativity and innovation Critical thinking, problem solving, decision making Learning to learn, Metacognition
Ways of Working
Communication Collaboration (teamwork)
Tools for Working
Information literacy ICT literacy
Living in the World
Citizenship – local and global Life and career Personal & social responsibility – including cultural awareness and competence

Table 1. The 21st century skills included in the KSAVE framework

Ways of thinking lens

Creativity. Creative learning environments are those that provide resources for creative thinking together with a balance between structure and freedom, opportunities to engage in authentic tasks, collaborative work and reflection as well as possibilities to work in an emotionally safe environment (Davies et al., 2012). All these properties can be integrated in game design tools and pedagogies. In fact, Robertson and Howells (2008) state that user-generated game content can empower learners by enabling them to express their creativity. They emphasize the need for students to begin by playing around with the authoring environment so that they get a feel of what can be done with it; they can then use the possibilities more creatively when game making activities actually begin.

While very few LDGM studies specifically consider the potential for enhancing students' creative thinking, those that do (Eow et al., 2010a; 2010b; Kangas, 2010) show that creativity can be successfully promoted by designing games. Positive results were particularly apparent when game design was combined with a creation of a safe and supportive atmosphere for dreaming, risk-taking and creativity (Eow et al 2010a; 2010b). Providing different kinds of thinking tools and co-creation possibilities was found to be essential for promoting pupils' creativity (Kangas, 2010). The aforementioned studies mainly relied on data from self-reporting and interviews, which was supported by observation (Eow, et al. 2010a; 2010b; Kangas, 2010) and small-group and whole class discussions (Kangas, 2010). A clear need

exists for developing study methods that systematically provide access to students' creative processes and also for sound methods for analyzing the end products.

Critical thinking, problem-solving and decision making. Pedagogy in game design often utilizes designing-for-others (e.g. Kafai, Ching& Marshall, 1997; Baytak& Land, 2010; Owston et al. 2008). This encourages students to assume alternative perspectives, which may in turn support the development of flexibility in their thinking (Kafai et al., 1997). However, Kafai and colleagues remind us that designing for others does not automatically foster this kind of learning. She noticed that 5th and 6th grade learners had difficulties assessing user needs. On the other hand Robertson (2012) reports how students do follow advice from peer reviewers to improve their games, a practice that is more evident in girls than boys. Furthermore, a small case study by Baytak and Land (2010) revealed that students (n=3) became active participants and problem solvers by designing their own games.

Learning to learn and metacognition. To learn effectively, students need to develop strategies and abilities to manage and reflect on their learning. So far, these aspects have attracted little attention in LDGM research. Vos, van der Mejden and Denessen (2011) demonstrate that LDGM stimulates 5th and 6th graders' use of deeper learning strategies when compared to playing games. Carbonaro et al. (2010) found similar results. In their research fifty high school students studied computer science concepts by programming their own role-play games with Neverwinter Nights and ScriptEase toolkits. The results indicated that the game authoring activity stimulated higher order thinking skills. Furthermore, the results revealed that girls significantly outperformed boys in these skills.

Ways of working lens

Communication. Developing games provides opportunities to develop a range of communication skills related to both to reading and writing and to use of spoken language and visual communication aids. Owston et al. (2008) compared the effect on 4th graders' reading and writing skills when they either developed or played trivia games. They found that the game development group outperformed the player group in logical sentence construction. Furthermore, developing games can enhance students' communications skills by inducing learners to cater for a target audience. For example, Kafai et al. (1997) conducted a study in which 5th and 6th graders made games for younger students. The results showed that the condition of having to use language the younger ones would understand encouraged the students to adopt their own wording instead of just copy-pasting information from external resources.

We argue that developing games has strong potential for developing the literacy skills needed in the knowledge society. LDGM can include traditional and new literacy activities (e.g. Robertson 2012) and utilize easy-to-use tools for composing interactive stories (Carbonaro et al, 2008). For example, in Robertsons' study, vocabulary exercises, individual reading, brainstorming, discussions, story writing and drawing were combined in making computer games. Carbonaro et al. found that high school students can successfully construct sophisticated interactive stories with very little training. Both studies found evidence that girls in particular might benefit from game authoring activities that emphasize narratives writing skills; Robertson found that girls spent more time on writing conversations and utilized peer feedback more eagerly than boys.

Collaboration. A study by Kangas (2010) showed that game playing and computer game creation in a playful learning environment provided young children with opportunities to

practice workgroup skills. Designing games can lead to an enhanced sense of classroom community, which encourages students to ask and provide help (Baytak & Land, 2010) and to share tips and alternative work methods (Robertson & Nicholson, 2007). Denner (2007) found that the majority of girls in an after school game-making program liked the social aspects of the activities. However, Denner did not analyse student collaboration procedures or the impact of collaboration on the game quality. Indeed, in the studies reviewed analysis of collaboration is mainly restricted to peer review and providing feedback.

Tools for working

Information literacy. LDGM projects can include phases in which students search online for information of use in game development, thus providing opportunities to practice information literacies. For example, in study by Owston et al. (2008), 4th graders used the Internet as an information source when they developed questions for their Trivia games. The students also developed a better understanding on the public nature of the Internet as their games were freely accessible online.

ICT literacy. Developing a game is a very complex task and requires several ICT skills. Tools adopted in game-making activities range from software targeted at children to professional tools. Experiences with a range of authoring tools are reported. These include Adventure Author (Robertson, 2012), Gamemaker (Baytak& Land, 2010), Gamestar Mechanic (Torres, 2009), Scratch (Brennan &Resnick, 2012) and Neverwinter Nights (Robertson & Howells, 2008). LMDG activities varied widely and selected tools need to be appropriate for learning objectives and students' skill level. According to Yatim and Masuch (2007), an ideal game-making tool for children would scale in programming 'granularity' in order to grow in capability along with the user's programming skills.

Scratch is a good example of visual programming language designed for children with no previous programming experience. The idea of Scratch derives from Lego bricks; Scratch syntax is based on a set of graphical programming blocks that children can snap together to create programs (Resnick, et al., 2009). In order to lower the starting threshold, the blocks are designed to fit together only in ways that make syntactic sense. According to Brennan and Resnick (2012), such approaches develop students' computational thinking skills. In a similar manner, Denner et al. (2012) showed that when "students with no prior programming experience program a computer game they have the opportunity to practice computational thinking that will prepare them for further studies in computing." Other commonly reported benefits of LMDG activities are systems thinking (Torres, 2009), interactive story authoring (Carbonaro et al., 2008) and storytelling (Robertson, 2012). However, only few studies reported gains in visual design or audience awareness skills (Robertson, 2012).

Robertson and Nicholson (2007) suggested that before beginning LMDG activities, students should play example games made with the same authoring tool they are to use themselves so they grasp the affordances and become more explorative. Furthermore, they suggest that the authoring system should propose hints about unused features and also include idea recording tools.

2.2 Main findings and research gaps

Analysis of papers in the literature review has shown that LMDG research has mainly focused on motivational aspects and adoption issues (e.g. Harnisch, 2010; Robertson & Howell, 2007; Owston, et al., 2008; Kazimoglu, et al., 2012). Very few studies have focused

on development of 21st century skills. Furthermore, the review reveals that most empirical studies conducted have been short-term and involved small sample sizes. Clearly, proponents of game making as a learning method rely heavily on conceptual research and more robust empirical research is needed, especially regarding the social nature of LMDG. One reason for this may be that digital game making tools do not usually feature support for collaborative game making online. Given the different roles (designers, programmers, artists) and skills involved, game making is an eminently collaborative activity. Furthermore, the research field lacks methods to assess learning processes and outcomes in LMDG activities. Only a handful of the studies focus on assessment of 21st century skills (Brennan & Resnick, 2012; Resnick et al., 2009) and this is a shortcoming common in the GBL field generally.

3. MAGICAL project: aims and adopted approach

These gaps are currently being addressed in MAGICAL (Making Games in Collaboration for Learning), a multilateral project co-funded under the European Commission's Lifelong Learning Programme. The project aims to define sound educational methods and pedagogical strategies for implementing collaborative LMDG, with special attention to the impact on 21CS (Dagnino et al., 2012). MAGICAL will contribute empirically gained know-how by deploying the proposed methodology in a set of field experiences carried out in partner countries at primary and lower secondary school level. Learners, including those with special needs, will have the opportunity to engage in collaborative game building using digital tools, and will be guided and supported where appropriate by their teachers, who play a key role in the process. To this end the project addresses three different target populations: student teachers, health professionals and pupils. Children with special needs have been included for the purposes of observing possible specificities in their experience with game building activities.

One of the innovative aspects of MAGICAL is the specific attention devoted to collaboration in game building. This has led to the development of MAGOS, a special gamified authoring environment which has unique features for supporting game making that set it apart from other LMDG tools. In MAGOS the various game authoring roles like designing game levels, defining game physics, creating visuals, sounds and music etc. are distributed among up to four player/authors, who are allocated different fields of responsibility. This hardwires an initial degree of cooperation into the authoring process. In addition, player/authors can exchange their individual "powers" (game mechanics) on the fly as they require, which involves communication, negotiation and (potentially) collaboration. In keeping with the gamified fantasy theme of MAGOS, the powers are presented as sets of magic spells with which the player/authors create their joint game.

To make game design and development accessible to young learners, MAGOS eschews any type of programming in favour of a high-level authoring approach (Ketamo et al, 2012). Games are developed by personalising, selecting and dragging elements (and their attributes) onto a tiled game space and then clicking and setting values. In this way a number of different game types are possible, including platformers, puzzles, racing and role playing/adventure games.

To pave the way for classroom experiences in MAGICAL, student teachers and health professionals in partner countries (Belgium, Finland, Italy, UK) are undergoing specific parallel courses that provide them with a grounding in the theory and practice of GBL and LMDG. A key aspect of this training effort is the design and orchestration of learning activities through carefully thought-out pedagogical plans. A specially designed online tool

called the Pedagogical Planner[1] has been developed for designing LMDG activities and this will also help MAGICAL researchers identify and document best practices. Classroom experiences will be carefully monitored not just to gauge the impact on learning processes but also to identify emergent good practices that can be adopted outside the project confines to support transferability and foster wider uptake of game making in education generally.

In addition to MAGOS and the Pedagogical Planner, MAGICAL is to produce a teachers' support package (example games, "magical" idea generation tool, ready-to-adapt teaching units, teacher's guide, etc.) and a tool kit for developing teacher training actions dedicated to GBL and collaborative game making. One early project output attracting interest in the LMDG and GBL communities is a library of game building environments for learners that are currently available around the world[2]

4. Conclusions

As Twenty-First Century Skills are critical success factors in the knowledge society, research and development of learning solutions that contribute to these skills is crucial. This paper has proposed collaborative learning-by-making-digital-games (LMDG) as one solution to this demand. However, in order for widespread take-up of LMDG to become a reality, several research gaps need to be bridged. As a number of researchers have argued (e.g. Games 2008; Games & Squire 2008; Brennan & Resnick 2012), more empirical studies need to be conducted before the precise added value of LMDG can be quantified. Firstly, evidence-based proof is required to establish whether it is actually an effective and engaging pedagogical strategy that contributes to 21CS. Secondly, methods and models are needed for assessing students' learning processes in LMDG activities. Thirdly, we need to develop pedagogical models that are easy to adopt and adapt for integrating the LMDG approach in teaching practice. Finally, we need well-designed game authoring environments with a proven track record in supporting collaborative LMDG activities so that promising research results and model good practices can be mainstreamed, thus becoming part of daily school practice.

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Human Machine Interaction, embodied cognition and phenomenology: the body in digital storytelling

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Abstract
Digital storytelling has emerged in recent years as a powerful tool for teaching and learning that involves both teachers and students (Robin, 2008). The construction of interactive narratives represents an educational challenge gaining in a considerable importance when they take into account the emotions felt by the users and exploit them to improve themselves (Mangione, Pierri & Iovane, 2012). In this sense, new paradigms of Human Machine Interaction can be a tool for reclaiming body in digital storytelling, unraveling the complexity of the narration and, as such, a simplex way (Berthoz, 2011) to learning with the awareness that "the degree of physical involvement is the measure of immersion" in a digital context (Krueger, 1991).
The objective of the research is the reinstatement of the body to digital storytelling, knowing that the gestures made by the weather person are embedded in a narration (Poddar, Sethi, Ozyildiz & Sharma, 1998).Based on a theoretical framework that integrates the concepts of embodied cognition developed in the context of cognitive science, the contribution of phenomenology (Dourish, 2004) and the new forms of HMI developed in the User Interface Design, this project aims the development of a gesture recognition software to allow authors to create effective, interactive gesture-driven stories, using Natural User Interfaces.

Keywords
Somatic learning, Embodied cognition, Digital storytelling, Exergame, Natural Interfaces

[1]Pio Alfredo Di Tore, PhDstudent,is responsible for the theoretical framework on Natural interfaces and the design of the software modules; Giuseppina Rita Mangione, PhD,works on computational model for managing emotions and affections in emotional learning platforms as part of the Alice project. In this paper is responsible for the theoretical framework on somatic learning and digital storytelling, Felice Corona, Associate Professor of Special Pedagogy and Didactics at the University of Salerno, is scientific advisor on Game Based Learning; Stefano Di Tore, PhD, is responsible for design and development of the software modules; Paola Aiello, PhD, Assistant Professor of Special Pedagogy and Didactics at the University of Salerno, is the scientific coordinator of the project.

1. Introduction: Narrative Learning and Natural User Interfaces

The aim of this work is to explore if the new paradigms of Human Machine Interaction can be a tool for reclaiming body in digital storytelling, unravelling the complexity of the narration, and providing a simplex way (Berthoz, 2011) to learn, with the awareness that "the degree of physical involvement is the measure of immersion" in a digital context. (Krueger, 1991)

Such an attempt is possible by virtue of the natural user interfaces, an emerging computer interaction methodology which focuses on human abilities such as touch, vision, voice, motion correlating them with higher cognitive functions such as expression, perception and recall.

A natural user interface or "NUI" seeks to harness the power of a much wider breadth of communication modalities which leverage skills people gain through traditional physical interaction (NUIGroup, 2009).

NUIs allow the use in the Human Computer Interaction of "simplifying principles that reduce the number or complexity of processes and allow to process information and situations very quickly, taking into account past and anticipating the future, facilitating the understanding of intentions without distorting the complexity of reality" (Berthoz, 2011).

These media involve two distinct aspects of sensory-motor connections:

- the components of user input related to movement are representative of user's intention;
- user input is in relation to a changing environment.

The paradigm of continuous interaction mechanisms that these two qualities contribute to build can be called "enactive interaction", with different characteristics from the conversational, discrete interaction based on GUI point-and-click (Chow & Harrell, 2011).

The enactive interaction involves not only the idea of space (changes the relationship with the space that becomes sensitive), but also the idea of time: Movement is "not just a change of place within a whole but a becoming in which the movement is a transformation of the body which moves".(Colebrook, 2002)

This type of interaction provides the opportunity to create environments and tools that can translate into educational practice a conception of instruction that, in theory, recognized the role of body and movement, struggling on the operational level to define methodologies and tools used to support the learning experience construction.

Based on a theoretical framework that integrates the concepts of embodied cognition developed in the context of cognitive science, the contribution of phenomenology and the new forms of HMI developed in the User Interface Design, this project aims at the development of a gesture recognition software to allow authors to create interactive gesture-driven stories, using Natural User Interfaces. (Chow & Harrell, 2011)

In this wider context, this paper documents the work that has been done to integrate an already existing storytelling learning resource with natural interfaces in order to support knowledge in action in risk education context.

Some specific situations in the story have been isolated and NUI-based alternatives have been developed for specific assessment events.

The choice is oriented in this direction because the assessment, in this particular storytelling resource, represents an important step that measures the level of learning objective achieved and suggests an alternative path in adaptive ways.

In particular, we selected an assessment situation that, through multiple-choice question, asks the user to solve a problem in the story.

Two variants have been produced :

- a first version based on drag&drop,

- an alternative version based on the simulation through different NUI-ready Devices.

These two versions differ for used devices and for degree of bodily immersion: the first version uses as device a touch screen, the second version uses Leap Motion, which allows the recognition of user hands.

With this in mind, this work is structured into the following sections:

1. Description of Design Storytelling Model defined within the Alice project in order to support the design of narrative experience
2. Development of a SCLO in the risk education domain and experimentation results
3. Fostering new scenario: the body in digital storytelling
4. NUI-enhanced storytelling game
5. Future Works

2. The Storytelling Model within the Alice project

The challenge that digital storytelling in education poses is how to harness the massive potential of the story form, with its possibilities to inspire, engage, transform, through a process that will endow it with opportunity for reflection, critical thinking and problem solving (Ohler, 2007).

VPS is an approach to flash out the story core with story details guiding the development of story-based didactic resources. A story core has the following three basic elements defined Story Core's Elements:

1. the central challenge that creates the story's tension and forward momentum,
2. the character transformation that facilitates the response to the challenge
3. the response to the challenge that resolves the tension and leads to story closure (Ohler, 2007).

The SDM exploits the concept of *transformation formations*, i.e. the transformation of characters. The characters can undergo different kinds of transformation. The literature identifies eight levels of transformations in a story map: *Physical/kinesthetic, Inner Strength, Emotional, Moral, Intellectual, Psychological, Social and Spiritual* (Ohler, 2007). The levels are not mutually exclusive, therefore the characters often transform themselves at more than one level at the same time.

The proposed model in ALICE project, considers the *intellectual transformations* as changes in terms of learning goals. At this level of transformation, the learners (who lead the characters) are asked to use intellectual-creative abilities in order to solve a problem. In particular, the SDM proposes an extension to the association between Bloom's Taxonomy and character transformations in order to map each transformation with a specific phase of the VPS.

Table 1 reports the mapping among VSP situations, Bloom's learning goals (Anderson, Krathwohl, & Bloom, 2005) and characters' transformations. In particular, Bloom's hierarchy of transformation, identifies a taxonomy of *intellectual changes* in terms of *six different levels of learning goals*, that are considered in increasing order of difficulty, from basic to higher levels of critical thinking skills.

VSP situation	Bloom's Learning objectives	Character's transformation
Beginning	*Knowledge*	*Character knows, remember or describe a concept or law in a story*
Call to adventure	*Comprehension*	*Character explains, interprets causal relationship between event and predict new events*
Problem	*Application*	*Character discovers, constructs and applies understanding to a situation or event.*
Middle	*Analysis*	*Character deconstruct a situation, define different option, plan or organized some action, compare and contrast different variable and opportunities.*
Solution	*Synthesis*	*Character pieces together parts to form an abstract comprehension of a situation*
Closure	*Evaluation*	*Character assesses a situation, critique or defends an idea and evaluate a situation in order to act using in the correct manner concept an law acquired.*

Table 1. Mapping among VPS situations, learning goals and character transformations.

The figure 1 shows as in our SDM, the learning situations, based on the phases of VPS (i.e. beginning, call to the adventure, problem, middle transformation, solution, closure), have been related with the aforementioned Knowledge levels (Mangione, Orciuoli, Pierri, Ritrovato, & Rosciano, 2011).
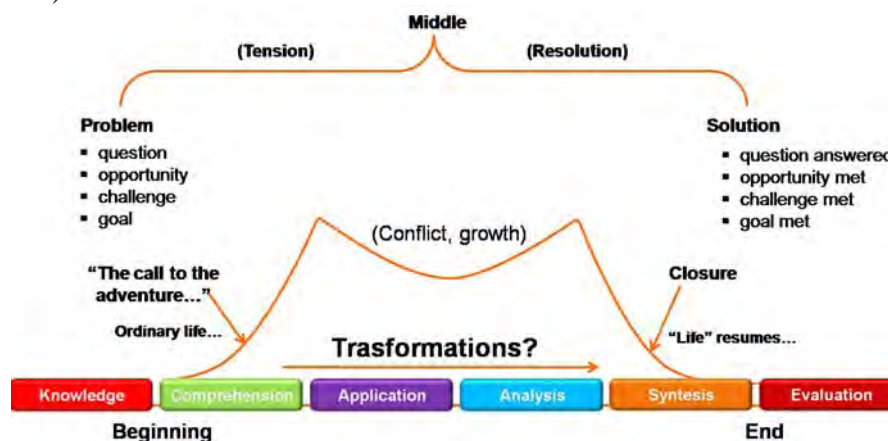
Figure 1. Mapping among VPS situations and learning goals

In order to ensure the achievement of the assigned learning goals, each situation presents itself as the composition of events whose structure favors the development of the selection,organization and integration of information (SOI) carried out by the learners in order to maximize the results for a specific learning objective that identifies a specific level of knowledge. The following events are repeated for each VPS situation:
- advancer event, that is designed to activate the prior knowledge of the student and ensure their initial involvement in the situation;
- learning event, that supports the learner's understanding of topic goal and it is based on a guided approach;

- reflection event, that is designed to help the learner to reflect on learned concepts and to allow them to consolidate the acquired knowledge.
- assessment event, that submits to learners a test (with respect to the specific VPS situation in which the learner is involved) for evaluating the type of transformation occurred.

An assessment event presents a selection of assessment modes through the arrangement of different types of tests and items with different levels of interactivity and complexity in order to detect different learners' abilities during the storytelling path. The result, in terms of measurement of acquired knowledge level, should determine a remodelling of the story path or the entire personalized learning experience where the SCLO is inserted, aiming at facilitating, supporting and motivating the learner in reaching the learning goals. The system adapts the situation (for the second iteration) by considering the score achieved by the learner during the assessment and by using the aforementioned rules corresponding to different micro-adaptivity treatments (media changing, scenario changing and role taking). In the second iteration, a further assessment is executed in an assisted way if the score of the assessment event is less than 50% of the admissible maximum score. The whole process is repeated for all the six situations of the SDM. The combination of these "instructional events" for each situation has the objective to enhance the wished learning level and to support learners' cognitive transformation in domain context focused on the safety management in an Amusement Park. Appropriate questions can then be developed to assess the desired level of knowledge (Mangione et al., 2012).

The following figures show the four events that characterize the process of transformation of the starting situation.
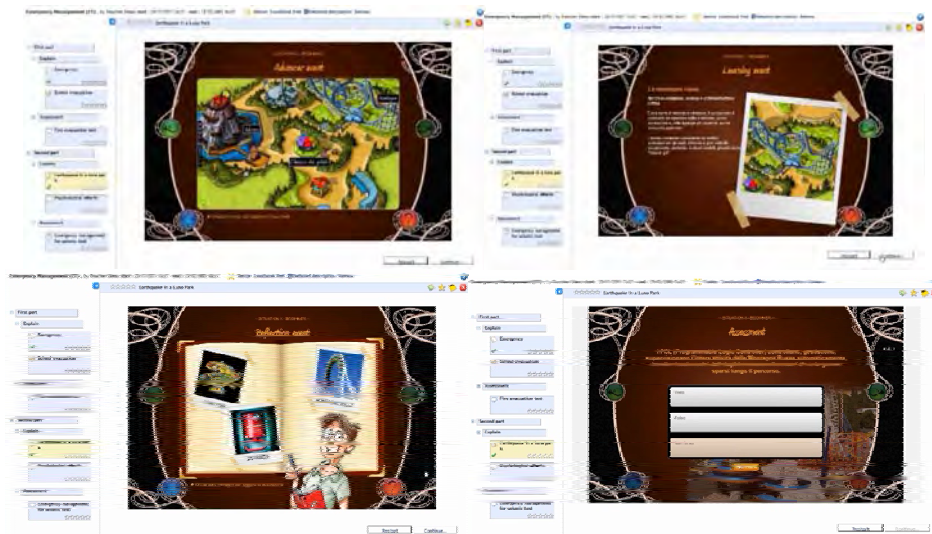
Figure 2. Events for each situation in a SCLR

The assessment events support the micro-adaptivity in the path, suggesting different ways of continuing the story (remedial paths tailored to meet the learning objectives). Alternative ways will allow the learner to play another role, change situation or re-live the situation with different media, in order to overcome the knowledge gap and access to other situations. By exploiting IWT- Intelligent Web Teacher is possible to include a SCLO within a personalized e-learning experience in order to deal with specific concepts requiring a sophisticated didactic method (Mangione et al., 2011). The output can be exported and annotated with IEEE LOM Metadata and played as a complex learning object.

3. First experimentation and critical aspect about abilities in risk education.

In order to evaluate the storytelling scenario and validate it through the effects in the learning process, 4 schools have participated in the experience. In the specific, 4 tutors and 58 students have been enrolled. From the usability and emotional perspective the results of the experiments validated the use of the Storytelling tool (SUS score was 60.25, this nearby the SUS mean score), feeling happy most of the time and the bad emotions were felt none or some of the times.
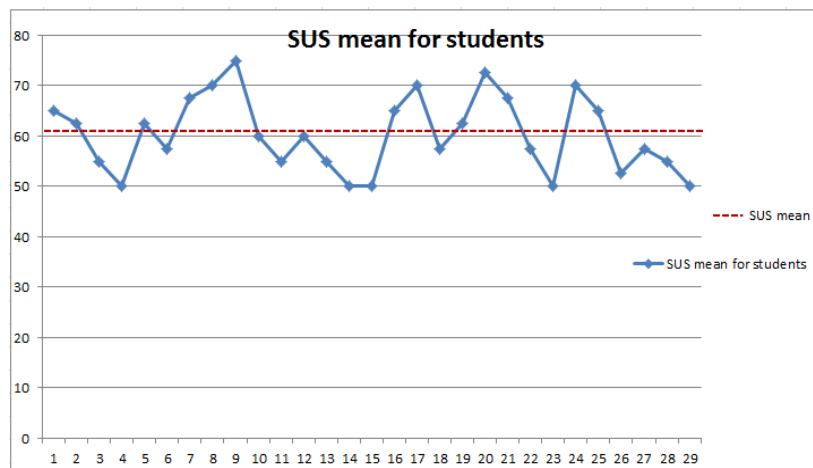
Figure 3. Usability Perceived from the students

In order to also validate the didactic structure of the six situations that compose the storytelling resource, we compare the navigation time (expressed in seconds) to the different knowledge types to be acquired in each situations. The Figure shows a satisfactory linear progression: indeed from the situation #1 to situation #6, the students' attention increases taking into account a more involvement compliant with the correspondent level of the Bloom's taxonomy.
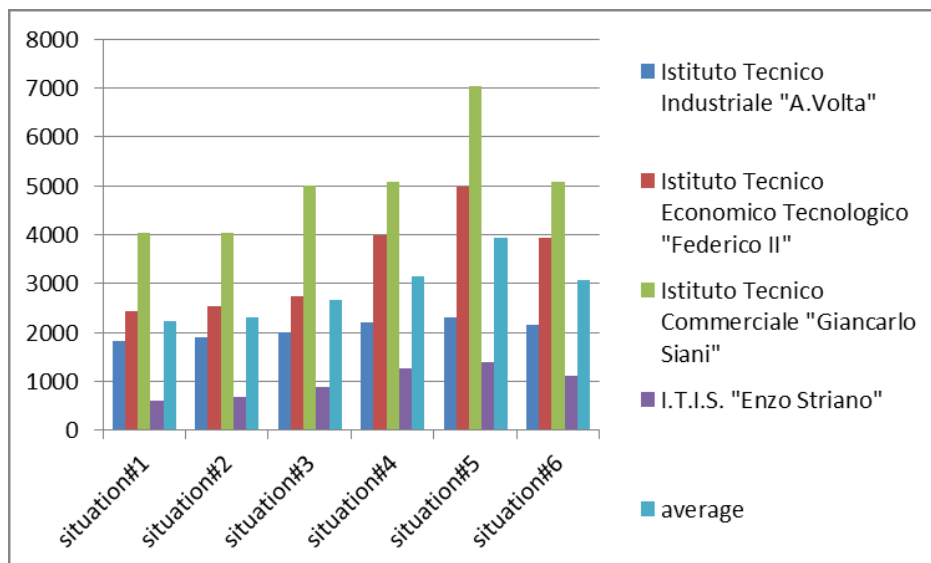
Figure 4. Navigation times for each situations

As we can see, the first three situations (*Beginning, Call Adventure e Problem*) are quite introductive, so the average fruition time is between 20 and 30 minutes; while for the other three situations (*Middle, Solution, Closure*), that required a more cognitive involvement of the student, the average fruition time is between 30 and 40 minutes.

In order to investigate the added value of the microadaptivity, we focus on the situation #5 and on how the assessment results change after the students have taken a different role: The *Figure 6* shows as students have taken a new role that has allowed for filling the competence gaps obtained with the previous role.

In such a way, the student can see the history from another point of view, registering, as shown in the figure, an assessment results compatible with the rest of the experimental group.
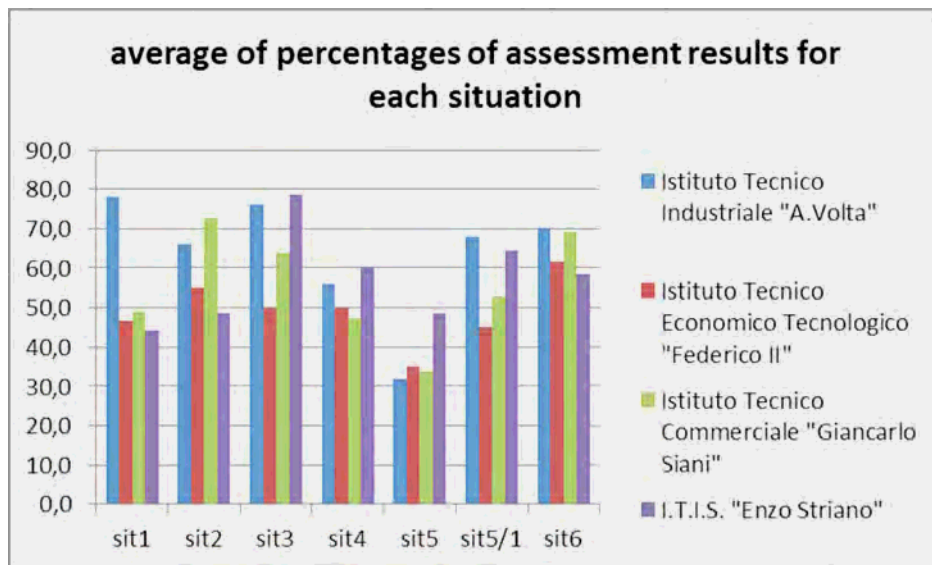
Figure 5.Assessment results for each situation

Another relevant aspect could be the mapping between the accesses number of the experimental groups to the SCLO and the knowledge level acquired.
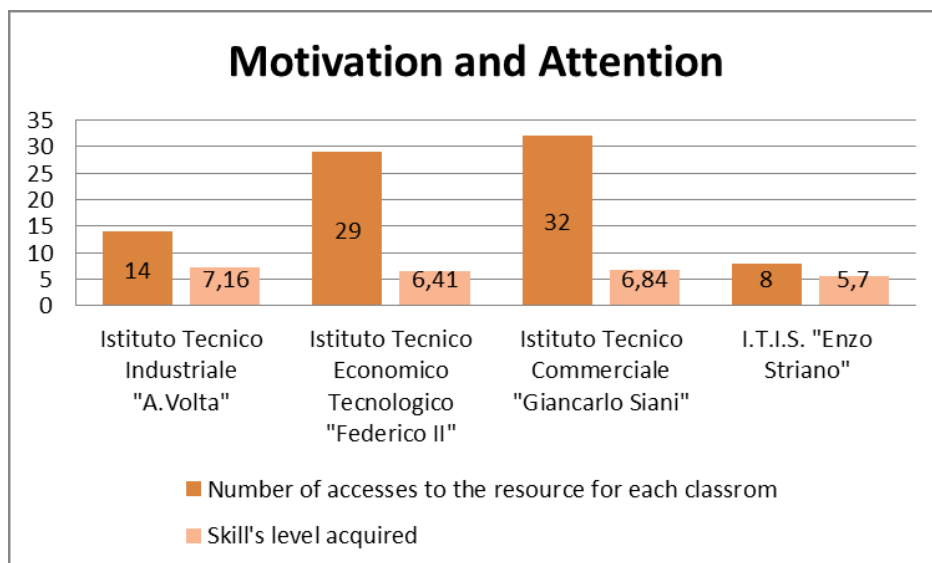

Figure 6. Motivation and Attention

This datum is relevant since allows us to understand if the student has used the time out to explore some concepts individually and make a self-assessment. As shown in the Figure 7 though the accesses number is high (see second and third classroom), the reached competences are above the average: that confirms the didactic validity of the storytelling resource that has allowed students to build some conceptual links recalling even in the case of stops and starts.

As a valuable resource, it was found some steps of engagement in the Storytelling educational resource. Interestingly, from these results it was found two different styles of resource use: on the one hand the tendency to the discovery and to the progressive approximation to the learning; on the other hand the tendency to multitasking and the preference to a cognitive moment.

Moreover, the teachers are found that the storytelling learning resource can offer more variation than the traditional practicing methods. The teachers participated in a survey that helped validate the Storytelling resources and they agreed that the resource provide to the students with the opportunity to express their cognitive attitude characterized by a progressive exploration of knowledge in a guided and structured context. The teachers strongly agree with respect the situation structure in instructional events and the efficacy of role taking, considering it a good strategy for filling some gaps through a different perspective. They validate the application of this methodology to emergency in education.

4. Fostering somatic pedagogy : the body in the storytelling

Pedagogies and technologies behind narrative games show a considerable potential to be applied in science education. In particular, they afford student embodiment with a complex system and at the same time use the human body as a learning tool (Di Tore, Aiello, Di Tore, & Sibilio, 2012).

The research about embodied cognition emphasizes the physical interaction as an element that intervene in the learning process (Glenberg, 2008); (Siegler & Ramani, 2008). "If we recognize our body as a significant part of our ability to acquire knowledge rather than as a means of transporting our brains from place to place, the somatic richness of our learning experiences becomes distinctly visible" (Amann, 2003).

Maurice Merleau-Pontyasserted that the "body is our general medium for having a world" through motor habit (Merleau-Ponty, 1962).

Merleau Ponty defined "intentional arc" our disposition, attitude, and aboutness toward something. The intentional arc exists in both space and time and works beneath the level of conscious conceptualization. Through repeated practice, we enrich our repertoire of actions within the intentional arc. It is the way we acquire bodily skills and build motor habits.

Our bodies "absorb" motor knowledge and take care of our everyday motion.

"With an awareness of the role of the body in designing interactive systems, Paul Dourishadvocates an approach to interaction design grounded in the idea of embodiment. Dourish draws upon notions from phenomenology, particularly Martin Heidegger's "being-in-the-world," to interpret embodiment as people's engagement in the world in order to make meaning of it. (Dourish, 2004)

For Dourish, engagement includes both physical and social interactions. Therefore, to create embodied interactive systems he suggests making use of people's "familiarity" with the mundane everyday world, including practical experiences with physical objects and communication skills in social communities".

Literature which studied the nature and definitions of somatic knowing, suggests how *somatic learning*can be incorporated into the practice of storytelling (Amann, 2003)(Horst,

2008). Somatic learning brings the body into the narrative experience so that the learner is always actively engaged in the education process.

The key to fostering *somatic learning* (Horst, 2008)is to overtly include the body as part of learning.
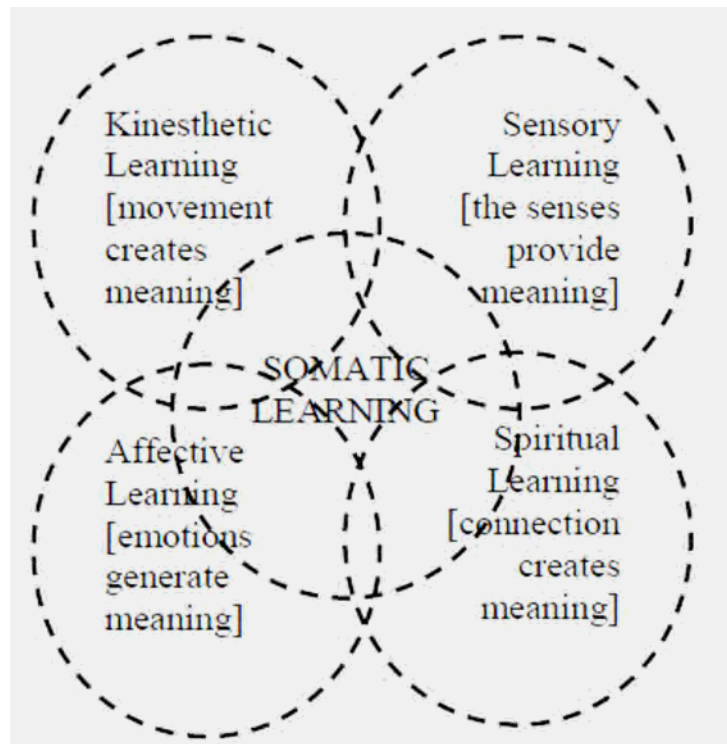
Figure 7. Somatic Learning Model (Horst, 2008)

The body should be actively invited into the learning space, and creative ways to incorporate the body should be explored. Somatic learning offers an opportunity for the type of reflection in action described by Schön (Schön, 1983) and the knowledge is the result of engaging in movement. Kinesthetic learning (figure 7) as specific type of somatic learning, offers the opportunity for students to move by engaging in role plays or dramatizations of situations or cases. Fundamentally, kinesthetic learning involves movement. From the use of fine and/or gross motor skills, our bodies spring into action. Kinesthetic learners need to be actively engaged in their learning by involving hands-on manipulation, physical involvement, and role plays.

A variety of movement practices can be used to foster somatic pedagogy. Learning should be experiential: the learner who is viewed as possessing both a mind and a body and given permission to use the two in tandem, will more likely find the educational experience to be transformational. *If we recognize our body as a significant part of our ability to acquire knowledge rather than as a means of transporting our brains from place to place, the somatic richness of our learning experiences becomes distinctly visible.* (Amann, 2003)

Exercise and gaming sign the development of "storytelling game" or "visual novel". These are recognized in the scientific literature as a form of competitive storytelling in the context of gameplay. This is a "privileged instrument for developing cognitive skills and organizing knowledge, supporting process of meaning construction". Visual Novel is carried out through a "quest", namely "call for adventure" on themes to be investigated: the student has the chance to perform different types of actions (e.g. talking, looking, interacting, etc.) in order to foster the achievement of a goal beforehand defined. In academia, researchers argued that an

interactive story can indeed be highly engaging to game players, leading to what Dow (2008) referred to as the "*embodied narrative engagement*".

Storytelling and gaming technology provide excellent chances to teach knowledge, skill and behaviors in compelling and engaging manner. Literature (Ritter, Göbel, & Steinmetz) focuses on narrative experience and recently studies analyze the potential storytelling game approaches to encourage students to learn and achieve specific learning objectives (Mangione et al., 2012). The exergame, as an expression of a pedagogy of embodiment, may be of help in revisiting tests present in the assessment of storytelling in order to maximize learning situated in the risk education. The creation of an active gaming storytelling that encourages higher engagement in the students and the quality of learning is based on the balance between challenge and targetskills."*The intentional design of educationally appropriate video games that require the use of the whole body to play already affords students the personalized experience needed to find balance between the level of difficulty and their skill level. Once that agreement exists, other aspects associated with intrinsic motivation and e creative flow can be attended to (achievable goals, perception of control, prompt feedback, focused concentration, etc.)* (Sheehan e Katz, 2012 pp 63). In terms of research on storytelling game there is broadly and innovative work about the design of game mechanics that increase the dramatic dimension of game, creating narratively engage the role-playing in the story.

5. NUI-enhanced storytelling game

Given the multiple ways to include somatic learning in the learning environment, is important to identify how such integration can foster transformative learning in our storytelling model. The pedagogical use of NUIs, as the utmost expression of a somatic pedagogy, can help revise the storytelling assessment moments, creating the exergame events able to maximize the learning in the risk education. In order to measure different levels of knowledge, it is necessary to plan moments of on-going and final assessment, that are presented at the end of specific situations of a visual story portrait. We have selected a specific piece of assessment test and we have elaborated new alternatives based on an natural interface. The Situation chosen to intervene with NUIshas been designed to replace the quiz - based assessment and to guide the student in the acquisition of "application" knowledge type (making reference to the third level of knowledge objective in Bloom's taxonomy).

Figure 8. Quiz based assessment

The students have to intervene during the RollerCoaster motion (decomposed in elementary sequences) applying the correct action and recalling the physical laws

Two versions with an high level of body involvement have been developed:
- a first version based on drag&drop,
- an alternative version based on the simulation through different NUI-ready Devices.

Figure 9. Drag&drop version

The second versionis based on an another NUI-ready device: Leap Motion.

The Leap Motion controller senses user individual hand and finger movements so user can interact directly with computer. Connecting the device, user gets 8 cubic feet of intuitive 3D interaction space.
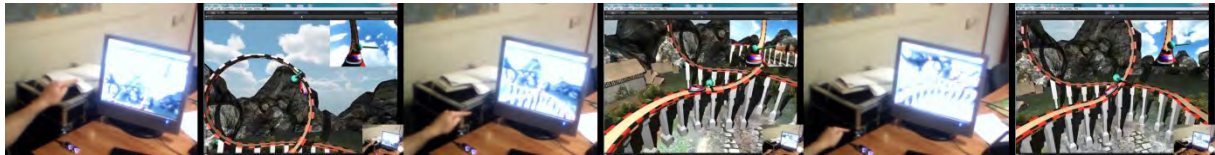
Figure 10. Leap Motion Version

Both versions represent a pilot study to see if it is possible to turn a courseware that already exists in a version with a high bodyinvolvement , using natural interfaces. The horizon that comes up is that of simulation, which is often excluded in the methods of assessment of the typical existing courseware. The objective of the study is to replace all situations with assessment nui-based interfaces built from scratch and to repeat the test with a sample similar to that involved in the experiment above, and compare the results.

6. Perspectives and Future Works

The procedures for the assessment of the effectiveness of natural interfaces simulation based training on have not yet been defined. The next steps include:
- Development of NUI-based simulation for all situations of assessment provided by storytelling and integration within the IWT platform.
- Validation procedures in order to measure the impact on learning processes and student engagement examining results obtained from the use of the traditional version and the version NUI. In addition we will complement the experimentation whit video analysis of a selected group of users who will be provided the NUI-based version.
- Demonstration that the basic hypothesis that a greater degree of bodily involvement results in greater attention and motivation, with positive effects on the learning in term of procedural and conceptual knowledge.

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What to Teach about Video Games, and How? An Action-Research Project with Undergraduate University Students

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Abstract
The paper presents and discusses an action-research carried out with a group of undergraduate students at the University of Parma, Italy. In order to study what to teach about video games, how, and what kinds of media competence to develop, a 30-hours long workshop was designed and implemented. In it, students analyzed video games, studied their characteristics, as well as invented, designed, and produced an action game. The results were collected with qualitative methods and are discussed at three levels: 1) the structure of the syllabus, 2) the skills acquired by the students, and 3) the effectiveness of the course in training prospective teachers on the specific methodology of video game education.

1. Introduction

In 1979, Wisconsin Senator William Proxmire harshly attacked the U.S. Department of Education, accusing it of squandering taxpayers' money in research projects of dubious value. In an interview with the *Boston Globe*, in particular, he attacked the funds for a program introducing media literacy in colleges, stating that the "Department of Education gave a grant to their friends at Boston University to teach college boys how to watch cowgirls on TV"(Kubey, 1998, p. 61).

This scathing statement of the U.S. Senator is now returning in mind, because this could be the possible reaction to the title of my contribution: do we really want to teach university students anything about video games? Formulated in this way, in fact, the question hides a twofold problem. On the one hand, we know that today's adolescents and youths are generally good users of video games, experts of platforms and upcoming titles, visitors to specialized sites and magazines, and members of social networks on these topics. The question, then, the eternal question that media education always raises, is whether it is possible and reasonable to teach something that youths already know, and maybe better than their teachers. On the second side, then, the question could be equally radical: does it make sense that cultural institutions of higher education, as universities, devote classes to this goal?

On both issues, I believe that we can seriously answer yes. In the first case, we could just remember that kids are certainly formidable users of video games, and media technologies in general, but their use – what they learn by themselves, by trial and error or by imitation of experienced people– is sometimes poor and uncritical (Felini, 2008; Gui, 2011), and requires a dedicated training program to shift them from a merely instrumental mastery of the technologies to more aware and deep understandings of messages and the dynamics of media production, with more communicative skills. To the second question –about the possibility of teaching video games at the university– it's easy to say that nothing is unworthy, so long as teachers are able to transform any contents into meaningful ideas for the students' education (and I might recall the concept of "college liberal education"(Newman J. H., 1907; Smith, 2002)). More precisely, though, I could add that a full possession of languages, production/distribution/fruition dynamics, and processes of interpersonal relationship corresponds, according to the OECD, to the "key competencies" related to the interactive use of tools: "1. ability to use language, symbols and texts interactively; 2. use knowledge and information interactively; 3. use technology interactively" (OECD - De.Se.Co., 2005, p. 10). These key competences, including digital competences, are considered as strategic for being fully integrated into our society and contribute to its progress.

At this point, then, argued the meaningfulness of the question (if it is acceptable, and in what terms, to talk about video games in colleges), we can focus on what to teach about video games, and how. In this field, in fact, there is a significant lack of experiences and literature at all levels (theoretical research, experimentation, teacher's guides…), about what is really possible to do in the classroom with gaming software. In fact, to say that video games can be reasonably introduced in educational contexts, or that their use can benefit any kind of learning, is not enough: we need to understand what to do, and how.

In this paper, I'm going to answer exactly to this question by presenting an action-research project (Scurati & Zanniello, 1993; Scrimshaw, 1992) carried out at the University of Parma (undergraduate program in Social Education) in the Spring semester 2009, inside a workshop related to the course of Media Pedagogy.

2. From the concept of "video game competence" to the selection of contents and activities

The concepts of "media literacy" and "digital competence" (Felini, 2008)led me to define more clearly what is the reference model of video game competence for my students. This is an absolutely essential step for facing the two problems of us, namely (a) the selection of contents to offer (*what* to teach about video games), and (b) the essential link between objectives, contents, methods, and evaluation (*how* to teach). The competence model that initially inspired me, can be summarized as follows(Felini, 2010; Felini, 2012):

- ability to recognize, describe, and analyze the elements, structures, genres, and technologies of video games;
- ability to critically analyze the relationship between the video game industry and its audience in today's society, and understand, for example, topics like marketing decisions, cross-media design, fulfillment of audience's needs or identification of new potential buyers;
- ability to conceive, design, develop, evaluate and distribute a simple video game, giving it some of the characteristics of this type of product and following the usual stages of creation.

It is possible to analyze this frame referring to the most well-known models of media competence (Bazalgette, 1989; Weyland, 2003, pp. 143-154; Calvani, Fini, & Ranieri, 2010, pp. 13-61; Gui, 2011), but I will do so at the end of the present article.

Given these elements of video game competence, which are basically nothing but the general aims of the course to be designed, I decided to set it up as a workshop, which could leave plenty of time for discussions, the students' previous (and even various) experience, and learning by doing activities. Furthermore, guided by my own experience and the literature (Buckingham, 2003; The Aspen Institute Communications and Society Program, 2010, pp. 22-24; Hobbs, 2011), I decided to insert both lessons on socio-semiotic analysis of video games, and lessons on design and implementation of a video game, because of the clear awareness that the production moment is effective in the field of media education, as a step to achieve significant learning of the concepts to be learnt(Burn, 2009). Finally, the design of the workshop had to take into account some binding conditions: it had to be 30 hours long, in three lessons a week of two hours each, it had to be held at the end of my course of Media Pedagogy (which lasted 30 hours as well), the availability of 4 laptops in the classroom, the compulsory attendance of a small number of undergraduate students (twelve: three males and nine females, all aged between 21 and 22;seven of the Italian program in Social Education, and five Americans from Boston College, in foreign exchange[1]).

3. Educational activities with the students: work steps

The workshop took place according to the five phases described below.

3.1. *Phase 1 – Introduction and video game theories (4 lessons)*

The first phase was based on sharing with the students the experiences related to their life as gamers. The starting point was a discussion on what kind of players they are, which titles they like most, how and with whom they usually play.

[1]The members of the first group were Nicoletta Bernazzani, Simona Biondelli, Federica Caviglioni, Alessia Malnati, Alessia Pimazzoni, Ilenia Satta, Matteo Viani. The members of the second were Lauren Fetky, William Ikeler, Tom O'Donnell, Kelly Rhatigan, Katherine Van Poznak.

Then, I tried to widen their knowledge about video games, focusing on two specific topics: the situation of the video game industry in Italy and Europe, through the annual reports of AESVI (Associazione Editori Sviluppatori Videogiochi Italiani: www.aesvi.it) and ISFE (Interactive Software Federation of Europe: www.isfe.eu), and the genres, features and components of video games.

3.2. Phase 2 – Video game analysis (2lessons)

After this general introduction to the world of games, the students started a practical game analysis activity that let them understand what are the typical linguistic, technical, and ergonomic features of this medium(Newman & Oram, 2006). Therefore, I decided to show and play an action-game, chosen among the most popular titles: *Rayman 3*, available for PC. The analysis of this game, carried on during discussions, focused on eight points I proposed:
1. skills required by the game (strategy, memory, observation, speedy reflexes…);
2. kind of entertainment the game offers (filling time, relieving, developing mental skills, challenging oneself or an opponent…);
3. characteristics of the protagonist and the other characters;
4. characteristics of the environment;
5. the time factor (total time of the game, time of each session…);
6. the interface that allows the gamer to play with the machine;
7. the audio (music, noises, sound effects…);
8. the "mechanics of the game" (goals to be achieved and how to reach them) (Fulco, 2004).

Then, the students worked on video game analysis, thinking on how different is, for example, analyzing movies and video games, because of the interactivity and the "openness" of the game, which is different in every match and for every player. Moreover, the students collaboratively developed a grid of analysis and applied it to a demonstration game I created through *Inventagiochi* (see the sections below), entitled *I want a scooter!* The students both strengthened their analysis skills and also understood which kind of product could be created with this software, the same one they had to use in the next phases.

3.3. Phase 3 –"Paper & pencil" creation and design (3lessons)

While the students got to analyze *I want a scooter!*, they also began to try *Inventagiochi*. The aim was to make them aware of the features and possibilities of the software, so that they could address their inspiration, in the next phase of design, towards creative forms that were coherent with the tool. The implementation was done in two smaller groups of 5 and 7 students each.

Through brainstorming, they began conceiving the general elements of their game: title, characters, environment, goals. At the end of this moment, the groups briefly described the game they had in their mind in a short paragraph. Moreover, they imagined and represented all the operations that the main character has to do in order to win. This was done in a schematic form (see Figure 1 for an example).
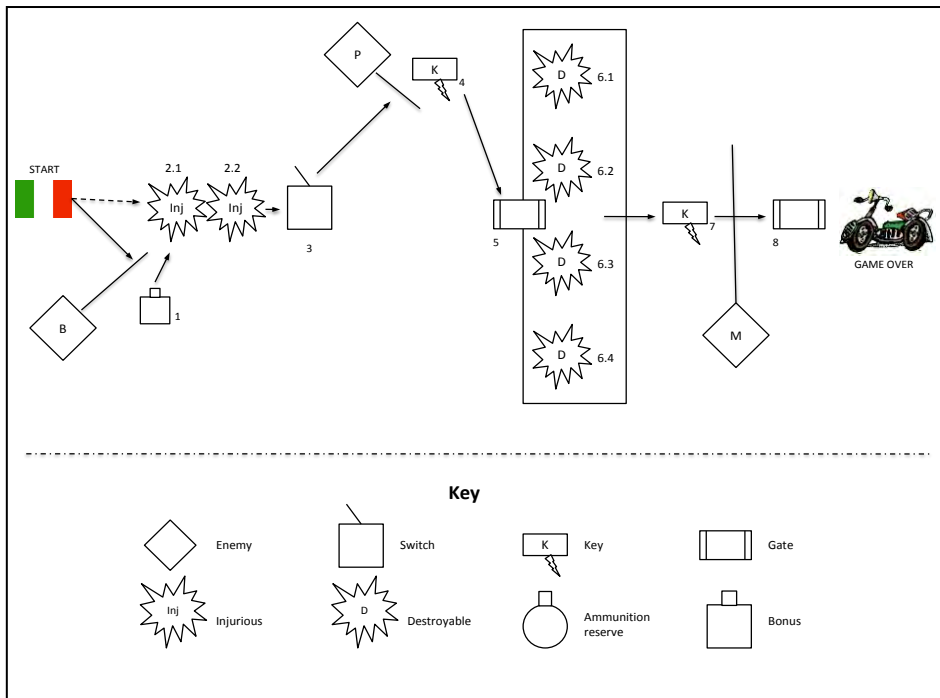
Figure1.Plot of I want a scooter!: example of schematic representation

Before the end of this phase, they also produced:
1. A list of elements (or storyboard), which contained all the necessary constituents and logical objects for the game, as shown in Table 1;
2. A real map of the game plan, with the correct placement of all the previously identified items. Groups used large white sheets, with a 32x32 grid that corresponds to the *Inventagiochi* work plan. On this poster, the different areas of the environment were colored (e.g.: woods in the north, a pond in the center, roads, buildings…);objects, helpers and enemies were added using leaflets or post-it, so that they could be left or moved at one's will.

At this point the students could "play" the game on the paper. As the character went on completing the simulated plot, they took notes of the collected items, of which doors had been opened, and so forth. The aim of this step was primarily to verify that the plot worked, and to check if there were points where the game could stop against the player's will, or that all one needed to conclude the game (switches, keys, bonuses…) was available at the appropriate point.

ITEM LIST						
N°	Symbol	Name	Description	Properties	Captions	Notes
START					*Do you want your scooter?* *Your mum has the key! Let's go to the park…*	
1	**Errore. L'origine riferimento non è stata trovata.**	Bonus_01_05	It gives the necessary stamina to pass the injurious alive.	+20 pt. of stamina	*Wow!* *You've got the power!*	
2.1	Inj	Injurious_03_08_a	If the protagonist has not enough stamina, the injurious kills him.	-20 pt. of stamina		
…						

Table 1. Example of the list of elements (storyboard)

3.4. *Phase 4 – Video game production through* Inventagiochi *(3 lessons)*

Following the storyboard, the two groups prepared all the necessary multimedia objects (sounds, texture, pictures…).Using the *Inventagiochi* libraries, the complexity of this phase was considerably reduced. In addition, they wrote captions containing useful or subtle suggestions to let the player understand the plot.

When the items were all ready, the students really began to use *Inventagiochi* to create their game. The group of the Italian students created *Il grossocolpo*, and the Americans created *Beer*. The two games are available for download at: http://www.koalagames.eu/inventagiochi/educativo.html.

3.5. *Phase 5 – Testing (1 lesson)*

The realization phase of a media product cannot be said terminated if not with the testing and distribution of the product itself to a real audience. In this case, I decided to simulate a process of satisfaction analysis, which was conducted by swapping the work of the two groups that had worked in parallel: group A tested the video game of group B, and vice versa.

Students developed a questionnaire to be filled in anonymously by each member of the other group after finishing the game. The requested information were:
- did you like playing this video game?
- how did you find the video game? (boring, funny, stimulating, complicated, too long, too short…)

- is it too easy or too difficult?
- what are the skills you need to play the video game? (memory, observation, strategy…)
- which PEGI rating would you assign to this video game?
- what don't you like in this video game?
- what would you like to change in this video game, if possible?

Beer (7 questionnaires) had an overall approval rating of 7.3/10, was defined "fun" and "complex"; it looked moderately difficult and the features that did not convince the audience were the scarcity of action (enemies, fighting…) and the lack of balance between the stamina demanded and supplied to the main character in form of bonuses. Some difficulty was created by the fact that the game was entirely in English (the authors belonged to the group of the American students), but the ambiance of a U.S. college seemed curious and stimulating. *Il grossocolpo*, on the other hand (4 completed questionnaires), had an overall score of 6.25/10;was defined "fun", "complex" and "challenging"; it looked more difficult and what convinced less the audience was the excessive width of the virtual space to explore, and the overabundance of unnecessary characters. The detail of the map, although constituted an element of dispersion, was also much appreciated. A compiler of the questionnaire said that it was very similar to other games on the market.

The questionnaires were collected and commented, before inside the group to which they were addressed, and then within the whole class, in order to think of some marketing issues: what are the reactions of the audience? are they similar to what you wondered before? do we need more or less time to finish the game? Is the game too easy or too difficult?, and so forth.

4. *Inventagiochi:* a videogame-authoring software

The game-authoring software *Inventagiochi* (www.inventagiochi.it) was developed by Koala Games Ltd. up to Beta version, released in October 2007. That version had been tested by some members of the research group, who provided guidance and suggestions to developers especially in order to make the software fully congruent with media education activities. Thanks to this work, in February 2008 *Inventagiochi* reached its 1.0 version.

Inventagiochi is specifically designed to allow the creation of "action games", i.e. those games where the main character, controlled by the player, moves in a set, performing various actions (killing enemies, collecting objects, gaining stamina or ammunition supplements etc.) as far as the target is gained, which is the conclusion of that specific level. These games are essentially based on rapid actions and have simple narrative structures; their environments, however, are very rich in objects and characters, whose features the player discovers as he/she meets them. *Inventagiochi* is designed to create third-person action games: in other words, the point of view on the stage is always that of an omniscient viewer who looks at the scene from above.

Figure 2. Outloook of the Inventagiochi interface

The main feature of *Inventagiochi* is its friendliness: the game does not require programming skills and all the procedures are the most intuitive as possible, so that a teenager can use it without any specific training.

The creation of video games with *Inventagiochi* starts with the choice of the game name and the protagonist. Thereafter, all the necessary operations are guided by an interface, organized in five menus (see Figure 2): main character, map, logical objects and game rules, enemies/helpers, and music.

In the *Main character* menu, the user can choose or change the game protagonist, insert a brief description that may appear in a caption, and set his/her stamina, speed and damage levels.

In the *Map* menu (see Figure 3), there are building and furnishing tools for the playground. The software provides six environments that can be selected by the user: city, jungle, fantasy, space, cartoon, and desert. The ground can be painted with multiple textures (sand, stones, grass, asphalt, wood, metal…) and completed with roads and rivers. Moreover, 2D and 3D objects can be inserted together with vegetation, walls, fences, houses… For both texture and objects, *Inventagiochi* has internal libraries where the user can choose his/her favorite elements; but it is also possible to import digital objects (for example, textures in bitmap format) created by the users themselves through other software.

Figure 3. Map menu

In the *Logical objects and game rules* menu, users can insert objects with logical properties (which must be specified) into the game plan. The behavior of these objects determines the set of rules that the player should discover and respect to win. At the same time, the logical properties also determine the plot of the game itself, with its obstacles, forced routes, opportunities, meetings, and fights. In *Inventagiochi*, the logical objects are grouped into six categories (see Figure 4):

- *keys:* objects that allow the operation of something else (e.g.: to open the door A, the player needs the key N);
- *doors:* gates that can be open or close according to certain conditions (e.g.: to open the door B, the player must first kill the enemy Q);
- *switches:* objects equipped with on/off positions. Each of them allows or does not allow the occurrence of given situations (e.g.: only if the switch M is on, the player can pick up the key N [which he/she need to open door A]);
- *destroyable:* items that must be destroyed to access a second hidden object (e.g.: the chest T must be wrecked to take the ammunition reserve P);
- *injurious:* items that, when destroyed, cause damage to the player (e.g.: the chest F lower the stamina level);
- *bonus:* objects that, when touched by the protagonist, take him/her a supplement of stamina, ammunition, speed, resistance to enemies' strokes, or invisibility.

Each logical object can have captions, by which the game designer can provide the player with tips, directions or even false clues.
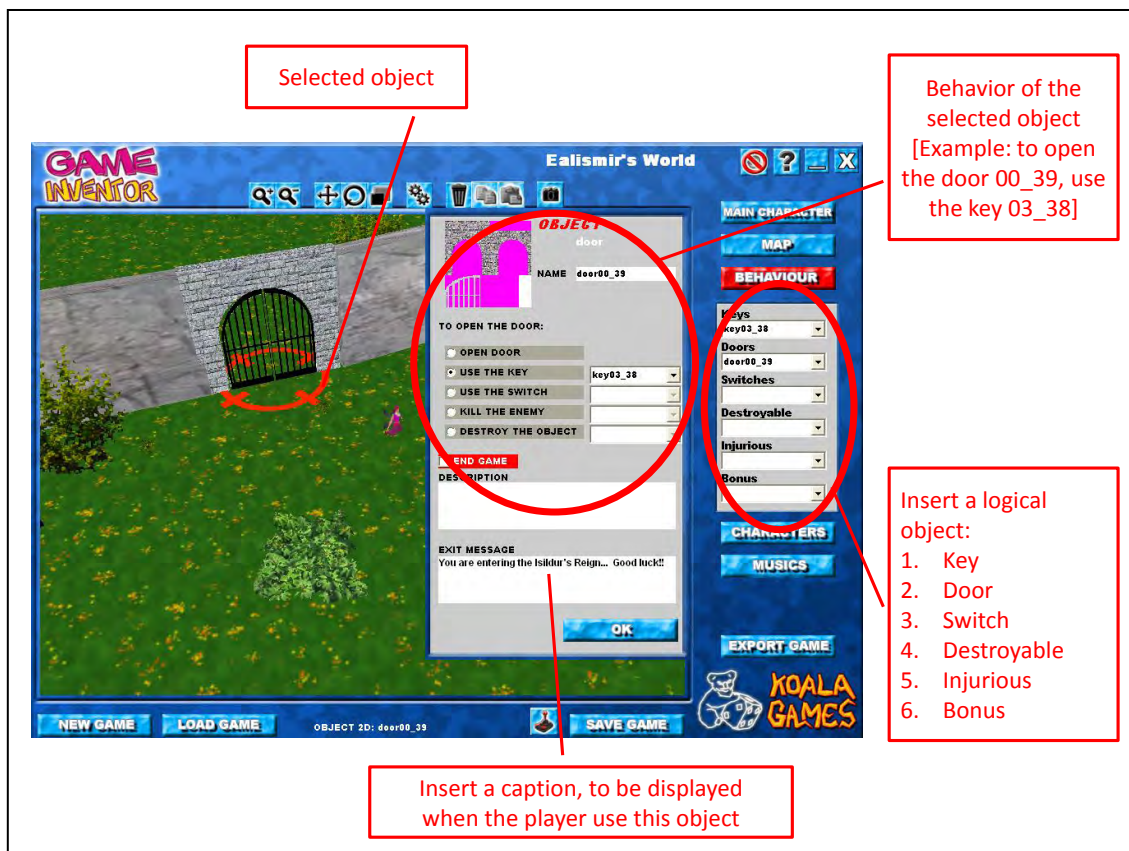
Figure 4. Logical objects and game rules menu

In the *Characters* menu, authors can insert antagonists or helpers, selecting them out of a library, and setting a certain number of traits: resistance to strokes, speed, weapon fire power (damage), action range and motion paths (waypoint).

In the *Music* menu, finally, soundtracks can be selected to play in the background during the game. Alternatively, one can load an Mp3 audio track.

When the game author has completed the insertion of all the elements, *Inventagiochi* has a fully automated function that creates and saves the entire project on the hard disk in a single .exe file, that does not require *Inventagiochi* to run. In this way, the game can be easily distributed on CDs or via internet, for example to friends, without requiring the purchase of any software.

5. Discussion: organization, effectiveness, competence

The entire process of action-research that, as a whole, lasted 30 hours, was monitored and evaluated through a set of tools:
1. teacher's diary;
2. testing questionnaires, designed and filled in by the students, and composed by 8 questions, whereof 2 were open;

3. evaluation questionnaires, designed by myself and filled in by the students (46 questions, whereof 23 were open);
4. the two video games produced by the students with *Inventagiochi*;
5. discussion of the experience with each student.

According to the qualitative data I collected with these sources, it is possible to evaluate the project on three specific aspects:

a) the structure and organization of the course;
b) the efficacy of the course in training prospective teachers on this specific educational methodology of media education;
c) the video game competence the students achieved.

5.1 Structure and organization of the course

About the structure and organization of the course, the abovementioned sources gave me data on:

- the global effectiveness of the educational design we improved;
- some limits in the design (e.g.: the storyboard is not necessary, the presentation of the software needs more than 40 minutes);
- handiness of the software, with some limits (e.g.: the scarcity of the digital objects provided by the *Inventagiochi*'s libraries);
- great appreciation of the testing activities by the students;
- the motivating power of the active and collaborative working.

5.2 Teacher training

About the efficacy of the course in training prospective teachers on this specific methodology of video game education (Felini, 2012), I can say, according to the collected data, that:

- the students understood that many are the areas of teaching about video games: not only the operational skills in using the software (as they thought at the beginning), but also linguistic, visual, designing, group-managing, and project-managing skills;
- constant intervention of the teacher is needed to make the students reflect on what they are doing, in order to improve self-awareness, especially if they will redo the course as teachers;
- all the students thought to be able to teach teenagers a course like the one they participated.

Summarizing these first two aspects, I can say that the considered factors confirm the goodness of the experiment, certainly in terms of motivation triggered among the students, as well as in having experienced and enjoyed a collaborative way of group-work, what is quite unusual in Italian academia. In addition, in terms of content selection, Iwould emphasize the completeness of the proposal. The chemistry between the moments of analysis and the phase of production – in a circular sequence, aimed at developing understanding, critical thinking and writing skills – proved its effectiveness once again. I could say the same about the alternation between lecturing moments and active experience, moments of reflection on action and moments of collective construction of meaning.

5.3 Video game competence

In this contribution, I would focus a bit more deeply on the third aspect of evaluation. If the experience of this action-research has given me the possibility to provide a possible answer to the initial questions (what to teach about video game, and how?), now trying to guess what kind of video game skills the students developed becomes interesting. Given that, by the nature of the workshop's setting, making formal assessment of students' learning was not possible, the students' statements expressed in the final questionnaires, the long talks I had with them, and my direct observations allow to make some considerations. I try to express them referring to some general models of media competence.

The most inclusive one was certainly developed by Cary Bazalgette (1989) for the British Film Institute. It focuses on the knowledge about the media system, branched into six categories. Compared to these, the students who participated in the action-research worked around the themes described in Table 2.

1. Media institutions	In the first part of the course, the students worked on the Italian and European gaming software industry, by reading and commenting direct sources.
2. Media categories	In the analysis moments, students worked on video game genres. In the design and construction phase, students repeatedly returned to the features of action games to ensure consistency of their own game to the genre.
3. Media technologies	The constraints posed by *Inventagiochi* were an endless source of ideas on what people may or may not do. The temporal organization of the workshop taught what are the production stages of video games, from its conception to the analysis of the audience's reactions, and showed what are the roles and the skills involved. The experience on the software allowed students to effectively deal with the typical production process and learn how to organize the work.
4. The language of the media	In the analysis phase, the concepts of game plan, narrative plan, play-narrative plan, game mechanics and logical objects, gaming time, and the avatar were examined. The development of an analysis framework for video game, and its application to several titles, allowed to understand what elements form the language of video games. In the "paper and pencil" design phase, students worked on the architecture and play-narrative plan, on the characters' representation (especially in terms of the language they use in the dialogues, given that physiognomy and clothing are not changeable…), and the environment, as well as on the human-computer interaction. Their work showed students that all the parts of video games are interconnected.
5. The audience	In the whole process of designing and building the video game, students strongly took into account the characteristics and tastes of the target audience. The cross-testing allowed students to reflect on the audience and its reactions.
6. Media and representation	--- [The work was partly on the relationship between media and representation, but not in specific terms.]

Table 2. Video game knowledge achieved by the students, according to the framework by Bazalgette (1989)

Properly speaking about competence, and not just about knowledge, it seems advisable to use the model elaborated by Stefan Aufenanger (2003), according to whom the media competence is also composed by six dimensions. Referring to these, the workshop worked on the groups of video game skills shown in Table 3.

1. Cognitive dimension	See Table 2.
2. Moral dimension	Development of critical skills.
3. Social dimension	---
4. Emotional dimension	Both in the analysis and design phases, students worked on the (kinds of) pleasure that video games bring, and wonderedabout how to satisfy the tastes of target audiences.
5. Aesthetic dimension	In the analysis phase, attention was paid to the form of video game messages, on the ergonomic (easiness in using controls, presence/absence of icons…), and the graphic level (attractive appearance, consistency between the narrative and the chosen graphic style…). In the production phase, the aesthetic dimension partially passed in second floor, due to the constraints of the software.
6. Productive dimension	The long time spent in learning by doing took the students to produce an analysis framework for video games, and a real video game. In doing so, students developed: • creative skills; • design skills related to the objectives to be achieved, the tools available, and the audience to capture; • technical skills in the use of the game authoring software; • organizational skills, according to the different production steps; • skills related to the detection of the audience appreciation.

Table 3. Video game skills achieved by the students according to the framework by Aufenanger (2003)

In this way, the goal of this action-research(namely, to identify a range of contents and activities that constitute, as a whole, an example of video game education, targeted to university students) looks achieved to me. The design and monitoring of the path return the image of a course balanced in its media-educational components, motivating students, and substantially replicable in similar contexts (or even with younger adolescents), without the need for sophisticated and expensive technologies.

Referring to the transfer to students of an educational method (I would remind that the workshop was set at the end of a course in Media pedagogy, dedicated to the theories and practices of media literacy education), the most important result was to have made fully understood that many are the necessary activities with prospective pupils. Not only teaching technical skills related to the use of PCs (what initially seemed the only thing), but also the design of work phases, the preliminary preparation of all the necessary materials, the management of groups and the teacher's tutoring of individuals' and groups' work. This outcome is certainly significant, considering that none of the students whom I worked with had a previous practical experience as educator.

This idea, then, would open my reflection not only to the media competence to be reached by the students, but also to the "second level" media education skills that teachers must have to lead a video game education course. As often happens in the field of media education, it is clear that anybody cannot improvise and need disciplinary, technical and educational skills. The project I presented here, however, is not unfeasible, and, with the endless changes that

could occur, can realistically act as an effective way to lead youths reflect on cultural objects which belong to their everyday life.

Acknowledgements

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Print quest: a learning adventure

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Abstract
Print Quest is an online educational application for young children that makes printing fun while using the tablet technology. One goal of this research is to determine if children can improve their motor skills while playing a computer-based game. Also evaluated is the performance of different algorithms for handwriting recognition. Testing sessions over a two month period gathered data through printing worksheets, questionnaires and in-game statistics. The children had two separate testing sessions where they used the Print Quest application.

For each letter attempted a score was determined based on three recognition methods. A weighted score is calculated from the results from these three methods based on the type of level. After gathering and evaluating the printing data, the next step was to determine if the children showed an overall improvement. The scores for each letter and each user were grouped to determine if the child improved between the first and final attempts. The results are promising for the future development and research of useful and beneficial edutainment applications.

Keywords: Edutainment, Printing, Recognition

1. Introduction

Print Quest is an original application created to combine printing exercises with interactive games. The goal is to allow children to practice printing skills while engaged with different adventure games. There are many factors involved when determining what type of interface and which types of games work best for younger children. Using previous research and original ideas, a fully functional application was built and tested by children to determine if this could be a useful tool for learning and improving writing skills.

1.1 Statement of Problem

There has been a growing trend of educational games and hardware aimed towards a pre-school and kindergarten demographic group, however few research papers measure classic printing skills with new technology and methods. By combining games with handwriting recognition techniques and a pen interface, one objective of the Print Quest project is to make an interactive interface that children will want to play. This will allow the users to practice printing while being entertained and working towards a goal. With the growing number of touch/pen based technologies available, this type of application is accessible to the general public.

A secondary goal is to obtain a more accurate idea of what types of games children prefer to play and what keeps them engaged. This way the application can incorporate games and levels that children will want to play.

The children had two sessions to play with the Print Quest application. Data was recorded for each level the child completed as well as each letter attempted.

This paper is organized in several areas:
- Theoretic framework
- application overview and scoring algorithms
- research evaluation methods
- summary of results and
- conclusion and future work

2. Theoretical framework

Several different areas of research were referred to when creating the Print Quest application. These areas include edutainment, interface design methods for children, motivations for playing games, and the importance of printing skills.

2.1 Edutainment

This project can be categorized as "Edutainment," the combination of education and entertainment. Some characteristics that allow a game to be categorized as edutainment are (Muda & Basiron, 2005):
- the target needs to be clearly stated
- the scope of the user age is specified in order to allow the correct level of learning
- the interface must be simple but elegant

- should be able to deliver the learning content with a targeted action
- rewards are offered frequently to encourage the user

An edutainment application can teach anything from simple math to complex physics concepts using different interactive methods. Print Quest is an interactive learning type of system (Wang, Tan & Song, 2007). Handwriting applications are a prime example of the benefits of combining computers with education. When children practice printing in school or at home, they are using workbooks or worksheets. By creating an edutainment system for handwriting, children can receive instant feedback for each letter attempted and they can alter their behavior to match with what is being taught.

2.2 Interface Design

The area of Child Computer Interaction (CCI) is relatively new in the study of Human Computer Interaction (HCI). "Child Computer Interaction encompasses traditional HCI but also specifically reaches out into the areas of child psychology, learning and play." (Read, Markopoulos, Parés, Hourcade, & Antle, 2008). Designing an easy and intuitive interface for children is an important factor for how much the child will enjoy using the application. If screens are confusing or the children cannot navigate the system, they get frustrated and no longer want to play. There are several general interface design rules which can be applied to user interfaces specifically for children. Some of the guidelines are:
- Strive for Consistency
- Offer informative feedback
- Design dialogues to yield closure
- Error prevention and simple error handling

Besides these general UI guidelines, children are drawn to applications that are interactive, animated and have simple goals. Additional consideration needs to go in to the design of recognition based systems. According to research by Read, MacFarlane & Gregory (2004), recognition systems are "fragile" and due to the "complexity of the algorithms," similar input from the users may result in different results. This has the potential to frustrate users with "conflicting feedback".

2.3 Games and Motivation

The types of games that are part of the application are a major factor when working on the design. Being able to keep children challenged and engaged means being able to develop different types of games that will appeal to the broadest audience. As part of Fromme's research (2003), it was noted that "boys and girls reported different preferences" when it comes to the types of games each prefers. Being able to find types of games both girls and boys enjoy was a key to development.

Another important consideration is the study of what motivates children to play video games. Determining why children play games can help with designing an appealing application. Olsen (2010) surveyed over 1200 students in grades 7 and 8 and found that "the chance to compete and win was one of the strongest motivators" among both boys and girls. Other top motivators included:
- Playing for fun
- Something to do when bored
- Challenge of figuring things out

- Friends like to play

Another common theme is that children not only like to learn and master a game, but they enjoy helping others with strategy and problem solving. Game communities drive the urge for competition but also for collaboration. "Whether to compete or connect, making friends is a major attraction of online games for adolescents and adults" (Olsen, 2010).Print Quest currently doesn't have a community component; however, several participants asked about it.

2.4 Importance of Writing

"Most schools still include conventional handwriting instruction in their primary-grade curriculum, but today that amounts to just over an hour a week (Bounds, 2010)."However, Spear-Swirling (2010) discusses the "Importance of Teaching Handwriting" in early education. She states that "handwriting in the earliest grades is linked to basic reading and spelling achievement" and that the better a child is at writing, the easier the child finds mentally strenuous tasks. In 2010, an Indiana University study used an MRI machine to determine that children who had practiced printing a letter before and after the exam had more advanced neural activity than children who were just shown the letter. There are several methods that teachers are taught to help in the process of teaching printing. Not all schools teach the same way, but the methods listed below are the most common methods when beginning to teach handwriting (Brailsford, Stead, 2006):
- Continuous formation of letters using a continuous stroke (if possible)
- Focus initially on learning the motor pattern rather than emphasizing neatness
- Teach similarly formed letters together (i.e. c, a, and d)
- Separate reversible letters (i.e. d and b)
- Use written arrow cues to help children learn the direction to form letters (top down)
- For children just learning to read and write, provide handwriting instructions with letter sounds.

One of the main observations from the testing is that the direction the children use to form letters is incredibly important in recognizing the input.

3. Application overview

This section discusses the layout of the application, the different types of levels for the children to play and an overview of the implementation.

3.1 User Interface

Print Quest: A learning adventure consists of three main sections: printing games, the arcade and the scrapbook. The printing games contain all of the printing levels and mini-games and revolves around storylines about two dogs. The arcade contains games that can be played with tokens earned from completing printing levels. The scrapbook maintains the scores and achievements the children have earned while playing the printing levels.

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Figure 1. Print Quest Main Menu

The menu items on the main screen are large buttons, easy to select for children. If the children are confused, they can click on the blue question mark button in the top right hand corner of the screen. Print Quest gives tips using animation and sound about what each section does. To keep the layout features consistent and to help children navigate, the back and information buttons have the same appearance and are in the same location. The letter printing levels and mini games use the same structure for capturing the ink and have the same placements for the "Check" and "Reset" Buttons. Keeping printing screens in the same format allows children to play any level without having to re-learn which buttons to push each time. Placing the printing buttons beside the ink presenter speeds up the process and allows for less mouse/pen movement between the printed letter and the button. This reduces the chance of the child drawing any unwanted lines while navigating.
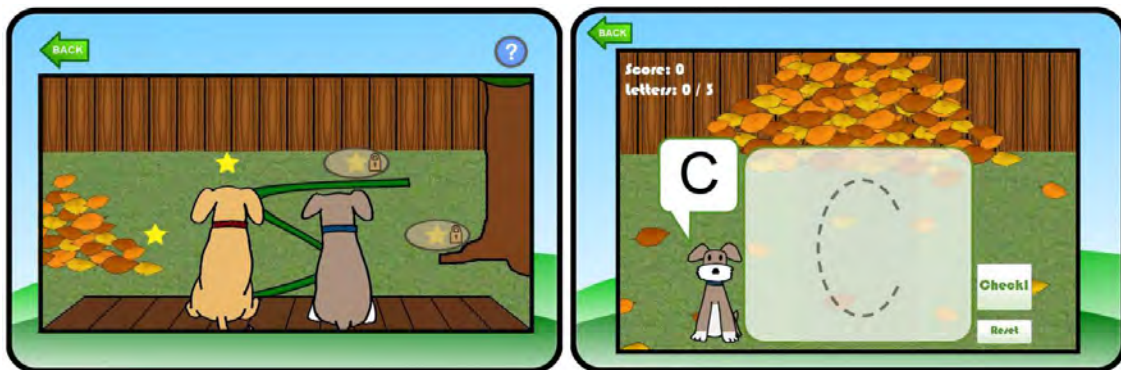

Figure 2. Buttons on Different Screens

3.2 Letter Level Overview

Screens and maps introduce different storylines to the children and they are able to navigate through the menus to the letter levels and mini-games to practice printing. As levels are completed, new and challenging levels are unlocked. Each "letter level" map consists of a subset of letters to be completed.
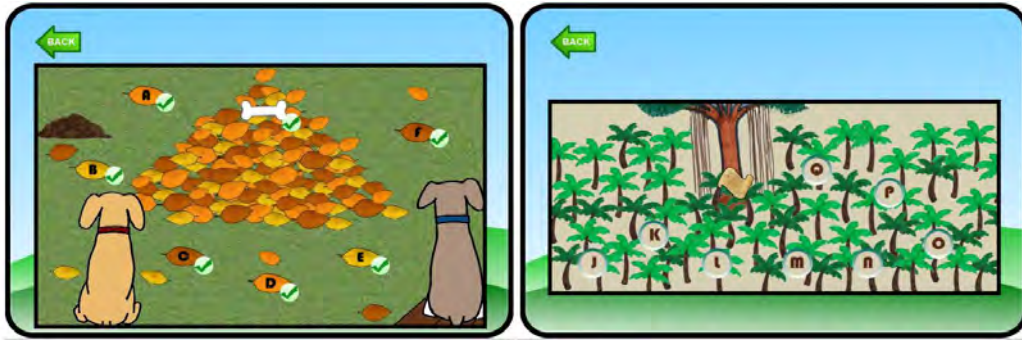
Figure 3. Letter Level Maps

Two types of screens require the children to practice printing; letter levels and mini-games. Letter level screens asks the user to print one letter a few times per screen while mini-game letter screens asks the children to print all of the letters they have completed in that section. There are two types of letter level screens; those with tracing guides and those without. These two types of screens can be seen in Figure 4. This is an important detail in determining the score. When a level is completed, data is saved to the database for future analysis.
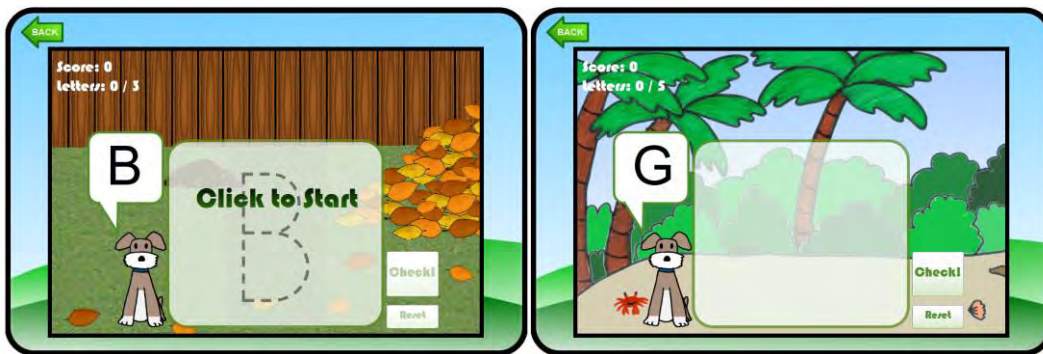
Figure 4. Letter Writing Screens for Leaf Pile and Jungle

Mini-game levels are used to test the knowledge the users have gained from the previous letter levels. There are several different styles of mini-games, including:
- a set number of letters to attempt and animations that correspond to each successful letter (Figure 5),
- A hide-and-seek style of game, where the user needs to find map pieces hidden behind leaves. The map pieces are randomly assigned to leaves for each game, so that each game is different (Figure 6), and
- A fixed time limit game where the user needs to complete all of the letters in the list before time expires (Bat Cave, Figure 7).
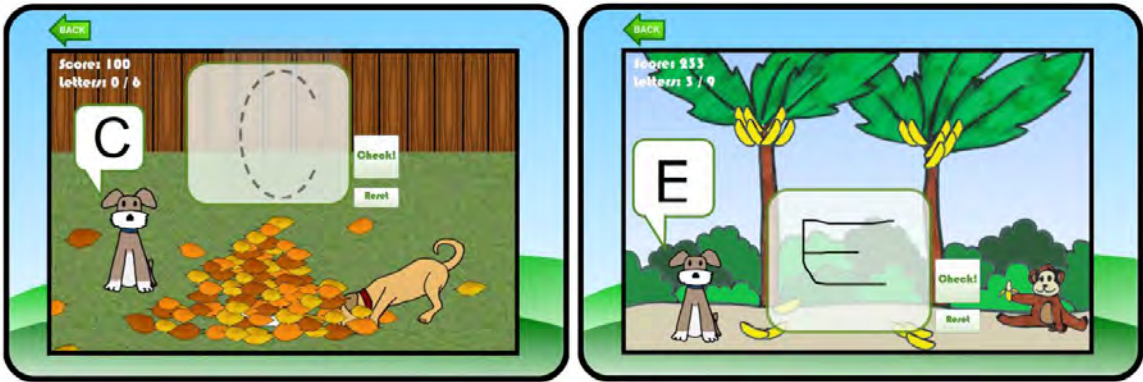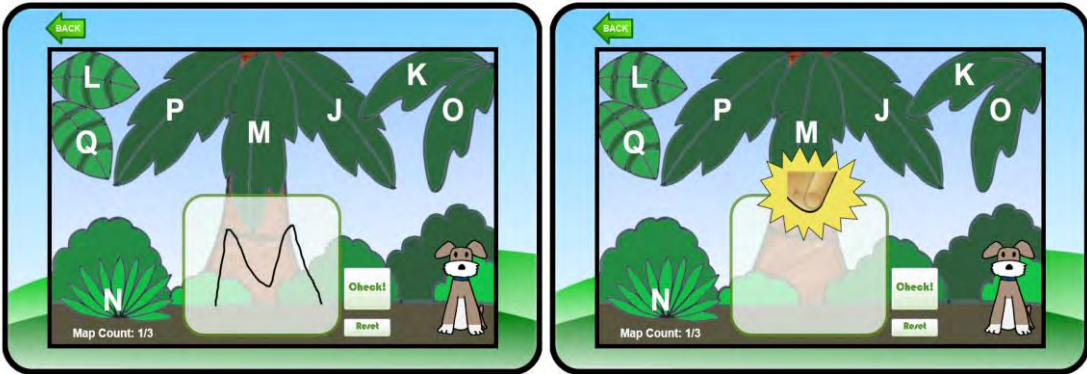
Figure 5. Simple Mini-Game
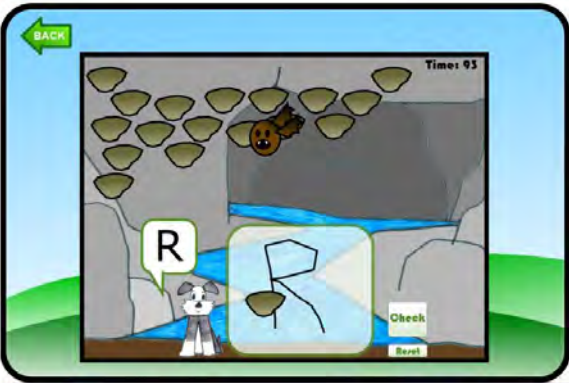

Figure 6. Map Mini-Game

Figure 7. Bat Cave Mini-Game

3.3 Motivations: Arcade and Scrapbook

Print Quest not only has levels to practice printing, it has two additional sections to motivate users to continue playing: the Arcade and the Scrapbook. When users enter the Arcade screen from the main menu, they see images for each game in the Arcade. If there is no lock over the game image, the game is currently playable. The top right corner displays the total number of tokens a user has earned. If an arcade game has not been unlocked, it can be opened by completing more letter worlds in the printing sections.

The first unlocked game in the Arcade is a game called "Dogger" (Figure 8) and is based on the classic game "Frogger."This game was simplified to be easier for young children, with changes including updating the theme to match the application, only having a single lane of traffic, slowing down the lane speeds and adding five lives per game. The Arcade helps motivate children to practice the printing levels because to be able to play the arcade games they need to earn tokens first.
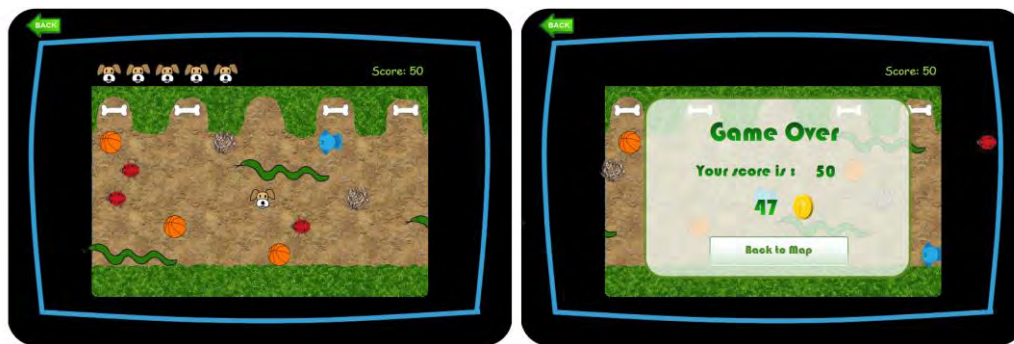

Figure 8. Dogger Arcade Game

The Scrapbook displays the user's progress through the application. Each time a mini-game is completed, a picture is added to the Scrapbook. Children like collect things and complete all levels. The Scrapbook helps them to keep track of their achievements.

3.4 Scoring Methods and Algorithms

Each time a child attempts to print a letter, the system attempts to recognize the drawn image and calculate a score. Three different methods are used to recognize the input and a weighted score is calculated based on if the level uses a tracing guide or not. The first recognition method uses the Microsoft.Ink library. Because this method returns only a single string of recognized text and is unable to calculate a score, two other methods are used. The second recognition method is a basic pixel by pixel comparison. Source images were created for each letter with the same font used as the tracing guide. The basic pixel by pixel algorithm compares the black and white pixels of both images and determines how many pixels were drawn and how many of the pixels drawn match the black pixels in the source image. Once we have these values, we calculate the score with the calculation shown below. This way, the child can't color the entire box black to match all of the points and they will need to be more accurate.

Score = (numMachingBlack / numBlackInSource) * 100;

This type of pixel comparison worked well enough for levels with the tracing guide, but it was not accurate when no tracing guide was available. It was too much to expect children to

draw exactly where the tracing guide *would* be when no tracing guide is shown, so a third comparison algorithm was created to offset this problem.

The third algorithm is a variation of the general pixel comparison algorithm. Instead of comparing the ink presenter to the exact same size image and having the position of the letter in the source image is the driving factor, the printed letter is clipped down and a fitted source image is used for comparison. The basic pixel algorithm is then run on these resized images and calculates the new "Resize Image Compare" score. Examples of the source images are seen in Figure 9.


Figure 9. Letter Level Source File and Fitted Source File

Although the "Resize" algorithm should always be superior, both algorithms are used because the application itself calculates the overall score with weighted percentages for the types of letter screens.

For levels with the tracing guide, the overall score is calculated using the Microsoft recognizer score at 30%, the basic pixel algorithm at 30% and the resize pixel algorithm at 40%.When no tracing guide is present, the overall score is calculated with the Microsoft recognizer score at 45%, the regular pixel algorithm at 10% and the resize pixel algorithm at 45%. The regular pixel score is barely used when no tracing guide is present and this decision was made after initial testing showed that most children write smaller and to one side without the guide.

3.5 Recognition Algorithm Analysis

A few observations were made after testing was completed in regards to the algorithms. One question that arose was how might the calculations be skewed if the child were to write a very small letter instead of a larger letter along the guide? If a child writes a small letter, there are fewer pixels to compare for the resize algorithm and fewer pixels drawn could increase the score when the pixels matched/pixels drawn calculation is done. A second observation was how dependent the Microsoft recognizer was on the stroke order of the letters printed. A perfectly good 'A' was not recognized if it was not drawn using a common stroke order format. Figure 10 shows and example correct and incorrect stroke orders, based on testing.
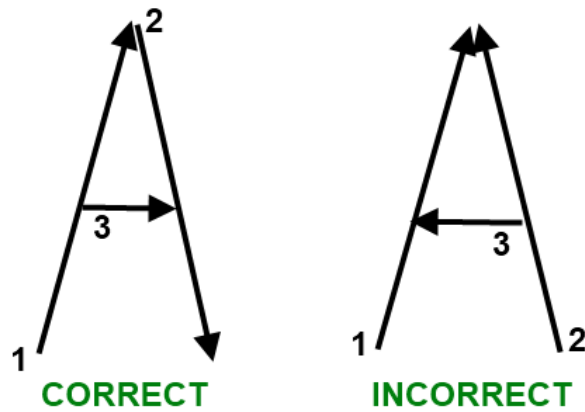
Figure 10. Stroke Order Example

Besides wanting to calculate a score, the strong dependency the Microsoft recognizer has on stroke orderwas the second reason for introducing the pixel compare algorithms. This way, if the letter looked like an A, no matter how the user would draw it, they would get some sort of score.

4. Evaluation methods

Several evaluation methods were used to gather both quantitative and qualitative data during the research phase of Print Quest. Qualitative data was gathered using printing worksheets, questionnaires and observations. Quantitative data was gathered from each level and letter attempted when using the application.

4.1 Evaluation Methods for Children

From previous papers, it has been stated that the most common research methods for young children seem to be interviews and questionnaires. Children often have a hard time understanding and answering questions, so designing questions that are easy for them to interpret is important. A list of "guidelines for surveys with children" was followed throughout the process. These guidelines are(Read & MacFarlane, 2006):

- Keep it short
- Provide assistance for non / poor readers
- Use appropriate tools and methods
- Expect the unexpected
- Make it fun and be nice

4.2 Testing and Questionnaires

Print Quest was tested with children between the ages of four and seven. Each child completed two twenty minute sessions with the application as well as questionnaires and worksheets before and after the testing. The printing worksheets the children completed contained all letters from A to Z. The worksheets help to determine each child's level of printing prior to using the pen interface. The printing sheets are graded using a printing rubric discussed in Section 4.4. The majority of the research time was the children playing the Print Quest application. A post-game questionnaire asked the children about how they liked using the pen interface, difficulties encountered with the interface, and how much they liked playing a game for printing letters.

4.3 Application Data

Aside from the qualitative data gathered, the application saved a large amount of quantitative data for each screen, game and letter attempted. The two types of data saved are performance data and recognition data. Performance data is saved for each level and includes: level type, time used, correct and incorrect letters, and if the level was completed. Recognition data is saved for each attempted letter and includes: the original letter, the letter recognized by the Microsoft recognition library, the scores calculated for both pixel algorithms and the filenames for the saved XML and image files. Not only does the application calculate the scores in real time, but it also saves all of the data required to analyze the data further. From the recognition data, we can determine if the children are improving with each attempt, if they are successful in their attempts, and which letters they are best at.

4.4 Grading the Worksheets

After each participant had completed the letter worksheets (Figure 11) from the two testing sessions, the worksheets needed to be assessed using a grading rubric.
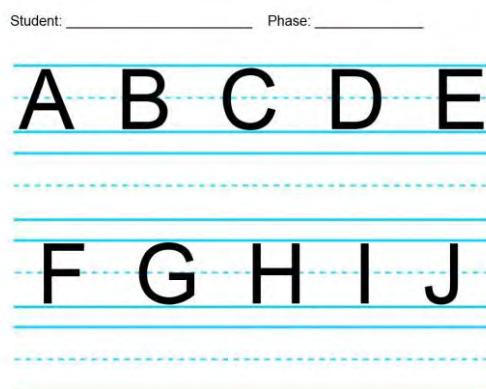

Figure 11. Printing Worksheet Page 1

The rubric in Figure 12 was provided by a local elementary school teacher. The rubric was chosen because it was clear, concise and translated nicely into a database structure.

|	Criteria				Points
	4	**3**	**2**	**1**	
Letter Formation	Each letter is formed correctly.	All but 1 letter are formed correctly.	80% of the letters are formed correctly.	50% of the letters are formed correctly.	____
Letter Slant	All letters have a uniform slant.	All letters have a uniform slant with 1-3 exceptions.	All letters have a uniform slant with 4-6 exceptions.	Slant of letters vary from letter to letter.	____
Neatness	There are no extra visible marks or smudges on the paper.	There are 1-2 visible marks or smudges on the paper.	There are 3-5 visible marks or smudges on the paper.	There are more than 5 visible marks or smudges on the paper.	____
Relationship To Line	All letters are located correctly in relationship to the lines.	The size of 1-3 letters are slightly larger or smaller than the space allowed by the line.	The size of 4-6 letters are slightly larger or smaller than the space allowed by the line.	The size of more than 6 letters are slightly larger or smaller than the space allowed by the line.	____
				Total---->	____

Figure 12. Grading Rubric

Using this rubric, each worksheet was "graded" on a scale of one to four for each section and stored in the database for further analysis. The four sections for grading are Letter Formation, Letter Slant, Neatness and the Relationship to Line.

5. Summary of results

The summary of results highlights the analysis of the data gathered from each method and discusses whether the results can determine if the children have improved their printing skills.

5.1 Comparison of Recognition Algorithms

Using the data saved for each letter attempt, analysis can be done on the different algorithms; how they compare for each letter and how they compare to each other based on different criteria. The first comparison shows each letter attempted by all testers and which algorithm had the best score. Figure 13 shows that on average, the resize algorithm performed much better than the regular pixel algorithm, which was expected due to the nature of the algorithms.
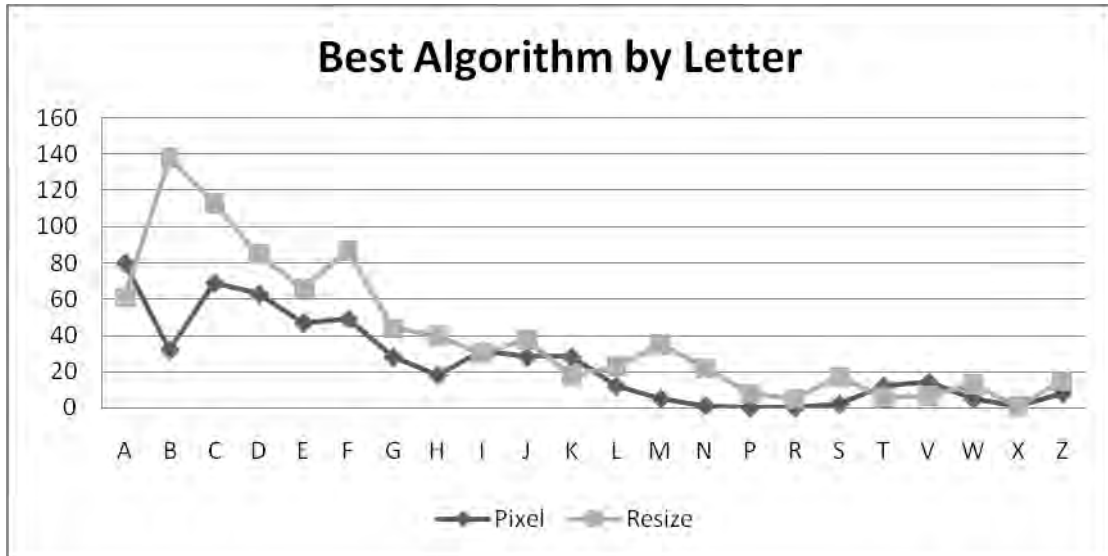
Figure 13. Best Algorithm by Letter

In very few cases, the pixel algorithm had a higher score than the resize algorithm (K, T, and V). After analyzing these attempts, it appears that occasionally when a child has drawn a skewed version of a letter or has drawn an artifact stroke, when the resize algorithm transforms the fitted source file to match the input file, the fitted source image does not line up as closely as it did before the resize with the original sized source file (Figure 14).
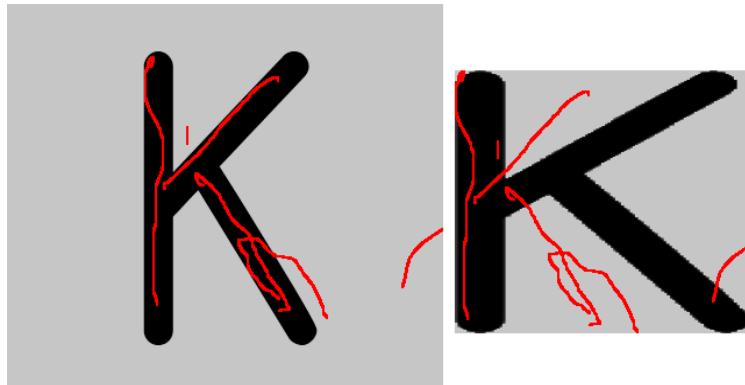
Figure 14. Pixel Compare vs. Resize Compare with artifact stroke

The next set of figures shows how each algorithm on average scored for each letter, depending on if the Microsoft recognizer recognized the letter or not. The intent of this analysis is to show how several letters are recognized using the pixel and resize algorithms about the same with no clear dependency on the Microsoft recognition and how the stroke order affects one but not the other.
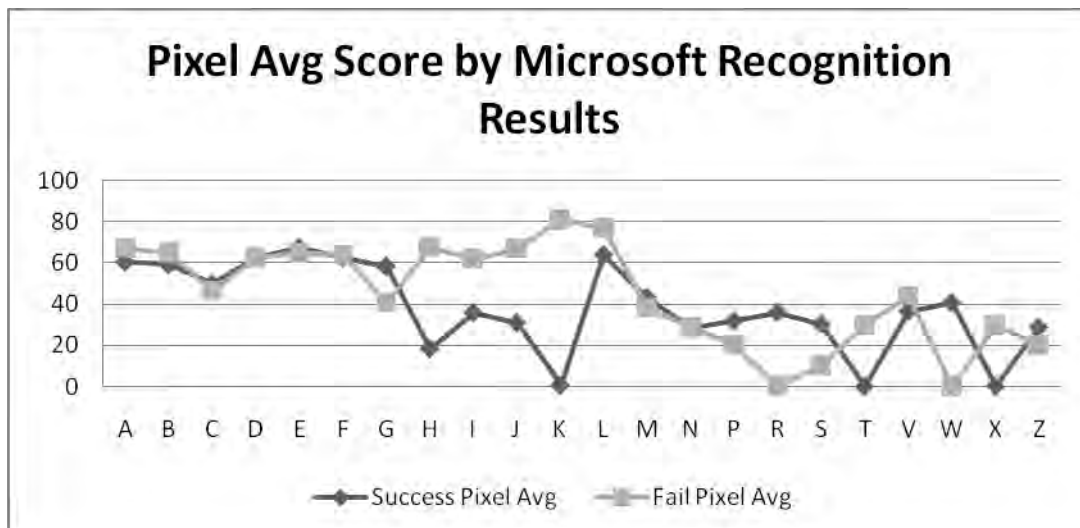
Figure 15. Pixel Algorithm for Recognized and Non-Recognized Letters
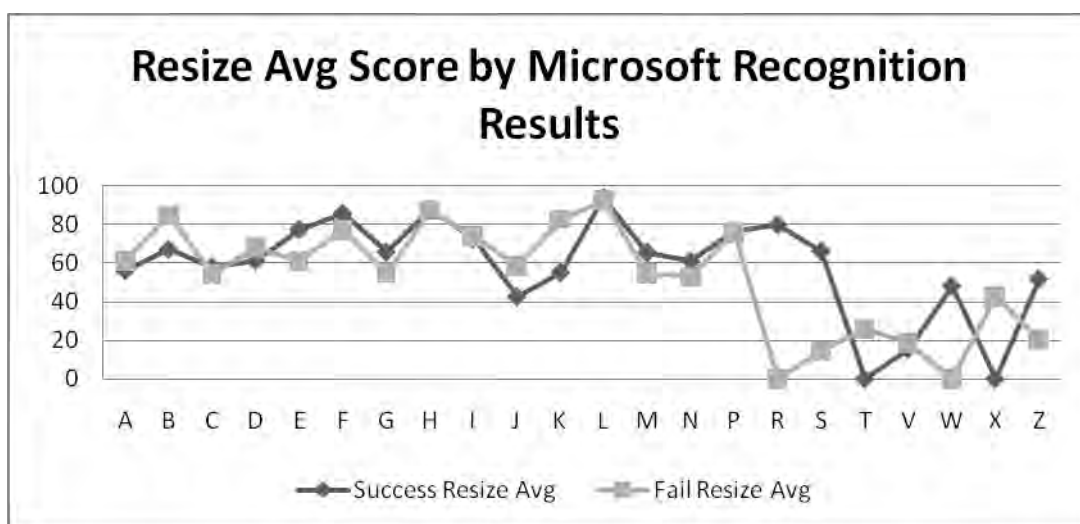
Figure 16. Resize Algorithm for Recognized and Non-Recognized Letters

From Figures 15 and 16, it appears that the Resize algorithm is about the same regardless whether the Microsoft recognizer matches the correct letter. One might say that it appears the pixel algorithm works better when the Microsoft recognizer has failed. After analyzing these attempts, the majority of the cases where the failed attempts are getting high scores are when the child spends a lot of time trying to trace the guide exactly, usually causing broken or backward strokes. It is shown that the more the children tried to trace the line without using the learned stroke order, the higher the pixel comparison score was and the lower the chances of the Microsoft recognizer working.

Figures17 and 18 outline, for both successful and failed recognition attempts by the Microsoft recognizer, how the resize and pixel algorithms compare to the final score calculated by the application.
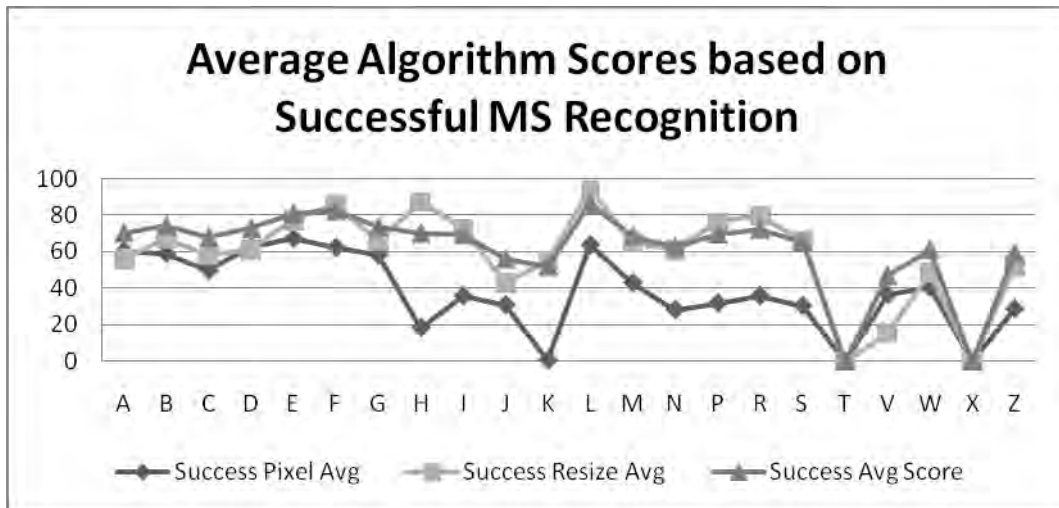
Figure 17. Average Algorithm Scores for Successful MS Recognition Attempts
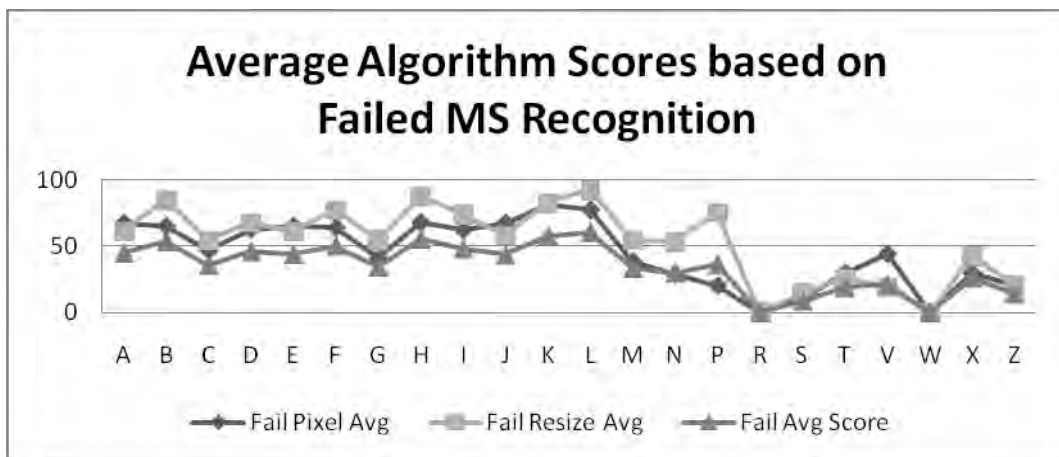
Figure 18. Average Algorithm Scores for Failed MS Recognition Attempts

From Figures17 and 18 it can be noted that the Average Score that is calculated by the application is directly affected by the Microsoft recognition results more than the other two algorithms are. This is because the score used the Microsoft recognition result as 30% of the total score. The failed average score for each algorithm appears to do better in almost all cases for the reason mentioned above where the children as drawing as close to the tracing guide as they can, not paying attention to how clean or concise their strokes are.

5.2 Qualitative Results

The qualitative results are gathered from the questionnaires and worksheets. The most relevant part of the qualitative data is the analysis of the worksheets. The first thing that was analyzed was to determine if scores improved between the first and second worksheets. Figure 19 shows the results.
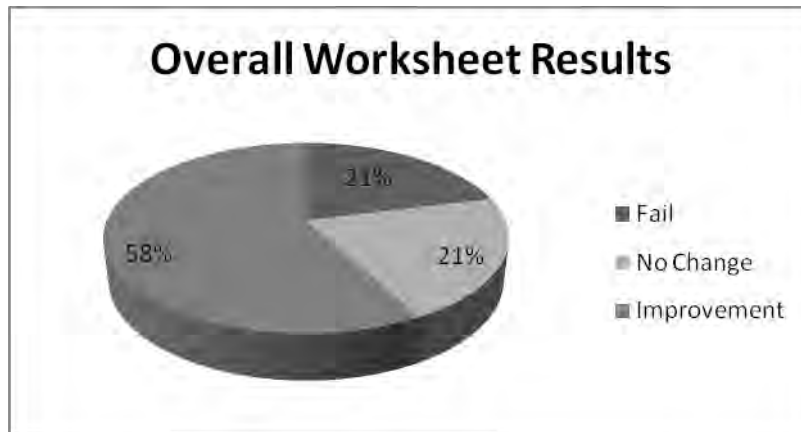
Figure 19. Overall Worksheet Results

Figure 20 shows the average worksheet score by age. As expected, the older children achieved higher scores.

Figure 20. Average Worksheet Score by Age

Finally, for qualitative results we consider the post-answer questionnaires. Figure 21 summarizes several questions asked of the children after both testing sessions. Each question has five answers that are phrased so that the children can easily understand and answer them. This diagram shows the average score for the qualitative questions by age group. One can see that as the age increases, so does the amount the child liked using the pen interface. Most of the younger children thought the pen was hard, but still liked being able to print letters while playing a game. The last statistic is very positive for this project and is a good indication that the idea would suit many age groups.
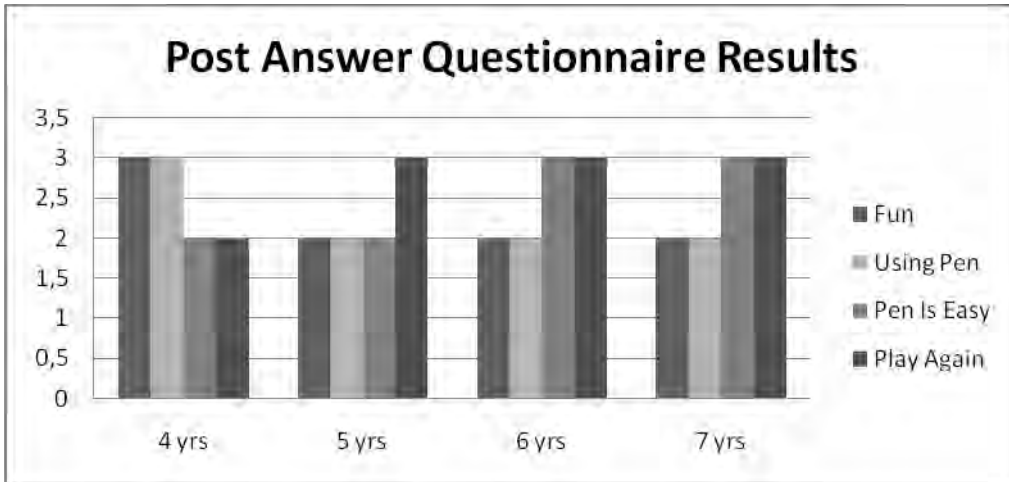
Figure 21. Post Answer Questionnaire Results

The children were asked to name three things that they liked about the game and at least one thing they did not. Figure 22 summarizes the results about what they liked, with the top three being the "Dogger" arcade game, drawing the letters and the "Map" game.
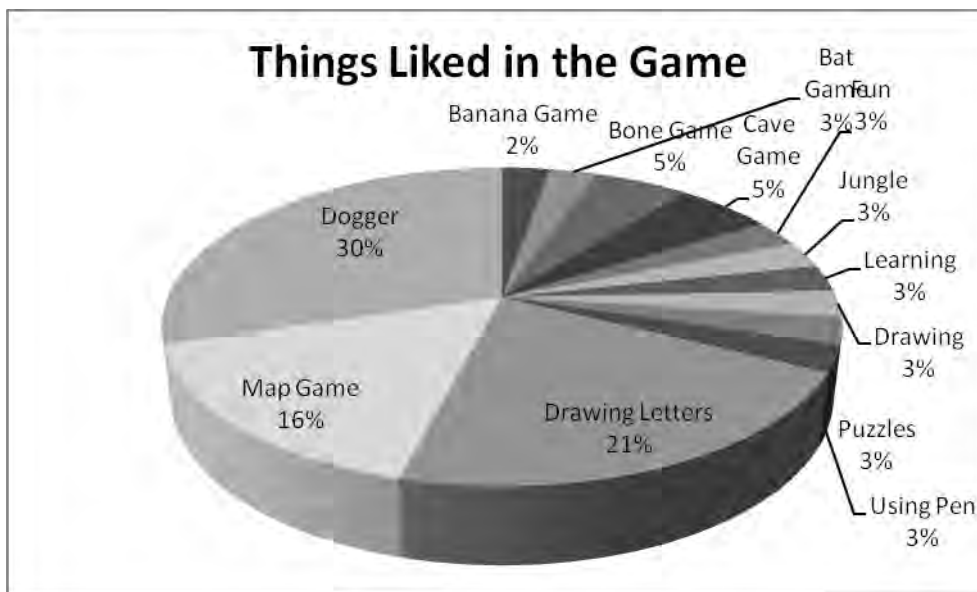
Figure 22. Things Liked in the Game

When it came to things that the children did not like about the game, the most common complaint was that sometimes the recognizer did not recognize a "perfectly good letter". Careful observation during the testing sessions showed that the claim was true. Some letters were much harder for the system to recognize than others. The hardest letters to recognize are T, K and X.

5.3 Overall Results for Improvement

The most difficult thing to measure was whether overall printing skills improved from using the application. With only two sessions, there was not much time for children to test with the application. However, we can use the data to determine if their scores have improved between the two sessions. The query that is used finds the score for the first attempt for each letter and compares it to the final attempt. If the final attempt has a higher score than the first, this is categorized as an improvement. Figure 23 shows the overall summary for all users and all letters attempted throughout the process. As one can see, in 38% of the cases, no improvement was categorized. However, it is important to note that overall, for all users and letters, there is a higher percentage of improvement.
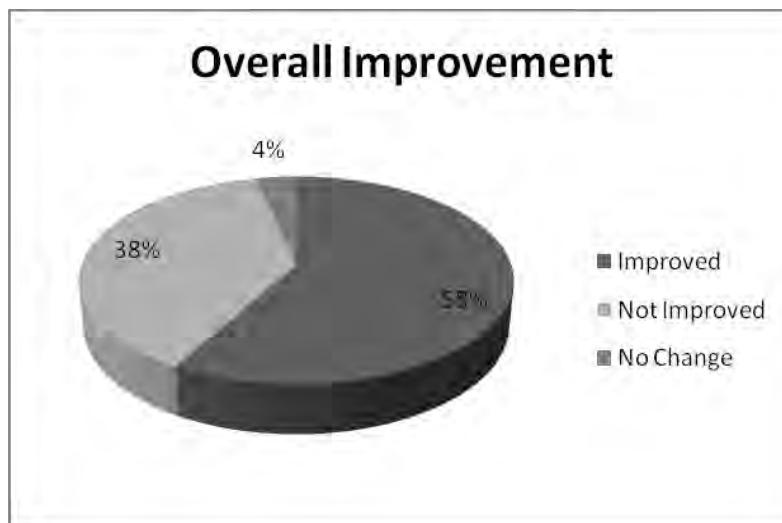
Figure 23. Overall Improvement

Next, the data was broken down to show all improvement results by letter (Figure 24), to see if some letters were easier or harder for children to improve on. It should be noted there is more data for the first half of the alphabet, since those were the first letter levels for the children to try. Only a few letters show a large amount of no improvement. This might be different if those levels had been played more. Letters like 'G', 'H' and 'T' were more frustrating due to the recognition issues, and in some cases, children may not have even finished the level successfully.
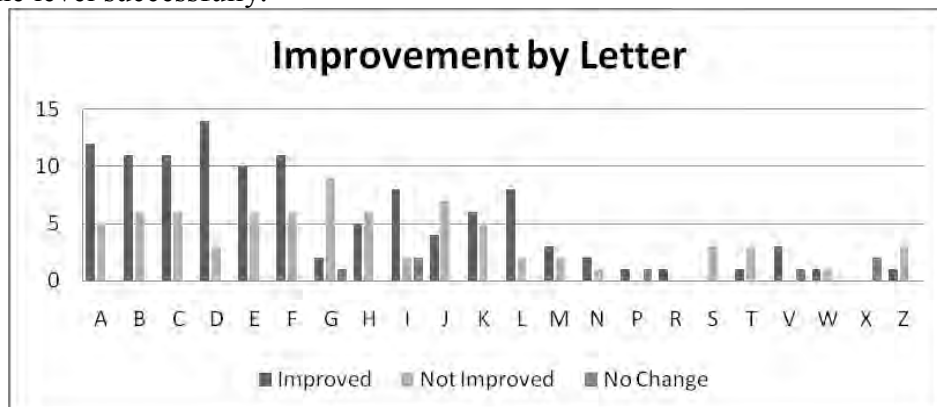
Figure 24. Improvement by Letter

The next breakdown shows all improvement results by user as a summary of each letter. Figure 25 shows that the majority of children, ten in total, showed overall improvement; four showed less improvement and four showed no change.
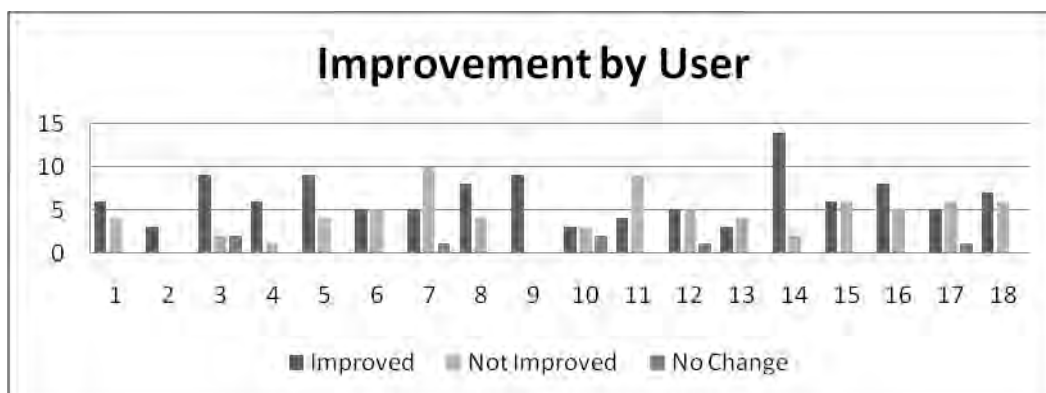
Figure 25. Improvement by User

Overall, only four children showed improvement on *both* the worksheets and the application testing. However, for both areas, more children showed improvement than not. This data shows that games like Print Quest can be beneficial and should be developed further and available to a broader audience.

6. Conclusion

6.1 Future Work

There are many things identified for future work to help improve the application. The primary focus for future work is to continue improving the recognition and scoring algorithms. Once the recognizer can be counted on to analyze when a letter is correct or not, the better the experience will be for the child. Additional animations and sound clips are in development to enhance the usability and experience of the application. Further research in the areas of stroke order and teaching methods could help to improve recognition. Methods such as D'Nealian and Zaner-Bloser could be added as a preference that parents could choose, depending on how children are taught to print in school. The application could recognize and teach the letters differently for the different methods.

6.2 Conclusion

Overall, the children involved in the Print Quest research seemed to be genuinely interested in the application and several wanted to be informed when the full version would be ready. The interest and excitement over the application from both children and parents helps deem this phase of the project a success in itself. With the majority of children showing an improvement in their skills as well as wanting to keep playing to finish more levels, Print Quest and other applications like it have huge potential in the edutainment industry. Finding out what children want to play and how to help them learn is everyone's continuing goal.

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Digital Games as Systems & Design Literacy: a review and a proposal

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Abstract

The study of games, and especially of digital games, as a medium through which to successfully channel learning to the so-called "Digital Natives" generation, is certainly not a new topic: the "Serious Games" framework finds nowadays ever greater application and achievements within formal educational institutions.

Acknowledging the validity and the value of this particular approach, this paper proposes a possible parallel paradigm for "game literacy", apt to analyze and stimulate the growth and the inner workings of informal networked learning processes, starting from a literature review based in the works of cyberneticians and eco-systemic theorists and ending with a research project proposal.

Keywords

Digital Games, Systems Literacy, Cybernetics, Ecology of Mind, Online Communites.

1. Why so "Serious"?

The first question in approaching the so called, emergent field of "game studies" is in fact a deep, philosophical one concerning its own boundaries: *what is "play"*?

To this question we have had, in our recent history, a wide variety of multifaceted answers from authors of different backgrounds, of which I give only some relevant examples:

- A free activity standing quite consciously outside 'ordinary' life as being 'not serious' – Huizinga (1938);
- An activity which is fun, separate, uncertain, non-productive, governed by rules, fictitious – Callois (1961);
- To voluntarily overcome unnecessary obstacles – Suits (1978);
- Free movement within a more rigid structure – Salen & Zimmermann (2003);
- The capacity to experiment with one's surroundings as a form of problem solving – Jenkins (2009).

Using this philosophical quandaries as a foundation, I will however inspire my inquiries from the debate on the nature of play opened by Gregory Bateson (1972), a discussion characterised by the refusal of any simplifying definition, by arguing that "play" itself may be at the core of our ability to de-fine, as in construct semantic boundaries. I therefore do not intend to inquire into an "all purpose" definition of play, but to explore some general characteristics of this particular medium as a possible participative, multi-purpose social research-and-education methodology, fields which are ordinarily considered as of the utmost "seriousness". On the other hand, one feature of play is indeed known since the dawn of western civilization: its link with embodied, participatory knowledge or, as Plato wrote, "you can discover more about a person in an hour of play than in a year of conversation", and, in a culture which so highlighted "self-knowledge", that is quite something to say. Still, more than two thousand years later, play remains, for the most part, the province of childhood or becomes institutionalised (and quite "serious") in the form of "sport", while discovering that the original root of the word "school", σχολή , referred to "spare time" leaves us puzzled and asking ourselves what generated the cleft that often seems to divide learning and leisure in our modern sensibilities.

This specific issue translates within educational and entertainment industries, their separation and their possible intersections, as "Serious Games" find nowadays ever greater application and achievements within formal educational institutions; this particular approach, rooted in the cognitivist and constructivist learning paradigms, uses the simulative power of games to produce experiential knowledge, while still maintaining a very explicit didactic objective and often as explicitly sacrificing fun for the sake of teaching (Crookall & Thorngate, 2008; Ritterfield, Cody & Vorderer, 2009).

The success and the validity of these approaches cannot be underestimated, as the proliferation of their manifold fields of application becomes more and more apparent; among them we can find, on the most basic level, courses in work security, first aid and business administration, fields which procedural structures lend themselves very well to a "gamified" approach (Bogost, 2010). More controversial are of course military simulations used for soldiers' training, distinguishing themselves from ordinary "shoot'em up" games by their realism and adherence to military procedures, e.g. *America's Army* and *Full Spectrum Warrior,* the latter of which is however also being used to aid the psychotherapy of soldiers suffering from PTSD, (Rizzo *et al.*, 2006) , thus highlighting the potential of simulative approaches in a wide field of applications. Still remaining within the "political activity"

spectrum, we can also find realistic government simulation games like *Democracy* or even so-called "newsgames" like *Darfur is Dying or JFK,* which have, as their explicit objective, the opening to public debate of critical political issues (Bogost, 2011). Continuing this brief overview, we cannot forget how serious games can be used to further science: an extremely prominent example is *Foldit*, developed by the Washington Center for Game Science to "crowdsource" the construction of models of protein synthesis; the results are outstanding, trumping years of "brute force" automated computation with the power of human collective intelligence, intuition and aesthetic capabilities.

However, notwithstanding the often amazing achievings of this approach,the connection between learning and "seriousness", in the writer's opinion cannot be intended as necessary in itself, as would seem from looking at modern educational institutions, but it is constructed within a system of discipline and punishment (Foucault, 1975) shaped by hierachical agendas and linear, unidirectional conceptions of the teacher-pupil dynamic (Bookchin, 1982); indeed, paradoxically, "Serious Games" have most often failed to gain purchase particularly in ordinary schools, among the so called "Digital Natives" (Prensky, 2001) to which they are originally targeted (Jenkins *et al.* , 2009).

This paper, founded in the ecological and systemic paradigm, will go on to inquire into this dynamics and illustrate the pervasivity and the relevance of learning found in digital "non-serious" games, starting from the theoretical and epistemological roots of the same technology that makes this new medium possible, as to propose new possibilities for a non-linear, non-hierarchical and participative learning paradigm.

2. Virtual Helmsmen

During World War II, mathematician Norbert Wiener worked for the US Army in the automation of anti-air guns (which need to be able to predict the postion of their targets to be effective) , and in the process formalised the notion of feedback in control systems, extending its relevance to living systems (Wiener, 1948) and thus founding the field of "cybernetics" as "the science of control and communication in animal and machine" (or, literally, "the art of the helmsman", from the greek root κυβερνήτης). After witnessing what science subserved to military intents wrought upon Hiroshima, Wiener refused to cooperate with the army anymore and took to heart that this "control science" would not become an exclusive tool of the elites; fearing that a few huge, state-controlled computers could have controlled the fates of humanity he moved the first steps toward the diffusion, privatisation and democratisation of information and communication technologies that, from their beginnings into the 21st century, deeply shape our life.

Among the countless achievements of this historical process, modern digital videogames can be elected as a quintessentially cybernetic medium in that they make use, in some form, of an explicit "helm" with which the player interacts with the game worlds; these systems of control are much varied and have seen a continuous evolution from the beginnings of digital entertainment, keeping up with the ever increasing complexity of games and reflecting the industry's research in interfaces and usability. The most common control implements are probably the "joypad" and the "joystick", devices with one (or more) element functioning as an analogic controller for directional movement and an ever-increasing number of buttons (up to 12 in some modern gaming systems), which are mirrored in the typical mouse-and-keyboard arrangement of games played on PCs.

While this is the most widespread "helm" configuration, from the dawn of the medium there have been tool-shaped controllers of many kinds, of course starting from military implements (mostly light guns, as the iconic *Nintendo Zapper*), but, in recent times also

simplified musical instruments, as those seen in the extremely successful *Guitar Hero* and *Rock Band* franchises. In more recent developments, modern touchscreen technology allows a more direct (and literal) manipulation of in-game objects, while motion sensitive devices (e.g. the *Wii Remote* or its Sony counterpart, the *Playstation Move*) allow a similar user experience without touching the screen, translating analogically the players' movements into the game world; a further evolution of the same concept, and (for now), the most innovative commercially available interface is the *Microsoft Kinect*, a stereoscopical device able to capture and recognize complex body movement and gestures and transfer them to an on-screen avatar without the use of any handeld periferics, thus reaching new level of embodiedness and immersiveness.

This latter concept needs to be focused on, in relation to control systems: immersiveness, as defined as "feeling within" a simulated world, is obviously strongly sought out by game designers, and while many of the above mentioned control devices may seem to "get in the way" of this objective, empirical evidence (McMahan, 2003) points in a different direction: after a brief period of interaction with a new configuration the controls can be "overlearned", thus becoming unconscious and automated, so that the player feels not anymore the individual button presses but instead acts directly within the game world; when this happens, the feedback from the game also becomes more deeply ingrained in the player, and this becomes extremely evident when observing a strongly involved gamer playing through a frantic action sequence, as not only he or she will dodge and flinch following the avatar, but he or she might even vocalize pain and effort almost as physically experiencing them.

This is a specific manifestation of what Mihaly Csikszentmihalyi calls "flow"(1997) , a mental state characterised by complete involvement and motivation, deeply connecting emotion and problem solving, as human beings seem to be "wired" to experience "fun" when freely mastering a skill (Koster, 2005). This specific capacity for extreme "withinness" brings us to the next point of our discussion: what does it mean to be so deeply involved in a plurality of simulated worlds?

We may search for a possible answer by following the "lineage" of the cyberneticians: among the first prosecutor's of Wiener's work we encounter William Ross Ashby, an English psychiatrist who formalized what would then be called "the first law of cybernetics": $Y = F (G (X))$. This formula, also known as "Law Of Requisite Variety"means that the element of a system with the highest number of available states has the most control of the system (Ashby, 1956) or, as more succinctly rephrased by Stafford Beer (1979), that "Only variety can absorb variety"; this need for variety in the management of complex systems leads us to another thing that videogames can teach: through digital games users can interact with manifold complex "states", both fictional and realistic, that would never come within the "ordinary" scope of their lives.

This is not only about learning to come to terms with specific situations (as it is in the "Serious Games" paradigm), but concerns a meta-level, "learning to learn point-blank" (Bateson, 1979) through the use and creation of flexible metaphors. Gamers meet "point-blank" an enormous variety of possible situations, which I hereby give only an extremely short sample of: from space colonisation (on the whole spectrum of "soft-hard" science fiction, exemplified each by the realistic missile dynamics of *Kerbal Space Program* and by the interstellar empires of *Master Of Orion*) to sports championships (be it the extremely successful *Pro Evolution Soccer* series or driving simulations like *Gran Turismo*), from dragon slaying (a standard trope in fantasy games, be them Massively Multiplayer as *World Of Warcraft* or single player experiences like *Skyrim*) to martial arts competitions (of course in the famous *Street Fighter* series, but in countless other fighting games), from cooking (*Cooking Mama,* first of an entire line of "homemaking" games, which while being borderline sexist in their design also found a widespread success within the male demographic) to pet-

care (as in *Nintendogs* and *Kinectimals*, both games leveraging the above mentioned forms of modern analogic control systems to simulate physical contact with outrageously cute animal representations).

If, as cyberneticians have taught us, variety can generate higher levels of consciousness (cybernetically defined as awareness and control of one's internal states), what can such a wide array of "possible world" experiences mean to a dedicated gamer, and how do they shape not only their cognitive processes, but also their relationship with their peers, their environments, as to say, their ecology of Mind (Bateson, 1972)?

3. Going Up a Level

We have now seen how videogames place gamers in a variety of situations, but another characteristic of the medium is its capacity to displace and heighten ordinary points of view, giving players the possibility to obtain more inclusive pictures of the simulated environment and therefore enable his or her decisional processes: the "external channels" of the mind (Bateson, 1972) must widely expand within the game world to proceed, and the necessity for ecological awareness to survive, while present in virtual worlds as in the real one, becomes evident in the virtualised conflicts and crises that continuously and necessarily drive gameplay.

I will hereby give an exemplificatory account of this "ascensional movement" which could start with the player watching from the roofs of the slums of a crime-infested city (as in *Batman: Arkham City),* continuing to the (literal) overseeing of a big metropolis in all its aspects (as in the famous *Sim City* series), to having under one's sights and responsibilities a continent spanning empire (as in the *Civilization* series) or even the ecology of a whole planet (in *Sim Earth*), up to uniting an entire galaxy of quite different sentient species, each with its own outlook and physiology (as in the climax of the *Mass Effect* series).

Some games (the most famous of which is probably *Spore,* designed by Will Wright, the same author of the above mentioned *Sim City* series) even allow the player to experience this "ascent" as a continuum from a mere unicellular organism, through the struggle for survival, the evolution of intelligence, the forming of tribes and states and ending with the creation of a galactic civilisation.

This ever-widening, almost vertiginous, amplitude of scopes echoes the paradigm of the "macroscope" as defined by ecological theorist Howard Odum (1971):

Bit by bit the machinery of the macroscope is evolving in various sciences and in the philosophical attitudes of students. [...] Whereas men used to search among the parts to find mechanistic explanations, the macroscopic view is the reverse. Men, already having a clear view of the parts in their fantastically complex detail, must somehow get away, rise above, step back, group parts, simplify concepts, interpose frosted glass, and thus somehow see the big patterns.

All games, in this theoretical framework, can be conceptualized as symbolic systems, (implicitly training players to manage the concepts of meaning, interaction and emergence); thus dedicated gamers, the "Digital Natives" of which I briefly spoke in the introduction, learn very readily to "see the big patterns" which are needed to proceed into games, and implicitly learn to counter the reductionist approach which still dominates educational institutions. This awareness can sometimes lead, even though at the cost of deep conflict within educational institutions, to a transition from the imposed linear curriculum to a freer and multi-branching "spiral curriculum" (Bruner, 1987; Squire, 2011)meant to allow learners to expand their interest both as individuals and as freely cooperating networks.

The above mentioned "ascensional movement", must therefore be understood as a spacial

metaphor for conceptual elevation: anyone who becomes aesthetically aware and involved in "big patterns" feels the ethical drive to openly discuss and modify them, not unilaterally, but as part of a second-order cybernetic loop able to include the observer itself; thus, if "environment is an invention of those who inhabit it", and very literally so in videogames, the theme of responsibility for one's creations becomes explicit (Von Foerster, 1981).

Indeed the most relevant characteristic of modern digital games is probably the eco-social one: the massive networked communication that nowadays characterises the medium; even single player games develop complex and rich communities interested in discussing, deconstructing and even modifying expanding the games' contents. The "conceptual leveling" process discussed above might explain the diffusion, within dedicated gamer communities, of the practice of "modding", defined as the modification or even total recreation of commercial games by productive parts of the general public which we could call "prosumers"(Jenkins, 2006). This practices started in the eighties and found ever more increasing audience and success, up to being recognized by software houses as a fundamental source of commercial success for their products (Jeppesen, 2004).

This "mods" can be extremely varied in their structure and meaning, starting from simple additions to the basic game experience (the most preminent example is probably the life simulation game *The Sims,* in which user-generated content is, at the present day, more than 90% of the total) to changing the perspective within well known game universes (for example by becoming a cat trying to survive an alien invasion in *Half Life*'s mod *Cat Life*), to recreating culturally relevant narratives (*Minecraft,* a game which allows the player to create constructions out of textured cubes, is often used to sculpt famous movie scenes), to mixing up different ones (as in the fighting game *M.U.G.E.N.,* which allows to recreate and pit against another characters from different games) or even making political statements (as testified by the creation and diffusion, within the famous, and quite bloody, shooter *Quake 3,* of avatars resembling George W. Bush, Dick Cheney and other political figures). All in all, maybe the most important characteristic of modding practices is their being systemic creative exercises made just for fun's (and weirdness's) own sake, in an aesthetical exercise of experimenting with possible worlds to generate and share a sense of wonder.

An important distinction must at this point be made between the mere consumption of closed games and the possibility of opening games: the first kind of game, to play to win and therefore end the game itself, is an exceedingly dominant paradigm, especially in modern western society, and this could be a good metaphorical reason for many of our society's shortcomings, like excessive competition and short term thinking; on the contrary, opening games means for the participants to play to continue playing, forcing even competitors to cooperate and continuously re-co-construct their relationships-within-their-ecologies, acquiring what we could call co-evolutive competence (Fornasa & Morini, 2012).

This manifold "metagames" are therefore prime ecologies to be explored in search of criteria for the co-costruction and facilitation of participative, non-hierarchical learning communities in which systems literacy and design literacy (ways of constructing knowledge that are emerging as fundamental and necessary in our globalized, closely connected world) are cultivated and fostered (Perron & Wolf, 2008).

While all expert gamers, as we have seen, become adept at manipulating and analyzing complex cybernetic systems, modders and game designers are necessarily involved in an evolutive and creative paradigm, and they'll be the privileged focus of a research project that I will hereby outline: to inquire into online gaming communities, with the objective of co-constructing and sharing an "Index" for "higher order design" (defined as the ability to create contexts in which "interesting things" can be created) and for the expression of cross-boundary social practices, criteria which are a central (if implicit) issue in each and every discussion of innovative educative systems and organizations.

4. A Quest For Participation

This research will begin by entering a number of gaming communities, chosen as to be inclusive of a wide variety of game genres and typologies: among the possible candidates are the above mentioned *Minecraft*, *The Sims* and *Civilisation* communities, but also sites more explicitly dedicated to game design and discussion, like *RPG.net*, *unity3d.com* and the social network *Gameful*.

Within this communities I will foster public discussion of the ways in which game designers and prosumers manipulate metaphors, whether they be of structural, mathematical nature (integral to the "rules of the game") or aesthetic (part of the "flavor" of the game) and try to cooperatively elaborate a series of guidelines, good practices and context markers for the crafting of social, technical, cultural environments in which cooperative design-and-learning processes could freely take place. The traditional "academic", in this perspective, becomes a meta-designer, co-constructor of open interactive models and animator of gaming/teaching/researching communities, which can range from the satisfaction of "simple" childhood curiosities to an in-depth examination of the most "hard" scientific modelization.

Of course this kind of research faces very specifical methodological challenges: as the contexts in which game & metagame happen are, by definition, not fully part of the "real world", making a necessity to forego from the beginning all ordinary notions of "validity" and "replicability", favoring instead aesthetical and ethical involvement (Denzin, 2004): following the particular choice of research field, embedded in participatory cultures and participatory media, the natural choice of methodology is a participatory one (Bradbury & Reason, 2007).

These methodologies begun their development in the '70s, and are commonly associated with the spread of diagramming and visualization techniques enabling rapid data sharing and discussion, naturally lending themselves to the multimedia culture of my specific field of research (Markham & Baym, 2008); on the other hand, participatory methods are usually focused on the empowerment of the disadvantaged, while apparently play, especially in its digital forms, seems to be an activity of the privileged (we must not, in fact, forget that digital divide is still a grave issue in developing countries, as a barrier to public democratic participation). Still, power structures work in subtle ways: hegemonic culture perpetuates itself, among other ways, through mediatic meta-communications, and thus social change can be instigated through the reappropriation of expressive spaces and languages which were, until now, exclusive territories of hierarchic, centralized economic forces (Suoranta & Vadèn, 2008).

The choice of this specific communities as the field of my research must be read in an ecological perspective: "community", in fact, is a term mutuated from ecological terminology, that, in media studies, refers to the spontaneous discourse which generates around a common, informal interest, a "meta" level placed in a liminal area between the "magic circle" and "reality (Turkle, 1997). The web is, then, not just the "space" where the research will take place, but will be its methodology for data co-construction, expressed (but not limited to) through a broad set of techniques:
   a) appreciative inquiry, where the "positive question" can unveil the hidden ways in which an organization achieves high functionality. (Cooperrider *et al*., 2008)
   b) public ethnography, the open discussion of a community's practices and representations. (Denzin & Lincoln. 2005)
   c) crowdsourcing, in this specific case the production of a "wiki" as a means of knowledge reflection and structuration. (Brabham, 2013)
Beside stating my theoretical background, chosen field and intended methods, in thispreliminary stage of my research, it wouldn't be intellectually honest, nor maybe productive, to make hypoteses on what could emerge from this kind of fieldwork, risking only

to put in action my (optimistic) bias.

All I can do at the present moment is state, with full honesty, my high hopes: the deep (and admittedly utopian) perspective of this line of work is not just to use games to "help" school or organizations in their "ordinary" tasks, but to be a small seed, to foster, among many others, the co-construction of informal ways of learning, in which not only ways of reading the world can be learned (Freire, 1970), but with them share the convivial, cultural and epistemological tools (Illich, 1973) to "mod it" and bring on the transition from this "information age" to a possible, freer, "imagination age".

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Digital Storytelling as a new meaningful teaching/learning strategy for mathematics and geometry

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Abstract

The goal of our research was to evaluate the effectiveness of teaching mathematics using a Digital Storytelling approach, and show how it can be an appealing communication method for students. The research focused on the students' and teachers' ideas about mathematics and the different teaching and learning methodologies comparing the efficacy of three teaching strategies: traditional lessons, lessons that incorporate the use of simple multimedia tools such as Power Point, and lessons that incorporate the use of a digital storytelling video. From our first analysis, it seems that students are very motivated to learn using digital storytelling videos. This methodology also seems to help teachers in communicating about topics that are usually taught with difficulty in a more 'formal' way. Digital Storytelling seems to be specifically effective when compared with traditional lessons and classes which make use of traditional multimedia tools. The research had a strong innovative impact on the teaching methods among schools involved in the project. For example, students seemed to appreciate this kind of teaching approach and their level of attention, motivation and comprehension of concepts grew. In addition, Digital Storytelling supported teachers in the communication of abstract content, contextualizing it into a narrative format and giving it a precise meaning.

1. Theoretical Framework

Recent research, - Schank (1990, 2007), Caine, Caine (1994), Bruner (1997), Gardner (2002), Jonassen (2000), McDrury and Alterio (2003) - seems to confirm the importance of the narrative approach in the process of teaching/learning, especially because it is able to effectively integrate emotionality and rationality (Damasio, 2006), the different dimensions of intelligence (Petrucco, De Rossi, 2009) and interpersonal communication (Stephens et al, 2010). Storytelling from a certain point of view has always been a part of teaching, although it is most often used in an inconspicuous manner: Abrahamson (1998), Schank (2007) and Egan (1989) state that what the teacher does, in reality, is nothing more than a form of storytelling, all the more effective the more it is connected to the telling of "stories" about problems and solutions related to the disciplines taught.

The decision to use digital storytelling as a specific method for teaching mathematics is due to the recognition of the difficulties that Italian students have in this field (OECD PISA Report, 2000-2009, INVALSI tests) and therefore the need to experiment with new strategies to improve the 'teaching'. With this in mind, therefore traditional mathematics education should be rethought, not only as knowledge that is transmitted through a formal set of rules, theorems and formulas that students need to learn, and memorize, without understanding the meaning and context, but also through new methods of communication (Chapman, 2008).

2. Objectives and context of the research

The pilot research on the use of Digital Storytelling for teaching mathematics is part of a larger study conducted in 2011-12 by the Department of Education of Padua and the Institute of IPRASE of Trentino, at various primary schools and secondary schools in the Province of Trento (North East Italy). The purpose of the research was to compare different teaching and communicative methodologies and to evaluate their effects on learning and the perception that they had on students. We took into account three different ways of conducting the lessons:
  1) traditional method, based on a direct oral explanation by the teacher;
  2) using the aid of multi-media material, via a PowerPoint presentation;
  3) using a video-narrative methodology

The research involved three classes of fourth grade primary school students, for a total of 55 test subjects (M = 28, F = 27). We used semi-structured questionnaires, video recordings and tests. Through a first pre-questionnaire we discovered the pupils' perceptions about mathematics, their self-assessments about their levels of learning and their perceptions regarding the various teaching methods. The students were divided into 3 groups: in this "quasi-experimental" design our control group was made up of the students that took part in the traditional lecture mode and the experimental groups included the students who took part in the lesson with the PowerPoint and the students who watched short videos in the Digital Storytelling class. Finally, students were given a post-questionnaire investigating the specific type of lesson experienced, and these were completed by the students a couple of days after the experiment, in order to receive their feedback on the effectiveness of the different teaching approaches proposed.

We evaluated the actual comparability of the groups through a statistical analysis of the t-test with independent samples (p-value>0.05), starting from their assessments of the first quarter and the gender distribution. We did not however, take into account other potentially significant variables such as: the "quality" of the teacher, prior knowledge and the presence of students with learning disabilities. The three different lesson types had the

same duration (45 minutes) and the specific mathematics topic addressed during the lesson was fractions, as they are considered particularly important and difficult for teachers to teach and for students to understand (Bonotto, 2007). The lesson that included the use of Digital Storytelling had the same content as the traditional lessons and the Powerpoint lesson, but was rendered through the presentation of a story in a context of everyday life familiar to students and in which the protagonists were their peers. Finally, each lesson in the three groups was video recorded to monitor the reactions of the students.

3. Research results

The analysis of students' perceptions measured by the pre-questionnaires showed that mathematics is a subject not appreciated by 41.82% of the students, even though more than half of the students like this discipline (25.45% very much and 25, 45% a great deal). Also, math's is not perceived as difficult in regards to completing exercises, for 60% of schoolchildren it presents minor problems and for 29.09% it does not pose any difficulty. The topics explained in class are very understandable to 44,44% of the students and are understood perfectly by 12.96% of the subjects involved. What seems to be more problematic is the student's attention span: in fact, 50.91% stated that they are able to keep a short attention span and 3.64% state that they become distracted immediately. It seems that most students are able to remember well (47.27%) or very well (9.09%) the contents addressed in school. There were no specific gender differences.

The students' perception about the learning tools that they would like to use in the classroom in order to understand mathematics are at odds with the one's used by the teachers and show a strong attraction for technologies that are used less frequently: 77.78% of students greatly appreciate the use of LIM, 68.52% really like Power-Point presentations and 59.26% of student are very satisfied with the use of audio-visual materials. Forty-two point fifty nine percent of students really like to use objects and materials. In contrast, the traditional blackboard lecture attracts only slightly 57,41% of students (or not at all, 22.22%) and lessons based only on voice / reading do not appeal at all to 27.78% of students.

An analysis of the educational approach, highlights that according to most of the students involved, the narrative method, (storytelling) is rarely or never used (41.82% never and 40% rarely), just as multi-media methods are rarely used (48.15% never and 31.48% rarely) or lessons based on games in the classroom (never 27,27%, 43,64% rarely). Examples are used more frequently (often 47,27%) and didactic materials created ad hoc (often 32,73%).

In addition, there is a strong liking for teaching methods that are the most neglected by the teachers (fig. 1); Eighty percent of students like to use stories to explain mathematical concepts (56.36% much, 23,64% very much) and also appreciate the explanations given by the PC software (much 23.64% and 43.64% very much). It's also significant to note the appeal for teaching through games in the classroom (47.27% much, 45.45% very much).
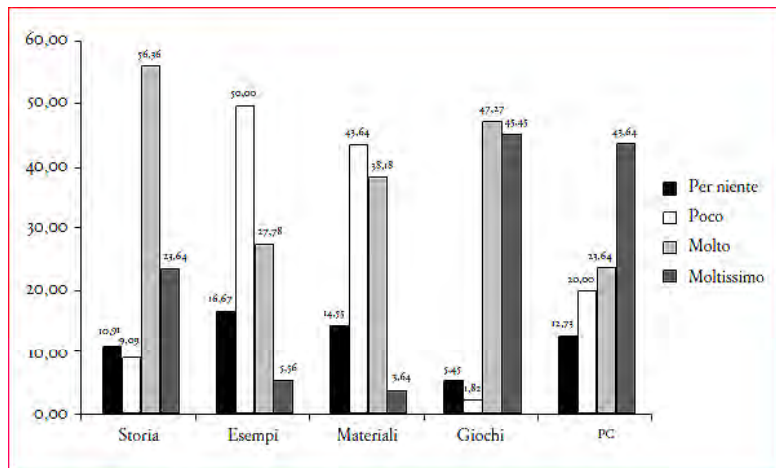
Figure 1. Student perceptions about their level of satisfaction in regard to the different methods of teaching in the classroom (%).

An analysis of the results of the post-questionnaires administered after the experiment to compare the perceptions of students, in regards to the 3 teaching methods used(traditional oral lesson, lesson with Digital Storytelling, and lesson with Power-Point) illustrates how the group that took part in the lesson with Digital Storytelling is the most enthusiastic about this approach, demonstrating a high degree of appeal (83,33%) compared to the group that only saw the PowerPoint 55,00% and those that had a traditional lesson, 17.65% (fig.2).
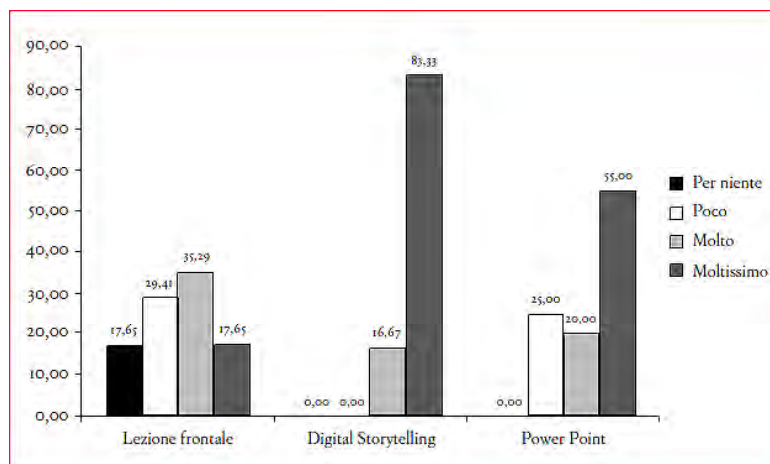
Figure 2. Perceptions of the students about the level of satisfaction with regard to the various teaching methodologies used in math class (%).

Comparing the level of understanding of the lessons, the 3 groups of students obtained very similar scores: 64.71% reported that they understood the lesson well with the traditional lecture format, 61.11% likewise using Digital Storytelling and 70% with the PowerPoint respectively; while 23,53% of the students that took part in the traditional lesson understood the lesson very well, compared to 38.89% of those who used digital storytelling and 20% of students who used the PowerPoint respectively.

With respect to the ability of the 3 teaching methods to capture and hold the student's attention, it would seem that students have more difficulty with traditional lectures: 29,41% of students in the traditional lecture group have some problems in keeping their attention on the material, and 5.88% have major problems. On the other hand, only 5.56%

of students had minor difficulties following the Digital Storytelling class and 10% had some difficulty with the PowerPoint lesson.

Much the same can be said about students' perceptions about their ability to memorize content discussed in the classroom (Fig. 3), 47.06% of the students that were in the normal lesson group stated that they only remembered very little of the information conveyed by the teacher compared to 5.56% of the group that was in the Digital Storytelling group and 20,00% of the group that saw the PowerPoint. In these two latter groups, the highest memory retention peaks are found for explained concepts (66.67% a lot and 27.78% very much for Digital Storytelling and a lot for 50% and very much for 30% of the PowerPoint group).
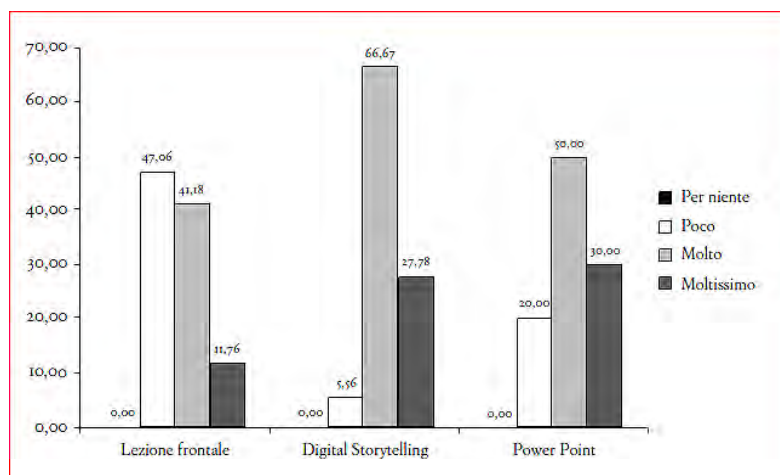
Figure 3. Perception of the students about the level of memorization favored by various methodologies of teaching mathematics in class (%).

Finally, as to the students opinion on the effectiveness of the lesson methods they had been exposed to, the group that took part in the traditional teaching methods expressed positive opinions about this methodology only in a limited way: very effective for 17.65% of students, compared to 44, 44% for Digital Storytelling and 50% for the PowerPoint, and extremely effective for only 5.88% of students, compared to the high percentages of extreme satisfaction for Digital Storytelling (44,44%) and PowerPoint (30%).

The test results obtained after the lessons on fractions were compared with each other and also compared to the marks of the first term of the school year. After carrying out an ANOVA univariate statistical analysis (p-value> 0.05) on the marks obtained by the three groups, there were no significant differences in the performance of students who took part in the traditional lecture, compared with Digital Storytelling and with the PowerPoint (analysis of variance). Even the comparison of means (t-test) showed no major differences. The same conclusion was reached by comparing the marks from the first quarter with the marks of the test carried out by the students post intervention, through a comparison of means for paired samples (t-test p-value> 0.05). We even compared scores on the post hoc test to see if there were differences between pre and post, but there were no significant differences.

Certainly analyzing the marks obtained on the post intervention tests there is a slightly higher average for the class that took part in Digital Storytelling (14.1 points out of 18) compared to the scores obtained post traditional lecture (13.4) and PowerPoint (12.8). There was also an improvement in the performance of individual students who took part in the Digital Storytelling lessons, However, we would require further studies to investigate the effects of different methods of teaching on students academic performance.

4. Conclusion

From the data obtained, we are not able to confirm an actual increase in the levels of learning and performance in math. Therefore other tests would have to be conducted and probably the duration of the experiment would have to be extended while including a larger sample size. The data does show, however, that Digital Storytelling can help the teacher and can become an effective tool to introduce in a captivating and engaging manner specific disciplinary topics, in order to significantly increase levels of attention and pleasure. From the analysis of the video recordings taken of the class that took part in the Digital Storytelling lesson, it is evident that students were fascinated by the flow of images and sound of the narrative story, remaining silent throughout the lesson and following with their full attention. In conclusion, Digital Storytelling can certainly become an instrument and method of teaching that is complementary to classical teaching methods, stimulating interest and the involvement of students.

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Section 4

Mobile, Web 2.0 and
Social   Networking   in   Education

What do the parents of students think about online social networks? Polarized visions about the uses of connected digital support

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Abstract
This article analyzes part of the data collected from the partnership of the research group *JER* (PUC Rio de Janeiro) with the *CREMIT* (UCSC Milano). An *online social network* materializes the *knots* and *connections* formed through the day-to-day *relationships* of people and organizations, part of the daily routine of the schools and influencing the relationships between parents, students and teachers. The results are part of a comprehensive ensemble of questions that involves the way parents relate to their children through the social and recreational use of *websites* in which the focus is in the relationships, and all the consequences that this brings to the educational environment. The results were obtained through a collection of 90 dissertative answers introduced in a form distributed to parents of students of an important and traditional school in Rio de Janeiro, Brazil, in August, 2011. The basic categories found were: (a) *relationship* (friendship), (b) *information* (knowledge, learning), (c) *entertainment* and *fun*, (d) *communication*, (e) *fear* and *surveillance*. Beyond the *thematic content analysis*, due to the understanding obtained of the polarized aspects that the internet evokes with the confessedly extreme positions (fear or approval), we opt for accepting the *valence of the answers* through the qualities attributed by the respondents.

1. What are social networks? Briefly placing the theme

The software dedicated to finding webs of connection between people have become the center of attention in the latest years. Besides making bonds/connections (social links) evident, they allow the continuity and broadening of our relations with people, objects and institutions, beyond the restrictions of space (proximity) and time (simultaneity).

The new *online social networks* are now part of the day-to-day life and of the relationships developed, especially, between Brazilian youngsters from the big urban centers (CGI-BR, 2012b, p. 27). For this reason, the *online social network software* today figure as one of the priority subjects among parents, educators and educational institutions, who often ask themselves how to enter these spaces so richly inhabited by the young-adult, being so easily accessible through a huge number of supporting digital artifacts. The *experiential gap* between the generations becomes an obstacle, and new codes are quickly created by the young in networks that many parents and teachers have no knowledge of.

We can say that the concept of *network*, and especially of *social network*, is not new, having its origin in the technical research of communications and information science (topologies) and in the study of sociology (communities, groups, capital and social links). The basic unit of a net is the *knot*, the meeting point in which a relation (link/bond/connection) between the elements (lines) that form it can be established. A *net* is, above all, an open structure in which new relations and *knots* can be formed, as long as the integrating parts have a common communication code so that the relation may develop, whether it be a one or a two-way one.

In the case of our object in this article, the digital networks would be in the decentralized category (Baran, 1964), although not yet reaching the ideal *all-all* model (Lévy, 1999), exactly due to the power that the *integrating-knots* possess in their profiles to create and maintain sub-networks and bridges (connections) with the other *integrating-knots*. The power to link themselves to another *knot* in the network belongs to the person who participates in it, and not to the one who created it.

The *openness* and the *porosity*, beyond the obvious element of *connections* and *relations*, are fundamental characteristics in the definition of networks (digital or otherwise). Networks with a decentralized or distributed character make the existence of horizontal and non-hierarchic relations between participants possible, although there might exist high concentration points of power and centralization as well.

The *online social networks*, whose goal is to explicit the high spectrum relationships of the people who inhabit it, form a sub-category in the broad universe of the existing social networks. Since we are talking about *networks of people* when we mention online social network software, we should keep in mind that a representative system is not the reality it represents. Thus, the connections maintained by someone are, many times, multiple, culturally placed and dynamic, coming from agreements and norms reinforced in the daily actions *inside or outside the online network*, possibly passing by unnoticed and, consequently, not leaving any traces in the online environment.

2. The fear of facing the "natives"

The *digital supports* are currently characterized by the *permanent connection* to fixed and mobile networks, with free dislocation of the connected supports by the ones that carry them, which offers the *sense of ubiquity*. In one or other modality, they offer creativity to the ones who access it, through independent authorship or through virtual communities, characterizing the dynamic of the *web 2.0* and giving shape to the concept of *collective intelligence*, whose

first glimpses came about in the 1990's (Costa, 2005, p. 244-246).

In this manner, the connected digital supports bring varied services, among which are the different *social network software* which, little by little, aggregate new features, having as the basic unit (knot) of its structure the network participants' *profiles*. The digital supports are more and more present, generating distinct opinions from parents, teachers and educational institutions about how they should be employed in day-to-day personal lives and study activities.

As expected when a new technological layer enters people's daily lives, the *social network software* brings a myriad of fears to adults. The generations from the 1990's and 2000's, depending on the local economy and culture, were already born inserted in this new context, surrounded by various types of media. In the most economically and technologically advanced regions there was talk, as early as in 2001, about the existence of a "digital native" generation.

Compared to the "digital immigrant", this generation has an integrated and dependent way of existing in its daily contact with digital supports, without any difficulties to learn or adapt to the constant changes in devices and online services. According to Prensky (2001), the most worrying thing in this case is that these young people are receiving an education in a culture that came from analogical, printing or massive-transmission electronic supports, oriented to memorization, to the use of standardized tests, and to step-by-step teaching.

Santaella (2010) alerts that the learning method brought forward by the mobile digital supports is ubiquitous, but chaotic (or less sequential) and speaks to the informational needs as soon as they appear, since the web is accessible at any time and place. Simultaneous activities (multitasking), fast and random reading of diversified topics, computer games and mobile phones permanently connected to the internet characterize the youth of this generation.

The worries with services dedicated to youth and their formal schooling context have been growing, in an attempt to shorten the distances between two spaces still so distinct and with so little integration. Due to this reality, we understand that there is the necessity of a partnership with the students, because it is the teachers' role to adopt and practice the exercise of the *digital literacy* and the *critical literacy* in schools, on a two-way path and recognizing the generational limitations belonging to each of the poles of the *youth-adult pair*.

On the other hand, it is up to the parents to orient their children to realize that the "virtual" world (meaning something intangible and immaterial) is also intertwined with the "real" social world and is, thus, something progressively more present and with concrete consequences in their "presencial" lives. It is not because young people are "native" of digital environments that their attitudes will be restricted to and will have consequences exclusively in this new space. To Sherry Turkle (Casalegno, 1999, p. 118-120), the frontiers are growing progressively more transpassable.

If the internet seems like a "land without law", generating *fear* in those who do not know at least a bit of it, the two institutions, school and family, cannot neglect the necessity to educate the new generations in the daily use of the web, even if the perception about the habits and ways of acting and understanding the world of this "digital native" generation is still diffuse.

3. Describing the research and its stages

To understand the *student-parent pair* in the context of contemporary society, surrounded by the use of digital supports, and also according to the interest of the research group *Jovens em Rede / Youngsters in Web* (JER), we applied, in August, 2011, during a bi-monthly meeting of parents and teachers in a traditional school in Rio de Janeiro, a research about *online social networks*. The attending parents filled a form containing two questions, as exposed below.

We ask that you answer the two questions below:

1. What comes to your mind immediately, when you think about social networks (Orkut, Facebook, Twitter, etc.)?
2. Are you a member of any of these social networks? (   ) No. (   ) Yes. Which? _____.
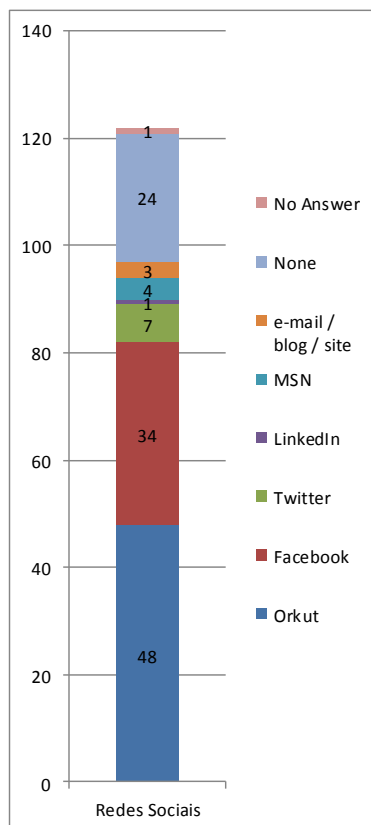
Figure 1. Participation and non- participation in social networks.

Starting with the results obtained from this form, we intend to expose, in this work, some considerations about the representations (ideas, mental conceptions) expressed by the parents about the *online social networks*. Taking into account that the second question is objective, the first analysis will consider only the participation or not of these parents in any social network on the internet. From the 90 respondents, 65 (72.2%) affirmed they *participate* in an online social network. In a general way, it can be noticed, among these parents, broad knowledge about what a social network software is, from their detailed answers, even when they have stated to not take part in any of the networks.

The analysis of the answers to the first question has allowed us to create, from what was implicit in the parents' discourses, which we noticed through what they made explicit in their lexical selection, in the *apparent clues* (Koch, 2005a; 2005b; 2006), categories in regards to the vision the parents have of the online social networks. At the same time, when crossed with the answers to the second question, it has allowed us to know whether the discourse of a given respondent was coming from someone who used the online social networks in their day-to-day life or not.

By the end of the categorization work, we noticed the existence of *positive ideas* about the use of social network software. On the other hand, we have seen that the *negative ideas* manifested themselves in other three big categories. Besides these six basic categories, we have also verified the existence of vague answers, or answers which simply named different

types of *social network software*, making it impossible for us to know the exact position of these participants; these answers were simply filed into the "NAMING" category.
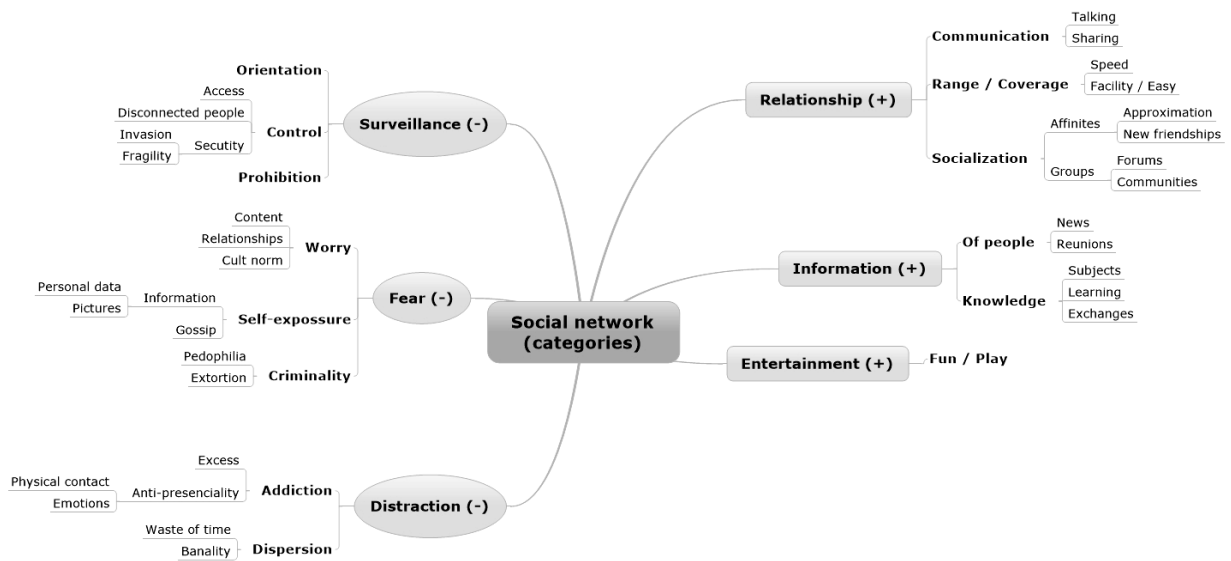
Figure 2. Categories found in the parents' discourse and hierarchically organized starting from six main axes (on the left side, the mostly negative ones; on the right side, the mostly positive ones).

Thus, based on these categories, which are not paralyzed or limited in themselves, we notice the existence of six visions which we classify according to the degree of the qualities exposed by them about the social networks and the bias of *approximation/sympathy* or *repulsion/distancing* that the parents expressed. These values were stipulated according to the vocabulary selection they used and to the interpretation of their meaning through the context of their answers.

CLASSIFICATION LAYERS APPLIED TO EACH ANSWER		
Which vision?	**Uses online social networks?**	**Categories**
Positive	Yes	*Negative1:* Surveillance (Orientation / Control / Prohibition)
Conditionally positive	No	*Negative2: Fear* (Worry / Self-exposure / Criminality)
Negative		*Negative3:* Distraction (Addiction / Dispersion)
Neutral		*Positive1:* Relationships (Communication / Range / Socialization)
Positive → Negative		*Positive2:* Information (Of people / Knowledge)
Negative → Positive → Negative		*Positive3:* Entertainment (Fun / Play)

Table 1. Classification layers applied to each answer.

It is interesting to point out that, in an already published previous work (Mamede-Neves et al., 2011), it was detected that there is still an *extreme approach* hanging over the digital supports. The same way, we know, in academic discussions, authors who are optimistic about the application of digital technologies in daily life, such as Shirky (2011; 2012) and Lévy (1999). However, other authors see themselves in the role of alerting about the social configurations which seem like a *cult of the internet*, as in Breton (2000).

The positions which analyze the emerging digital technologies without taking a stand in regards to which way society should take about their uses (tendencies) are rare. In fact, we know such aspects do exist and are part of the behavior of the ones who use these technologies, but this dichotomy tends to become paralyzing when it is radicalized in the *good media* versus *bad media* opposition, distinguishing universes which, in reality, are interwoven.

4. Analysis of the parents' answers

Let us examine the quantitative data in regards to the categories found in the answers, when crossed with the different kinds of vision. The 90 respondents were distributed in this way, according to their participation or not in the social networks and their qualification into the different visions:
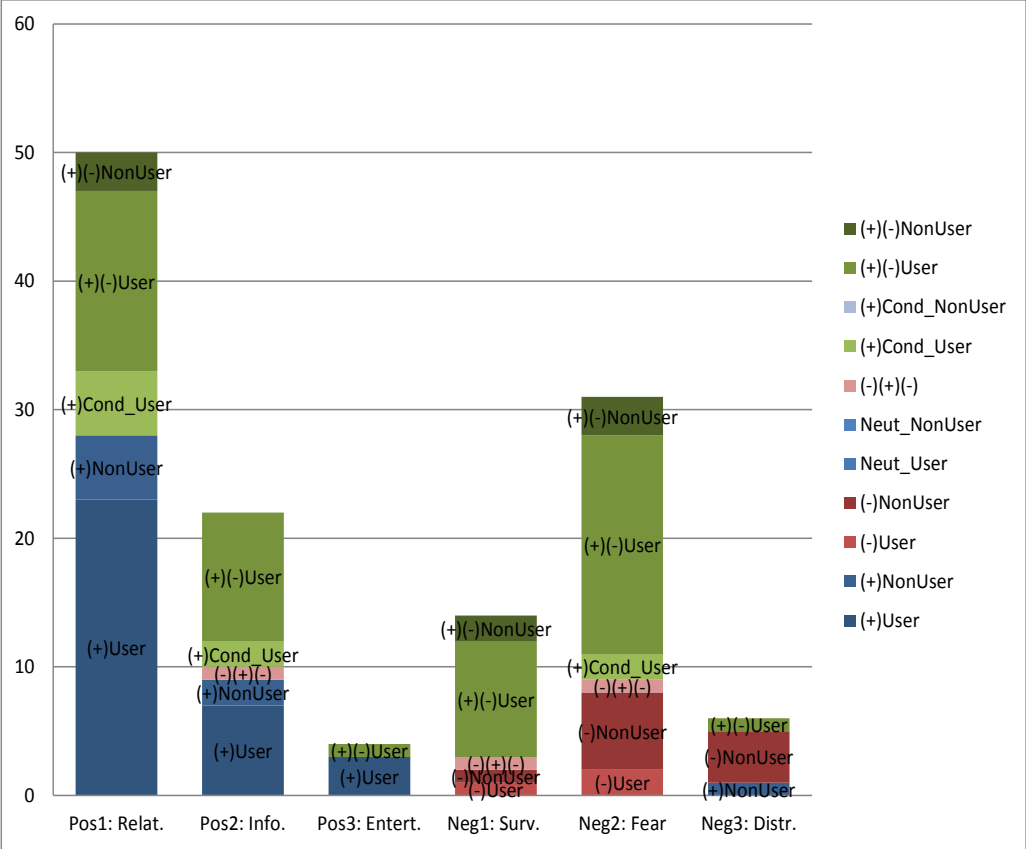
Figure 3. Classification of the parents between users and non-users of online social networks, in regards to positive, neutral, conditionally positive, positive/negative and negative/positive/negative qualifications and in the six main analytical categories.

As the graph shows, we verified that 45 (50%) of the parents who answered the questionnaire demonstrate some kind of *fear* or the *necessity to be vigilant* of their children's or their family's use of online social networks and internet. This means that *half of the parents have a negative final vision of the social networks*. Starting from the six category-axes, we will organize and discuss the answers.

4.1. Categories considered POSITIVE in regards to online social networks

Interpersonal RELATIONSHIPS as the main answer

In 50 of the answers, we found the idea that social networks promote *relationships* between people, here understood as (a) capacity to communicate through sharing (of links, of data, of personal information, of news) and to maintain a conversation, as well as (b) capacity to *socialize* through virtual communities and forums (collectivity around a common matter), approaching people and cultivating new friendships in the continuous act of creating and maintaining social bonds.

This was the most expressive category among all the others, and it evidences the strength of online social networks when it comes to promoting the idea of the formation and maintenance of interpersonal links, of allowing people to relate to each other and build bonds, whether strong or weak. According to Recuero (2009), when manifesting themselves in the internet, differently from in their presencial relationships, people need to create profiles, personal pages, websites and, through these *representations of themselves*, they create bonds and manifest their identities in the cyberspace, being able to form weak or strong social links, depending on the maintenance of these created connections.

Expressions as: "opportunity to maintain friendships" (R3), "looking for new friendships" (R12), "socialization among friends" (R39), "a place where we can relate to other individuals" (R43), are repeated in a diversity of ways throughout the answers, evidencing certain redundancy, seeing as the expression *social network* manifests explicitly that such spaces are destined to the socialization and the creation of bonds and relationships. The basic idea of social networks is clear, even if the respondents do not have a formal concept about them, since, basically, their answers show the idea of bonds and their maintenance through acts of communication and interaction.

Out of these 50 answers, 28 were given by people whose vision of social networks is exclusively positive, being that 23 participate in them and 5 do not. It is substantial to emphasize that no one with a totally negative vision of social networks pointed this aspect out. On the contrary, they said that online social networks show the dispersive and invasive character of the new online spaces.

Among the ones who have a positive/negative vision, 17 mentioned the positive side of promoting *social relations*. Three of these 17 are not members of online social networks. However, as the vision itself (positive/negative) demonstrates, this benefit is always contrasted to fear and to the necessity of surveillance and orientation. The last 5 answers out of that group of 50 come from the conceptions considered positive with a condition in regards to what is exposed. This shows that, according to these answers, online social networks promote contact and social relationships, but it is necessary to use them cautiously and discerningly.

In a general way, we noticed that the main consequence of online social networks, the creation of bonds with people – independently of institutions, familial relations and geographical localization – is seen as both a benefit and a great problem, a risk in potential, especially for the youngest. Implicitly, in their discourses, parents suppose that their children have little or less capacity to distinguish the good bonds from the bad ones, making it possible for the parents to have diverse contention attitudes, from orientation to the radical prohibition of their use.

It is important to call attention to the fact that, inside the *Relationships* category, the *communicative potential* is seen by 23 participants, which is not surprising when we know that communication is the basis to the creation of links and, consequently, of social bonds, in a mutual interaction (Primo, 2007). The biggest part of the interviewed parents participates in

online social networks, which demonstrates, on the part of these people, in spite of their small number, knowledge of the networks' role.

INFORMATION and its multiple meanings.

Another category found in the answers is *information.* Information is understood here not only as the action of becoming informed about something, but also as a development in learning and constructing knowledge, indicating a process that, beyond simple apprehension, also denotes a relationship of exchange with the other *participant-knots* of the network. We could affirm that information is the "substance" from which the relationships, the bonds, the social links are made, through the stronger or weaker maintenance of communication between the participants of social networks. The two kinds of information pointed out by the respondents were (a) in regard to *people*, getting to know about personal news or promoting reunions, and (b) in regards to *knowledge*, through the exchanges permitted by the networks and the learning of diverse subject matters from them. They are, thus, modalities of information which present meaning, which make sense inside the contexts in which the network participants are inserted. Only 22 of the 90 responding parents exposed in their speech the idea of information, which can be considered data in itself, since social networks are *not* seen by a big part of them as a place for learning and obtaining information through exchanges with other participants, at least not as the first idea that comes to their minds when they think about online social networks.

ENTERTAINMENT and fun: little presence in the answers

The idea of *entertainment* and *fun* appears in only 4 answers, being all of them participants of online social networks. This small representation appear, at the least, curious, seeing as many see social networks and the internet as a platform for games, playing, "chit-chatting" and so on. Perhaps the responding parents do not use the internet as a hobby, for fun, and see its functions through other purposes, in special relationships, communication and information exchange. It is interesting that the idea of *waste of time*, which many times ratifies the idea of fun and highlights the notion of lack of seriousness, also appears very little. In only three answers, being all of them from non-participants in social networks who have a negative vision of them, when they associate addiction and the lack of presence in the "real world".

4.2. Categories considered NEGATIVE in regards to online social networks

FEAR and/or the necessity to keep SURVEILLANCE

The mention to *fear* and/or to the *necessity to be vigilant* is highlighted in the answers of the responding parents. The two categories, if united, are present in almost half of the answers: 31 talk about *fear* and 14, about *surveillance* (45 in total), being that 5 of them mention the two categories at the same time. The adversative and conditional clauses detected in the filled forms led us to realizing that, even when there was a positive vision of the online social networks, the respondents demonstrated having *fear* of the "unknown" *online world* and feeling, in part, the necessity to *watch* the ways of utilization and the relationships developed by their children in this environment. This necessity to confront visions evidences a bigger level of carefulness with a new, recently appeared environment, which deserves attention and orientation on the part of the "digital immigrants" who are *scared* for their children's safety in the internet. Although fear is a basic emotion, as affirms Solomon (1995,

apud Santos, 2003, p. 49), this does not mean that it is a universal human phenomenon, with a purely organic, neurological base. Truly, the significance attributed to fear varies from culture to culture, and from time to time, as it is a social and historically placed construction. Nowadays, our culture is surrounded by the idea that one should not trust anything or anyone (Koury, 2011), that is, a state of permanent distrust in the face of the other, coming from an environment in which the general conditions are highly unstable.

Thus, the contemporary fear has a direct relation to the distrust about the other, with the potential threat generated by the connections we form, being that, in online social networks, the level of distrust is even higher, since the potential of forming connections with people outside the close friendship circle is augmented by the millions of profiles. According to Koury (2011), the culture of fear currently installed in modern society makes the families of teenagers and young people in general have a certain level of distrust even when it comes to their children's closest friends.

Such fears, however are not new. According to Briggs & Burke (2004), in the Sixteenth Century, an Italian writer complained about the quantity of books that were produced. To him, they were so many that it was not even possible to read their titles (2004, p. 29). The fear in regards to new technology exploded everywhere, just like we see today with critics and unsatisfied people growing and strengthening the culture of fear. This piece of criticism demonstrates solely the fear of some to lose the status and the place of thinkers and formers of opinion, because these "common people", suddenly, become real participants of their culture.

Although the corporative fear (of journalists, editors, musicians, etc.) does exist, we cannot keep from mentioning the real fear of each user. According to the *TIC Children Research* (CGI-BR, 2012a, p. 31), carried in 2010, 25% of the children aged 5 to 9 who use the internet affirm having already experienced fear or danger in the web: " It is observed that, as they grow in age, children notice higher exposition to situations of danger: at 5 years old, this proportion is 9%; at 9 years old, 33%." Starting from this information, we can rethink some things about the parents' positions in regards to the fear and the necessity of surveillance they feel. As we have seen, from the 90 respondents, 24 are not participants of social networks, 65 are and 1 has not answered that question. Among the 24 non-participant ones, 13 demonstrated fear or a vigilant attitude; from the 65 participant ones, 28 demonstrated fear and/or vigilance. The one who does not inform whether he is a participant or not also affirms fearing the use of online social networks. However, all this fear and preoccupation are not translated into an actual daily presence of the parents in the use their children make on the internet, as the *TIC Children Research* (CGI-BR, 2012a) showed that children between the ages of 5 and 9 years old use, in big part (39%), the internet alone, and 21% of the parents said they do not control or restrict their children's use or access to the internet.

5. Finishing, but not ending

The *digital supports* and the *parent-children relationships* are not unmovable topics of which we can analyze each and every point, fact and consequence, and reach a definitive result. These are phenomena that appear quickly, but change just as quickly, being protagonized by young people. This protagonism was exactly what set the present research in motion, for it is necessary to verify the perceptions of these young people's parents, classified as *digital immigrants* (Prensky, 2001) for not having familiarity with the language of the *web*, since these perceptions help us trace the profile of a generation of parents who find themselves perplexed when facing the freedom of action and network association their children have in the cyberspace.

Truthfully, this generation was used to relationships whose identities were produced based

on a local culture derived from personal connections, using the bodies and the physical, geographical space; but this reality has changed, together with the concept of community itself (Costa, 2005). That is the reason for our agreement with Turkle (Casalegno, 1999) in that it is no longer possible to distinguish the real from the virtual. The local culture reaches out to the global culture and the spaces become intertwined and feed off each other mutually, in the measure in which the interactions through the digital supports become ubiquitous (Santaella, 2010). The new language derived from the new ways of creating social networks advances and changes itself without allowing for slow and suave adaptations. They are open networks which expand themselves according to the new profiles and connections that are created, the *emergent* kind of network (Recuero, 2009, p. 94-97), being that this freedom, evidenced in the categories *relationships* and *communication*, was accompanied by the apprehension in the face of such expansion, generating categories as *fear*, *worry*, *control* and *surveillance*. It is very important, for instance, to accompany the relations of *fear*, *surveillance*, *worry*, *prohibition*, *orientation* and *control*, as lived by parents and their children, for these values tend to change according to the new experiences and paths that society and the local cultures take. It should be remembered that most of the negative visions about online social networks, in this research, came from those who do not use them on their daily lives. Perhaps, as the time passes and the "digital immigrants" become more familiarized with the online social networks, the fear can be overcome in favor of conceptions that are better adapted to the experiences and realities negotiated in these still new spaces. It is good to keep in mind that a quarter of the respondents had never used online social networks, although they still felt qualified to answer the questions and state their thoughts about them. The general conceptions, spread by the mass media devices which present at times the positive sides, at times the negative ones in opposition, tend to be adopted by those who are not immersed and familiarized with the new online environments.

In the face of so many transformations, we can notice that young people, in this globalized and media-oriented society in which we live, need to exercise their critical thinking so as to not be fooled by "hungrier world-readers", which is a fair reason for the preoccupation and worry their parents feel when they enter networks which can potentially lead to the contact with any given person on the planet. The culture of fear becomes amplified due to the freedom in the creation of bonds with unknown people, a reasonable justification for the reactions expressed by the parents, but one which does not need to be definitive.

The current society is being built with an intense network of communications, intermediated by the digital supports permanently connected. This means that the reading and the choices made through reading – written and visual texts – are more and more common. And this permeates all the means we now have within our reach to communicate with each other, socialize ourselves, and learn. In short, school-age children have the demand of learning how to be critical citizens and, through this ability, being able to actively take part in public life. However, for all of this to occur, a conjoined work of school and family, and of teachers, parents and students, is urgent. Both institutions must take part in the stages of development of the digital society, so as to not only present deprecating criticism based on common-sense.

It is necessary to overcome the dichotomic *extremes vision*, exchanging it for one which comprehends the daily experiences with the digital supports and allows for the inclusion of those who still consider themselves immigrants and less capable of accompanying the speed of the informational and social fluxes in the online social networks. Experiencing life in these new spaces should bring naturalization and, with that, a larger approximation of the generations, moving towards overcoming the *experiential gap* currently existing in the *student-parent* (or *native-immigrant*) pair, if that is possible in the face of the new stages that are still to come.

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A digital learning environment www.coloredellastoria.unifg.it: didactic methodologies, interactions and guidelines for the participatory design of digital tools

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Abstract
An interdisciplinary analysis of the social context reveals the signs of digital revolution, meant as redefinition of the Western culture paradigm. This change involves educative context and, particularly, didactic methodologies, learning strategies, educative communication and didactic tools. www.coloredellastoria.unifg.it is a digital learning environment for history teaching in middle schools, realized for the MediaEvo project by ERID Lab, a research laboratory of University of Foggia. The quoted environment was tested in four middle school classes using a constructivist didactic methodology, Problem based Learning. The selected methodology promotes team working, learning goals personalization, development of problem solving skills and enables an integration of new technologies in the didactic practices. What are the interactions generated in a digital learning environment between students and teachers and among students? What are the students' guidelines to design a digital learning environment? The present research points out the reflections about interactions and competences of students in the didactic context described above through the use of questionnaires among students and data analysis obtained by the observation of the didactic experience.

Keywords
digital learning environment, problem based learning, digital book, participatory design, constructivist didactic methodologies

1. Digital revolution and didactic strategies

Rethinking process of traditional textbooks is more and more present in the reflections on didactics and school innovation at international level.

Digital or mixed textbooks are mandatory since the school year 2011-2012, according to the Italian Law (30 October 2008, n. 169; 6 August 2008, n. 133); pedagogical and technological features of new textbooks are defined by the Ministerial Decree n. 41/2009.

Schoolbooks should be «scientifically accurate», «up-to-date», they should promote «autonomous activities for students» and include a glossary and in-depth resources. Their technology should be compatible with the commoner softwares and hardwares, they should allow dynamic lectures and network usage to upload integrative services and news (Vincelli, 2011).

The introduction of digital textbooks is changing publishing industry. The 2012 report on the situation of Italian publishing industry by the AIE, "Associazione Italiana Editori" (Italian Association of Publishers) states that the supply of e-books increased to 31,416 volumes until May, compared to 1,619 in December 2009. E-books reading and purchasing doubled. It is interesting to consider the quantitative framework of registered changes, even if the term "e-book" is not unequivocal and does not refer to textbooks only.

Textbooks production involves a considerable number of actors: publishers, authors, computer technicians, final users (teachers and students), therefore its implementation in everyday teaching practices is slow when compared to normative choices and educational needs of young generations, that are the result of an international change.

This transformation depends on a «phenomenon of the second digital revolution taking place in the education world: the change in socio-economic and communication contexts (Ferri 1998, 2004) which characterized the transition of advanced capitalist societies from the post-industrial (Bell 1973) to the informational model.» (Ferri, 2011, p.102)

Since 90s, the scholars from the New London Group (1996) have promoted a new Pedagogy, a Pedagogy for Multiliteracies that considers learning a practice strongly related to social and informal experiences (Kalantzis & Cope, 2012). In the educational field, the changes in social and cultural communication, caused by the introduction of digital tools, are converted to the choice of new forms of educative communication and storytelling, innovative didactic strategies, different learning styles.

Based on these premises, teaching tools are not simply transformed to cultural artifacts (as described by Vygotsky), but frequently to learning environments (see Cattaneo, 2010).

Textbooks remain the favourite instrument for didactic communication (Anichini, 2006; Vincelli, 2011) but, in the international complex scenario described, we need to study and update its features to make them effective for the learning strategies of new generations.

We can define two main digital production methods of publishing content (Limone, 2011; 2012a; 2012b):

- INDUSTRIAL MODEL. The digital books for school activities are produced by authors and publishers; they can be easy pdf or ePub files, but also excellent transmedia environments that match the textbook with students and teachers communities and interactive online activities. In this more complex form, they can include contents that cannot be part of a printed textbook: videos, 3D objects, virtual games, online questionnaires, continuously updated contents thanks to the "perpetual beta" status of software and digital tools. (Moriello, 2009, p. 10).

- SELF PUBLISHING. Web 2.0 tools are significantly employed in several didactic contexts: blog, wiki, interactive maps (Petrucco, 2010); the interactive multimedia board literally came into classrooms; several educational projects were developed using teamwork and digital technologies (Parmigiani, 2009). According to the vision of the *user generated content*

(Cattaneo & Rivoltella, 2010), every user can become a knowledge and learning objects producer by simple *authoring tools* and *open source* softwares.

The grassroots participation moves forward self publishing events which are becoming popular for ethical and economic reasons and are involving the world of education to produce printed textbook (see "Book in progress" project), but also multimedial products, videogames, class blog that partially replace the institutional textbooks edited by publishing houses. Teachers increase their energy and tasks with respect to the possibility to customize content, language and textual forms while costs for families are significantly lowered.

The finalized digital textbook is a digital learning environment, www.coloredellastoria.unifg.it, and represents a third proposal of digital publishing production which exceeds the distinction between self publishing and industrial model and involves the academy as a link between school and industrial publishing (Limone, 2012a; 2012b).

2. www.coloredellastoria.unifg.it: a prototype of digital learning environment

The ERID (*Educational Research & Interaction Design*) Laboratory research team at the University of Foggia designed and realized a digital learning environment: www.coloredellastoria.unifg.it during the MediaEvo project financed by European and Apulia Region Funds for the three-year period 2007-2010 in order to realize a multichannel platform for the edutainment of Medieval History.

Starting from the content of school educational program, the project developed a complex and integrated system prototype that puts together the formal and informal contexts through the use of multimedia contents and transmedia architecture of teaching actions (Figure 1): transmedia refers to the ability of distributing and rebuilding the educational narrative across different media (Jenkins, 2007; Rodriguez Illera, 2012).
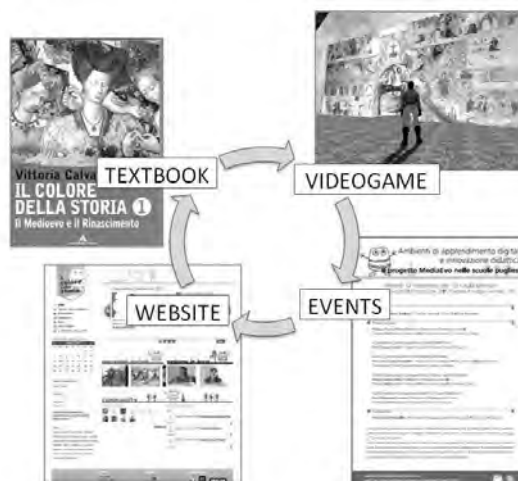
Figure 1. Transmedia architecture of MediaEvo project. (Limone, 2012a, p.133, our translation)

The website (Figure 2), planned through the MUST participatory design model (Kensing, Simonsen & Bødker, 1996; Kensing, Sigurdardottir & Stop, 2007) is largely described in previous works by Pierpaolo Limone (2011; 2012a; 2012b) and Rosaria Pace (2012; Pace & Demarco, 2012). www.coloredellastoria.unifg.it[1] collects texts, links, images, videos,

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[1] The learning environment in the quoted papers and volumes (Limone, 2011; 2012a; 2012b; Pace, 2012; Pace & Demarco, 2012) at www.coloredellastoria.it; is currently available at www.coloredellastoria.unifg.it.

interactive exercises; it provides access to area univocally dedicated to students or teachers; besides several discipline contents, it uses the Web 2.0 communication tools, such as a blog and a community where students can share ideas and abilities, update contents, informally communicate after school time.

Figure 2. Homepage of www.coloredellastoria.unifg.it.

Table 1 describes the website contents.

CATEGORY	CONTENTS AND TARGETS
I secoli della rinascita (The Age of Rebirth)	Digital and hypertext version of printed textbook enriched with multimedial synthesis, conceptual maps, navigable charts and exercises for each chapter.
Studentario (Students area)	Video-lectures, in-depth links, tridimensional reconstructions of medieval daily objects, forms, games and free time resources.
Community	*Social networking* area that allows communication among users, multimedia resources publishing and sharing.
Blog	Area for collaborative writing.
Area docenti (Teachers area)	In-depth resources, didactic materials, methodology sheets, classroom or home assessment exercises.
Medioevo nelle arti (Medieval Arts)	Reviews, didactic sheets and multimedia insights about Medieval literature, cinema and theater.

Table1. Categories, contents and targets of the web portal www.coloredellastoria.unifg.it. (Limone, 2012a, p. 128, our translation)

3. The experimentation: digital environments and constructivist didactic methodologies

A learning environment (such as the described one) changes the didactic setting, methodologies, communication among teachers and students, and further students learning behaviors.

What are the didactic methodology features which allow the simultaneous utilization of a digital learning environment as www.coloredellastoria.unifg.it? What are the interactions generated in an online students environment? And between teachers and students? What are the students main strength points to design a digital learning environment effective for knowledge acquisition and for the participation to the current digital democracy?

100 students from 4 middle school first-year classes were enrolled in an experimentation: two classes completed the activities, while these are in progress for the other two.

This experimental activity aims to verify the ideal features of a didactic method when used simultaneously with a digital environment for Medieval History teaching; the analysis wants to identify mechanisms and interactions generated by this didactic situation and to provide guidelines for a participatory design of online learning environments.

As stated by Rosaria Pace (2012), "Colore della storia" is a constructivist digital environment featured by «community dialogue spaces; a link to the out-of-school time learning; a focus on didactic "deeds"; a negotiation of goals and processes; a reflection on methods and reasons, not only the contents for assessment; a reading of different languages; writing and producing; possible interpretations, not solutions; autonomous cooperation and a students' opportunity to explore and not just "to attend" the lesson; making mistakes, and not merely getting a bad vote» (ivi, p. 176, our translation).

Constructivist didactic methodologies are defined by this statement and a literature survey as the most comparable with digital books, since they in the same ways try to develop collaborative processes in team activities that lead to co-construction of knowledge, enhance motivation and *self-directed* study.

In particular, the choice has fallen on Problem based Learning (PBL), a *student centered* methodology introduced since 60s in the Canadian Faculties of Medicine by a physician, dr. Howard Barrows.

This methodology, currently widespread all over the world and in all levels of education (Lotti, 2005), is based on problem solving through its process analysis in a peer group. Compared to realistic problems, students perform problem solving activities, they set autonomously learning goals, search for materials and are motivated to learn by teamwork (Barrows & Tamblyn, 1980; Schmidt, 1983).

Timing of activities in PBL allows the introduction of digital tools in didactic actions; for this reason, PBL was selected for this experimentation between the constructivist didactic methodologies analyzed. In fact, in PBL there are two sessions: in the first one, the tutor asks students to analyze a problem, to explain unclear terms, to define the problem, to identify, outline and prioritize hypotheses to solve it. In a perspective of *self-directed learning*, students define learning goals as «arguments, data and concepts to search out of the group, through individual study, in order to explain and solve problems. Students state what they are going to look for and what bibliographic or informative sources they will use» (Lotti, 2005, our translation). In the second session, students share the collected information, describing a possible framework to solve the problem.

There is a period of individual study between the sessions (from 3-4 days to 2 weeks), when it is possible to introduce the online activities related to the digital learning environment.

Other than didactic reflections, the experimentation adds considerations about participatory design of digital environment for learning through the use of didactic methodology identified as a design methodology. As stated in *Projects Method* by Kilpatrick, if the cognitive process begins with action, teaching should deal with the design; between the different projects, the author identifies the ones that start from a problem and drive students to invention and discovery, as in the PBL (Bottero, 2007, p.140).

Table 2 schematizes experimentation activities: the first three meetings are focused on history contents; the fourth one is centered on design of digital book as learning environment.

MEETING	HOURS	ACTIVITIES
1	2	Introduction to the activities Ex ante questionnaire Split into groups of 5-8 students Start of the first problem "La lettera di Ascanio" (Ascanio's letter) (Theme: agricultural innovations) Search on www.coloredellastoria.unifg.it
2	2	End of the first problem Start of the second problem "The economist" (Theme: urbanism and trade) Search on www.coloredellastoria.unifg.it
3	2	End of the second problem Start of the third problem "Indovina, indovinello" (Guessing game) (Theme: Maritime republics) Search on www.coloredellastoria.unifg.it
4	2	End of the third problem Start of the last problem "A lavoro per mamma" (Working for mom) (Theme: digital book) Discussion and team work End of last problem Ex post questionnaire

Table 2. Experimentation activities.

Students split into groups of 6-8 members, choose a moderator and a secretary, as required by the proposed method, and analyze problems using the scheme in Figure 3, adapted from Ann Lambros (2002).

Figure 3. Scheme for problem analysis in PBL (adapted from Lambros, 2002, p. 8)

According to 7 steps of PBL (Schmidt, 1983), the Ann Lambros scheme (2002) simplifies the phases of problem analysis for students' use. Middle school students, as stated by the researcher, have «more and more independence from adults, they appreciate the opportunity to work things out for themselves. These students are developmentally ready not just to access new information but also to determinate its relevance and to apply it.» (ivi, p.48)

4. Results

In the questionnaire administered at the beginning of the activity, half of the students involved in the first phase of the experimentation claim to have a facebook or other social network account, and mainly use it to chat with friends, to upload photos and videos, to comment posts, to play games and to challenge friends in online applications.
50 on 52 students use internet to study. In particular, as shown in Graph 1, students perform internet search (48), read experts' opinions about discipline topics (26), perform simulations or educational games (23), watch videos to clear their ideas (19).
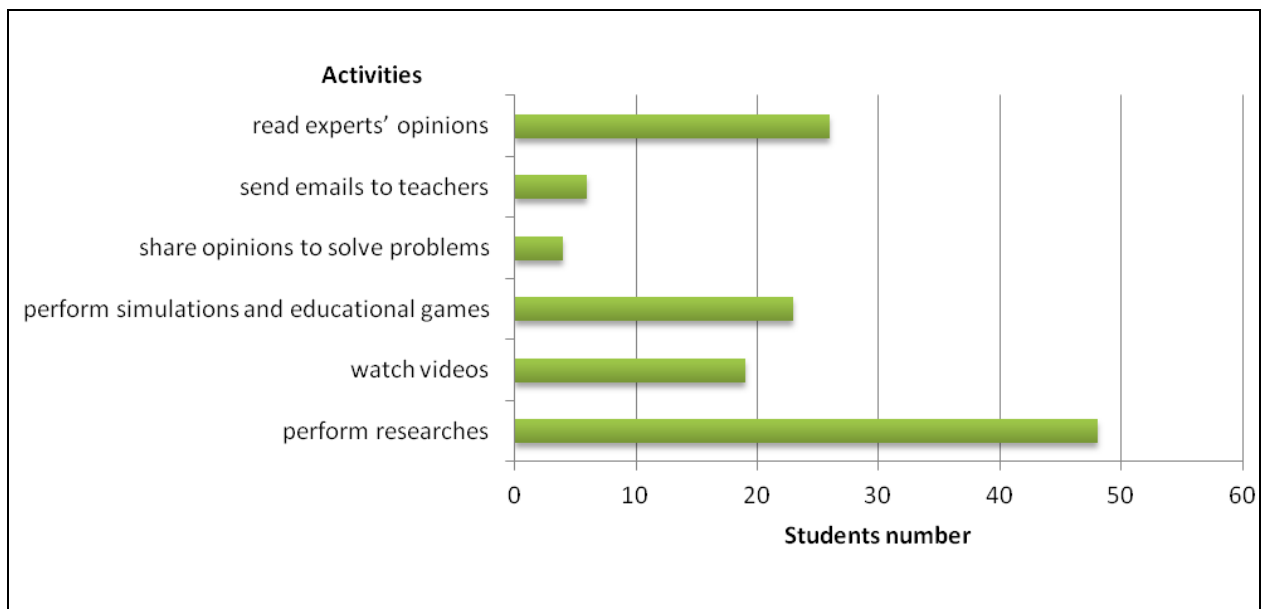
Graph 1. Online activities of students enrolled in the first phase of the experimentation

Only one of two classes uses digital communication tools for learning at school.
During the first meeting, students received group credentials to access the portal. This choice, suggested by the importance to create a group identity and by the need to speed up the registration process for first access to the portal, constituted a difficulty in the communication platform. The groups customized their profiles by inserting an image, but not all students felt so much involved to operate in the community and to write personal messages.
However, some students decided to create a personal account on the portal; 44 on 52 students connected to the portal for the researches related to problems solving at home too.
During the experience, students easily discussed about browser, tag, homepage, multimedia materials. The collaborative climate developed in the classes through the use of Problem Based Learning let students share information about the access and navigation modalities of the materials available online.
Graph 2 shows the preferred students' resources among those in the portal.
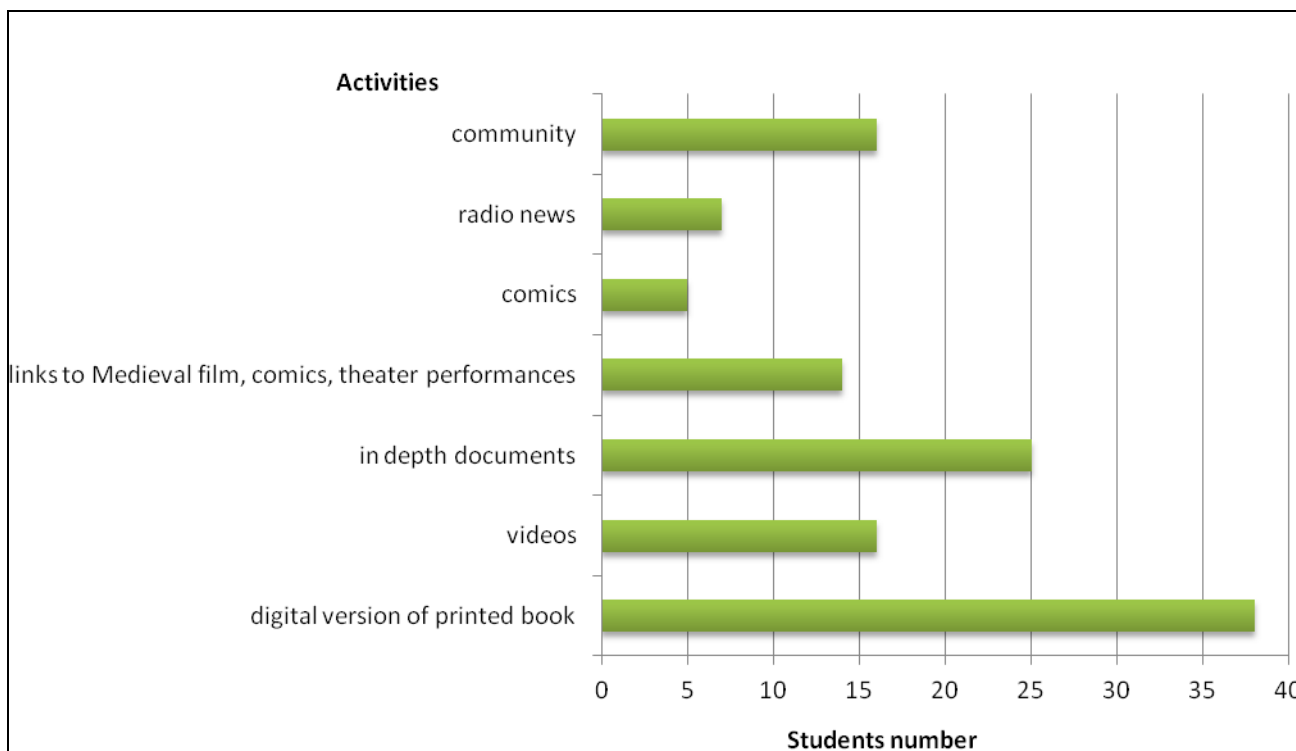
Graph 2. Students' use of digital resources available on "Colore della storia".

As shown in the graph, the most used resources are the digital version of history book, in-depth documents, community and, finally, videos and links. Students enjoyed the opportunity to work in teams, to solve problems, to identify themselves in historical characters, to learn in a fun and innovative way and, last but not least, they appreciated the possibility to use network, portal and multimedia for learning.

Students in fact took an active part at the last session of the experimentation dedicated to the design of an online space for history teaching; as observed before, during the meeting the PBL was used as a design methodology and not as a teaching methodology.

After the problem analysis through the scheme proposed in the previous paragraph, students were asked to implement an innovative digital solution to teach history at school, starting from 4 tasks:

- to introduce a list of contents into the portal (topics and types);
- to integrate a list of innovative applications in the portal;
- to design the homepage;
- to advertise a slogan for the project.

Table 3 shows some of the most interesting results obtained from data analysis of the works realized by pupils.

CONTENTS (TOPICS AND TYPES)
medieval music, documents, sport, clothing, religion, art pieces; movies; interactive images; exercises; games; information on daily life, economic activities, historical characters; poems; recipes; comics; 3D museums and statues; aphorisms on famous historical figures; jokes; nursery rhymes; extinct animals; medieval buildings still present; timelines; maps; creative activities; news and events; content to download; support page link.
INNOVATIVE APPLICATIONS
online auction; animations where historical characters tell events and lead users to the website navigation; virtual museum; virtual reality where users design their own city, create statues, perform the role of medieval characters and live historical adventures; voice command; online souvenir shops; history magazine; webcam communication with students from foreign countries.

SLOGAN (*in brackets the original version*)
Entry history village (Entra nel villaggio della storia)
Funny history, wise student (Storia divertente, bambino sapiente)
If you want to learn history, come and study with us on the website (Se la storia vuoi imparare, vieni con noi nel sito a studiare)
History according history (La storia secondo la storia)
Learn history together with us (Conosci la storia insieme a noi)
Learn new things (Scoprire cose nuove)
The history is funny (The history is funny)
If you want to learn on our website you have to search (Se vuoi imparare sul nostro sito devi cercare)
The history web: history explained for you (The history web: la storia spiegata per te).

Table 3. Results of the meeting dedicated to the design of a digital learning environment

In the graphic design of the homepage, pupils demonstrated that they know how to balance the spaces of the page, alternating images to written texts.

They proposed some of the most traditional layouts (for example by placing the main menu on the left), or innovative solutions such as a homepage with central images and videos. In most groups the homepage contains the login box, the search engine, the support page link.

In conclusion, we present a final observation on the logistical aspects of the activities. For both classes, group activities of PBL were carried out in the classroom; on the contrary, the research on the portal in the computer lab. This means the activities were always "interrupted" to allow the shift of classes from one environment to another. Equipment and internet connection proved to be adequate and accessible in one of the two schools, thus students accessed the lab with the teachers even out of the experimentation time; in the other school, access to the computer lab and secondly to the network was difficult: tools and materials of the portal www.coloredellastoria.unifg.it were only available through the interactive blackboard because of a very slow connection.

If technologies integration in training courses can take place only when the accessibility is guaranteed (Technology in Schools Task Force, 2002 in Messina, 2012, p. 65) we urgently need to pay attention and solve situations like the one described, which are common to many schools in our area.

5. Conclusions and perspectives

This experimentation is still in progress. The two new classes involved (44 pupils) will use the same timing of Table 2, but with a different access to the portal. Students will receive personal credentials to login instead of group credentials, in order to verify the personal participation and not the group participation to the proposed online activities.

At the end of this second phase, the reflections resulting from students' activities and their own proposals will let formulate guidelines for the design of digital learning environments, which will contain observations on didactic and design methodologies, analysis tools, ideas on the new role of students and on teachers training.

The results obtained, however, allow us to considerate the following issues:

- Students demonstrate a good management of media languages and fine abilities to organize self directed study;
- The ability to work in teams solving real problems motivates students and makes them active protagonists of educational activities;
- Students have a clear idea on the graphic rules for the construction of an online portal, they know digital tools and are able to imagine future scenarios for the evolution of

online learning, even though they never attended training courses on the design issues of web environments;

- Teaching actions require time, space and logistics that do not fully fit in the present organization of daily school-life;
- For the new generations, access to digital tools such as computers, tablets, smartphones, is set free from the technical experience hidden behind the most complex available communication objects;
- It is shown the need for teachers training in order to use innovative teaching methods and digital learning environments because, despite the promotion of digital books use by Italian law, their implementation in daily school-life involves training of trainers.

Idit Harel (2002 in Ferri & Marinelli, 2009) states it is necessary to add three X to the three R for students training (*Reading*, *wRiting*, *aRitmetic*):

- «*eXploration*: the ability of a selective search for information in order to be principal actors in personal learning;
- *eXpression*: the ability to use digital media to represent and communicate knowledge and ideas;
- *Exchange*: the ability to ask questions, share ideas and work in team» (ivi, p. 23, our translation).

The first step to translate into reality the warning of Idit Harel are represented by the integration of digital technologies in classrooms, experimentations carried out with the digital language, group activities, protagonism of the youngers.

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Social Media As a Tool That Transforms the Collegiate Classroom

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Abstract
As education evolves to find efficient and culturally relevant ways to enlighten students, the power and versatility of social media has given teachers a myriad of opportunities to transform their collegiate classrooms. Two approaches presented here used social media to create meaningful instructional experiences that increased student engagement and relevancy of curriculum content, and developed competencies that prepare students for the real world.

Seniors in a capstone mass communication course were charged with not only demonstrating production skills they had acquired as a result of their matriculation, but were also required to post their moving image projects to a social media platform in order to generate interactivity ~ a contemporary approach to marketing moving image content. Secondly, in order to broaden their understanding of global media American Black college students were required to find and interview a Facebook friend from a selected foreign country as part of a Global Media class presentation in an introductory media and society course. Facebook interviews were conducted that focused on gaining an understanding how citizens of foreign countries experienced specific mass media. This process resulted in students gaining a deeper awareness of the similarities and differences of mass media experiences around the world.

Keywords
Social Media, Student Engagement, Global Education

1. Social Media in a Senior Capstone Course: Reaching Target Audiences and Changing the Way We Think and Learn

Social media has changed the world. It has allowed people to connect globally. It has also allowed people to reconnect with old friends from college, high school, and even elementary school. It has changed the way we shop, schedule appointments, plan vacations, and work. In Social media is also changing the face of education and the very way in which we learn and think about what it means to know something. Colleges and universities are using social media in a myriad of ways from alumni relations to teaching in the classroom. Social media is also being integrated into college admissions processes and campus life.

It is no surprise that colleges and universities have embraced and are integrating social media platforms such as Facebook, Twitter, Instagram and Pinterest in order to grasp and keep the attention of millennials.

A study by the UMass Dartmouth showed that, of the colleges surveyed, a whopping 100 percent are using social media. The results of the study are featured in a new infographic developed by bestcollegesonline.com. When it comes to reaching a target audience, social media trumps traditional media: one in three schools find social media more efficient. Currently, Facebook reigns supreme as the social network most successful at meeting these goals for colleges and universities.

A 2010 Pearson social media survey found that four out of five college professors use social media in some capacity in their courses. However, the smallest reported use is in having students create and share their own work through social sites. Research indicates that the use of social media in the classroom can aid in college retention and helping struggling students better understand course material (Junco, Social Media in Higher Education).

Social media can be used in the classroom as basic course communication, connecting beyond campus, as a research mechanism, creating and sharing media and research, virtual lecture and virtual course assignments. It is most commonly used in the classroom as a channel for communication between instructor and student.

1. Some of the best tools to facilitate classroom communication are:
    a. Nurph – This tool allows Twitter users to come together for a more formal conversation in a hosted chat room.
    b. Present Online Now! – This site provides a free webinar interface to present any type of content.
    c. BackNoise – This back channel tool allows conversations to take place while students are engaged with other tasks.
    d. Livestream – This tool allows the creation of live video streams of classroom events with embedded chat features.
    e. Edmodo – This site lets users establish a class microblogging network for students where they can post, share and critique each other's ideas.

One of the challenges of having online tech tools for your students is finding a way to manage them. Symbaloo is a functional way of bookmarking your tech tools for the classroom. It allows you to set up a "web mix" of tiles, each tile linking to your favorite websites. You can colorize the tiles, add short titles, and even a small image. You can then post the link on your class's web page for all to access.

2. Other online curation tools to consider are:
    a. Pinterest - more visual, can use boards to divide tools.
    b. Pearltrees - similar to a mind-map, allows users to group like tools together.
    c. Scoop.it - create your own magazine-like collection of sites.
    d. Diigo - great for both collecting and sharing online resources.

Many of these tech tools and social media are utilized in the "Media Seminar" capstone course for mass communication majors. The course challenges students to not only apply media production skills learned throughout their undergraduate career, but it also challenges students to utilize new technology and social media platforms to market, distribute and garner interactivity with their final media projects.

2. Media Around the World: Gaining a Global Perspective

Students in an introductory course for mass communication majors - "Survey of Media and Society" used social media for one of the course activities. The Global Media presentation activity was designed to make global media real for the students.

As part of this class presentation, American Black college students were required to find and interview a Facebook friend from a selected foreign country. Countries selected by the students included Australia, India, Italy, and Japan among others. Students were told that the focus of the interview with the Facebook friend was for them to gain an understanding of how selected mass media were experienced by citizens in a foreign country thus deepening students' awareness of the similarities and differences of mass media experiences around the world.

Students were instructed to select a country and media genre (magazines, radio, cinema, newspapers, etc), find and interview a Facebook friend from their selected country. The countries & media selected by students in the class included:
- Japan/Television
- India/Cinema
- Trinidad-Tobago/Radio
- Australia/Newspapers
- Canada/Television

Students were told to prepare questions for the Facebook interview to help them and their classmates gain an understanding of how mass media were experienced by citizens living in countries around the world.

Here are two examples of the Facebook interviews:
1. Excerpt from Interview by Student Joi X - Trinidad-Tobago:

Joi X: Hey Shanice. Here (are) the question(s) I needed to interview you on? The questions are pertaining to radio in Trinidad.
   a. Is the radio poplar in Trinidad?
   b. Do you listen to the radio?
   c. Why or Why?
   d. What is your favorite radio station and why?
   e. In your opinion how does radio in Trinidad differ from the radio in the US?
   f. Are commercials a problem for listeners?
   g. Is censorship a problem on the radio in Trinidad?
   h. Does the radio (stations) play mostly Trinidadian music or a mixture of Trinidadian and US music?

2. Excerpts from Interview by Student Anita X – Japan:

Anita X: Greetings. I am a college sophomore in the United States and I was wondering if I can cask you a few questions about Japan's media system.

Interviewee: Hello I will be glad to help (Smiley Face)

Anita X: Would you say that television news in Japan discern(s) what is
true and what is false?

Interviewee: Yes our news is much like the America they are quite honest.

Anita X: What do you watch on television?

Interviewee: Anime (Smiley Face) it's really big here & I love to draw

Anita X: How is it censored in different ways? Or is it censored?

Interviewee: Um no Japan is freedom or expression and doesn't really censor things.

After a shaky start where students had to overcome their fear/shyness of connecting with a stranger via social media, they became engaged in the activity and most were able to make effective presentations to their classmates. The personal experience of connecting with foreign citizens tended to heighten the relevancy of the course curriculum, taking what seemed like an arbitrary assignment and infusing it with meaning for the students and their classmates. The take away: They are like me. In the guided class discussions that followed the presentations, students were able to articulate the similarities and differences they gleamed between media in the American and around the world.

3. Conclusion

These two approaches demonstrate the ability of social media to create meaningful instructional experiences that develop competencies and deepen understanding for undergraduate media students.

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Inclusive society, web accessibility and social networks: the case of Facebook

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Abstract

Social networks represent the tip of the iceberg of a long maturation of the Web in participation's way (Riva 2010). Among them Facebook with over nine hundred million of users, is the most known. If the diffusion and pervasiveness of the Web has made that it is the border of sociability and communication, it is also true that with regard to such opportunities are still technological barriers. Accessibility is the characteristic of computer systems allow the use of the information contained in the site, accessible to impaired people and people who use old or specific hardware and software. Starting from these theoretical references and in the awareness that the issue of web accessibility should be inscribed in a wider cultural framework, representing the instances of persons, social achievements and the rights of all, here is the contribution sets, presents the results of a validation process of the accessibility of the instrument through Facebook.

Keywords
accessibility, media communication, inclusion, equity, disability

1. Introduction: web accessibility and social equity

The potential of technology to connect people and provide access to education, commerce, employment and entertainment has never been greater or more rapidly changing. Communication technologies and new media promise to "revolutionize our lives" by breaking down barriers and expanding access for disabled people. Yet, it is also true that technology can create unexpected and undervalued forms of social exclusion for disabled people.

"The global reach of connectivity can make the most isolated outpost into a centre of learning and economic activity" (Turkle, 2011, p. 152). Technologies of connection have changed how we date and how we travel. The worlds "apps" summons the pleasure of tasks accomplished on mobile devices. (Cfr. Ivi). Beyond all of this, connectivity offers new possibilities for experimenting with identity the sense of a free space. From the very beginning networked technologies designed to share practical information were taken up as technologies of relationship

If the diffusion and pervasiveness of the Web has made that it is the border of sociability and communication, so that it stands as S. Turkle says "as the architect of our intimacies" (ibid. p. 1) is also true that with regard to the technological opportunities remain above all cultural barriers.

The United Nations Convention on the Rights of Persons with Disabilities and the ICF [WHO, 2001], highlighting the importance of making accessible environments and telecommunication technology. and make available the information contained in sites accessible to people with disabilities, those who surf the web using assistive technology and those with obsolete hardware and software tools. Accessibility is making the content of a Website available to everyone, including those with physical disabilities and cognitive learning problems (Kirkpatrick, 2003) explains accessible Web design as designing the Websites in such a manner that the information they contain is accessible regardless of a person's abilities or disabilities, software, or equipment.

The W3C (World Wide Web Consortium) defines accessibility as "The ability to ensure that the services (such as Web access) are available for people to the greatest extent possible, regardless of whether or not the impairments, of whatever nature" (Www.w3.org). Therefore, to make a site accessible means making the content available to the widest range of people and through a plurality of devices. This involves taking a series of measures and devices to which people with disabilities or people who are forced to use specific software and hardware (assistive technology) are not penalized in the use of the network.

Since the nineties, even in Italy, through legislation that has decided in the Stanca Act of 2004, we tried to put at the service of the disabled the sophisticated technological development to compensate for its special needs and improve their quality of life (Pinnelli 2007). Law followed two Ministerial Decrees published in the Official Gazette No. 183 of 08 August 2005.

The first MD provisions of article 11 of Law: Technical requirements and different levels of accessibility to computers, gives the Minister the power to determine, in accordance with the criteria and principles set out in Regulation guidelines on the technical requirements and different levels of accessibility, the technical methodologies to verify the accessibility of websites, programs assisted evaluation can be used for this purpose. The second MD relates to the technical rules for the accessibility of multimedia and electronic documents.

The Act is not limited only to indicate the requirements to be met, but provides information on the methodology of evaluation of the accessibility of Web sites, dividing it into technical and subjective, where for technical accessibility refers to the compatibility of websites with respect to different browsers and operating systems, and an evaluation related to writing code

in a page, while accessibility refers to the subjective quality of a website from the point of view of the person who is accessing and browsing..

Web accessibility guidelines play a crucial role in accessible Web design. The Web Content Accessibility Guidelines (WCAG), version 1.0 in 1999 and version 2.0 in 2008 developed by the Web Accessibility Initiative (WAI) of the World Wide Web Consortium (W3C) at http://www.W3.org are widely accepted publications, which give Web developers a concrete set of rules to construct barrier-free Websites. But alongside technological standards and legislative action is necessary to build the social sense of accessibility.

Discuss accessibility means continually cross the axis of the technology with the new horizons of cultural, social, identity, participatory and open training the network and unfortunately not yet completely free of barriers for people with disabilities. "States should recognize the outstanding importance of accessibility in the process of creating equal opportunities in all fields of social life.

For people with disabilities, States should enable both programs to make the physical environment accessible and take the necessary measures to provide access to information and communication world ...

Member States should ensure that new computerized systems to provide the public with information and services are made accessible from the beginning or adapted so as to be accessible to disabled people" (United Nation, 1993).

2. Inclusive processes as a system action

Regulatory intervention and the European recommendations set out the boundaries within which to guide technological development and encourage the promotion of inclusive processes that take account of technological contexts of development, but it is true that cultural changes, especially those that require integration and attention to the differences and free membership to the needs of others, does not operate only by decree, nor exert only an obligation but ask periods of acceptance, are part of a wider cultural climate, take root in the logic of benefit to all and grow thanks to the attention constant of who takes care of them.

It needs of a system's action that involved besides the governments, the technical experts also the research groups and the stakeholders. They should develop standards for accessibility for ICTs and means for incorporating the input of persons with disabilities into the creation of ICTs. A considerable part of this research endeavour could be determining current levels of accessibility in existing ICTs in relation to different types of disabilities. A clearer picture of the actual levels of accessibility to ICTs by type of disability would help establish what accessibility issues are not being addressed in current design, development and implementation processes.

Several researchers have pointed out that accessible Web design benefits not only people with disabilities but for all. Kirkpatrick (cit.) says that if you create a Website that is accessible to people with disabilities, then you increase the usability of that site for everyone, each accessible design choice generally benefits several disability groups at once and the Web community as a whole. Sloan (2004), reminds that improving accessibility for specific groups will often have usability benefits for all users. Jasek (2007), points out that when you improve usability for visually impaired persons or users with disabilities, you also make your site more accessible in a wide variety of environments, like dark rooms and bumpy airplane rides. In addition to the multiple advantages that could be generated by accessible Web design, it is considered a social and legal responsibility to protect the rights of the disabled people in all areas of concern. Therefore, the knowledge of Web accessibility guidelines is essential for today's professionals, like distance educationists who are exclusively using the Web

(Wijayaratne, 2010) World Wide Web Consortium (2008) has pointed out that accessible Web design benefits a wide range of people with disabilities, including blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech difficulties, photosensitivity and combinations of these. Pernice and Nielsen (2001), remind that senior citizens have trouble using Websites that disregard their special needs because the majority of them are slightly disabled. In addition to physical impairments, they may also have issues caused by slightly reduced cognitive capacity.

3. Theoretical framework: online identity, social networks and people with disabilities

Our communication processes are characterized by a growing influence of new media that have changed and continue to change the way we communicate, play a central role in this process is played by social network: electronic platforms that allow users to manage their social circle and social identity (Massarotto, 2011).

The social network sites (SNS) represent the culmination of a long maturation of the participatory Web (Riva 2010) and in this sense have become emblematic of the last stage of development of the networked world, the so-called Age of Web 2.0.

The SNS are electronic platforms that allow "users to manage both their social network (organization, extension, exploration and comparison) and social identity (description and definition) (Ibidem, p. 17).In this sense, social networks site can be regarded as' a group of people connected to each other by various social ties, ranging from casual friendship, work relationships, family ties. Among them. Facebook with over nine hundred million users, is the best known. The strengths of it are certainly the immediacy and ease of use, combined with attractive graphics, initially designed for a young audience, but in reality Facebook collects registration of users of all ages.

Already there is a wealth of research looking at SNSs considering how friendship and identity work are expressed through these sites. Boyd and Ellison (2008), describe SNSs as spaces where individuals can create a public or semi-public profile within a bounded system; display a list of users to whom they are connected, and can reciprocally view and traverse other users' lists of connections. It is like showing personal hyperlinked address book so friends can connect to them too (Greenhow & Burton, 2011).

Scientific research has shown long as identity is a relational concept (Castellis, 2002) and how identities are multiple (gender identity, professional, friends, family, etc..) and fluid (change in life). Social networks can be a gym in which to experiment with roles and identities, a tool for self narrative, in this sense of empowerment of self and identity, "With these tools the user can either develop its identity, is to understand that of the other. At the same time it can seek support or offer it. "Social networks are able to accompany user in their own personal development"(Riva, 2008, p. 34).

At the turn of the millennium, the worldwide population of persons with disabilities was estimated to include as many as 550 million people (Jaeger, 2006).

With the growing importance of ICTs, equal access to electronic information and services has become an important new area of concern for social justice for those have been marginalized in other areas of society (First, & Hart, 2002). Generally, an ICT is accessible to persons with disabilities if it can be used in an equal or equitable manner by all users without relying on a specific sense or ability (Lazar, Beere, Greenridge, & Nagappa, 2003). Assistive technology devices, such as voice synthesizers, magnifiers, alternate keyboards, voice-activated software and keyboard pointers, can help people with a range of disabilities to use ICTs. Failure to account for a range of accessibility concerns can cut a huge number of

potential users off from the content or services of ICTs. For example, as the literature says approximately 400,000 people use screen readers as assistive technology to access online content; when a website is incompatible with screen readers, those 400,000 potential users are unable to access that website (Jaeger, cit.p. 2).

Accessibility for people with disabilities has been frequently neglected in the development of ICTs, they have usually been developed without regard to accessibility, leaving many individuals with disabilities excluded from using the technologies unless appropriate assistive technologies are developed so frequently, advances in ICTs create new ''barriers for people with disabilities'' (Department of Justice, 2001).

As a result, the level of computer usage and Internet access by persons with disabilities is much lower than that of the rest of the population. Considering the disabled population as a whole, regardless of socioeconomic status, the research finds that older people and disabled are less likely to be users, as are those with lower levels of education and income persons (Dobransky & Hargittai 2006, p. 15). The study has demonstrated that there is, indeed, a disability divide that needs to be taken into consideration when discussing digital inequality. Whether it is in terms of access to or use of computers and the Internet, many people with disabilities lag behind those without impairments. The technical accessibility barriers are likely the cause of these groups' lagging behind those without disabilities. Not only is adaptive technology difficult to learn and expensive, but it lags in development behind the technology to which it is supposed to enable access (ibidem, p. 18-19).

4. The empirical survey

Building on the theoretical references and expressed primarily in the knowledge that the issue of web accessibility should be inscribed in a wider cultural framework, representing the instances of persons, social achievements and the rights of all, here is the contribution sets, presents the results of a process of validating the accessibility of Facebook through the validator tool: ACHECKER.

The term "validator" comes from the English "validation" and refers to the 'set of analysis techniques useful in determining whether a document or website are available and to what extent [Diodati, 2007].

In evaluating the level of accessibility distinguishes between the accessibility of theoretical and real accessibility. The first refers to the technical conformity of the site according to the standard used in this case is represented by the standard technical requirements of accessibility and the articulation of the activities planned for the technical assessment established on the basis as indicated in the Recommendation of the World Wide Web Consortium and in particular those in the Web Accessibility Initiative (WAI) by Ministerial Decree of 8 July 2005. The second is tested by users accessibility beneficiaries, ie persons with disabilities who demonstrate their ability to use the content and services of a site. This second step is essential to bridge that gap between aspects exquisitely technical and implementation of the code and the usability and consistency with what is required by the end user, ie to avoid the risk of what is termed generality of the rule.

Starting from these theoretical references and expressed primarily in the knowledge that the issue of web accessibility should be inscribed in a wider cultural framework, representing the instances of persons, social achievements and the rights of all, the contribution presents the results of a process accessibility validation of Facebook through the validator tool: ACHECKER.

Figure 1: The possibility of validation permitted by ACHECKER

Centeno, Kloos, Fisteus Alvarez (2006 p. 88-89), distinguish between four levels of validation: Objectively automated, Subjectively automated, Semi-automated and manual validation, and say that semi-automated and manual rules are very expensive to evaluate and should be kept to a minimum. Automatable rules, even though subjectiveness imply very cheap evaluations.

Web Content Accessibility Guidelines (WCAG) from W3C consist of a set of 65 checkpoints or specifications that Web pages should accomplish in order to be accessible to people with disabilities or using alternative browsers. Many of these 65 checkpoints can only be checked by a human operator, thus implying a very high cost for full evaluation. However, some checkpoints can be automatically evaluated, thus spotting accessibility barriers in a very effective manner. However, the automation degree of these Web evaluations is not the same for each of tools. Since WCAG are not written in a formalized manner, these evaluators may have different "interpretations" of what these rules mean. As a result, different evaluation results might be obtained for a single page depending on which evaluation tool is being used. (ibidem p. 89).

The survey was launched in March 2011, with the objective to assess the level of accessibility of websites school, taking as reference the guidelines of the W3C and the directions of Stanca Act

Through ACHECKER you can select the type of access to be checked (WCAG2.0, Stanca Act, Level A, AA and AAA. WCAG 2.0 provide three levels of compliance for the achievement of Accessibility and measure these three levels with one, two or three A). A checker is very effective on the quality of the results and you can choose through it, how to organize the results: guidelines or source code.

The display for the guidelines is very useful as it makes it possible to target support only to the conditions that you want to meet based on the level of validation tried.
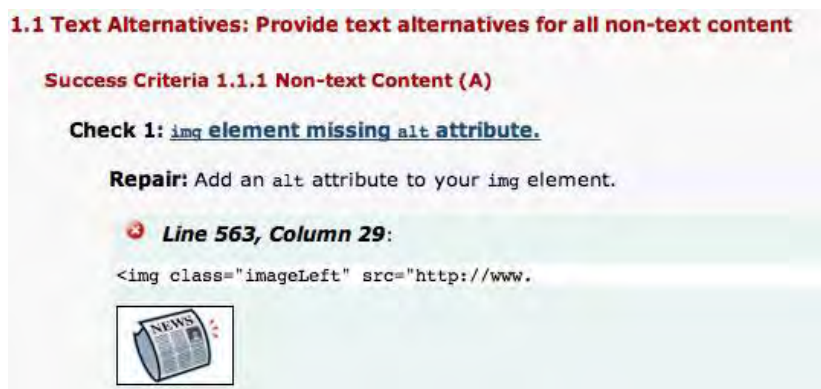
Figure 2: Example to shows the solution proposed by the validator to respond to the success criterion 1.1.1 level A

Although not written explicitly to specify requirements of Annex A of the Stanca Act refers to success criteria of WCAG 2.0 level AA accessibility own, suggesting that what is the minimum level required to declare an accessible website. The validation of accessibility to the requirements of the Stanca Act and of WCAG 2.0, was applied on the homepage of registration to the site and Facebook pages, and as rebuttal on that of some municipalities in the province of Lecce: Lecce, Grottaglie Palmariggi.

3. Results and Discussion

The analysis showed errors so as regards the requirements of the Stanca Act as for WCAG 2.0. Any of them are similar, but reading the many reports of the validator has been possible to intercept a number of suggestions for improving the website Facebook to a low level of accessibility to at least double A. The following table shows the problems encountered in relation to the two normative criteria of accessibility and describes the indications deducible from the analysis of the validator to make Facebook more accessible to everyone.

Stanca Act	WCAG 2.	Contents	What should be done
Priority 1		Create pages and objects within them using technologies defined by formal grammars published in the latest versions available when supported by user programs.	Provide a text equivalent for every non-text element. Ensure that all information conveyed with color is also available without color, for example from context or markup.
Priority 15	Priority 1.1	Recorded content presented in audio-only, video only or as an animation without audio must be provided an alternative text to a content on the page.	Organize documents so they may be read without style sheets. Ensure that equivalents for dynamic content are updated when the dynamic content changes.
	Priority 1.4	Distinguishable: Make it easier for users to see and hear content including separating foreground from background.	Replace with bold italics. Change the e. M. = Unit of character.
Priority 16	Priority 2.1:	Keyboard Accessible: Make all functionality available from a keyboard	Insert the positioning on the keyboard for all elements Color Specific Visual Contrast Use style sheets

Table 1. Problems and actions to improve the accessibility of Facebook

The analysis of the municipal homepage of the sites showed that the errors are always the same. This is obviously due to a format the system setup FB inaccessible at the outset that affect every newly registered user. Non-compliance of subsidiaries Facebook pages is not caused by how it is made and what the individual page that it is plugged in, but are non-compliance related to the structure of Facebook.

Given the spread of this social network, that result is obviously alarming in view of the fact that it would take a few formal constraints to predict the structure of FB to allow the full and complete enjoyment of everything for everyone. The results allows some conclusions: on the one hand circumscribe the area of technical measures to make Facebook more accessible to everyone, including those who live in situations of marginalization, distress and isolation, on the other attest once again that the inclusive culture not is promoted only by a legislative act, but must act through the means by which culture is built, primarily the tools of communication and especially digital communication media.

4. Conclusion

The rapid expansion of information and communication technologies has given the increasingly intense use of the Internet in our daily lives requires constantly being used and consumed information services. Banking, databases, opac, maps, government services and news portals replace the traditional classroom and printed forms of interaction. Computers in its variety of formats as smartphones, notebooks, tablets, among others, had become instruments of access to a universe of resources available on the Internet, following the trend of convergence of multimedia in a single context: the digital environment. The use of this wider environment is no longer a mere possibility, but it is needed for many aspects of our lives. By the time that this means become a need for the people, the Internet has to have the necessary conditions for various user profiles, including disabled people. For this requires an awareness of all staff involved in content development Web, government and educational institutions for Digital Inclusion. It means giving everyone an equal footing in the use of a variety of digital resources - especially computers and the Internet.

Accessibility is important for a number of socially significant reasons. The capacities to transmit, access and receive information are key components of citizenship. An inaccessible ICT, such as a telecommunications system, turns a physical disability into a social disability (Goggin, G., & Newell, C. 2000)."A hearing impairment coupled with an inaccessible phone system results in virtual exclusion from telephony and all of the roles telephone communication can play in everyday life" (Paul T. Jaeger, cit. p. 114). Limited access to ICTs also increases the possibility that people with disabilities will have a harder time performing well in a professional context . Ultimately, a lack of access to socially important ICTs, such as telephony or the Internet, can lead to social alienation (Jacko, J. A., & Hanson, V. L. 2002; Jaeger, P. T., & Thompson, K. M. 2004).

It is, therefore, to retrieve a value horizon and the human dimension in the technological life, so that the younger generations grow up immersed in the online connectivity and build their world on parameters of efficiency and effectiveness of communication losing sight of the meaning of relationship, intersubjectivity, will says Jerome Bruner, of communicative acts. "The networked culture is very young. Attendants at its birth, we threw ourselves into its adventure. This is human. But these days, our problem with the net are becoming too distracting to ignore. At the extreme, we are so enmeshed in our connection that we neglect each other. We don't need to reject or disparage technology. We need to put it in its place. the generation that has grown up with the net is in a good position to do this, but these young people need help (Turkle cit, p. 294). The author refers to the responsibility of adults, those

who are the generation of passage, "we did not sufficiently teach the importance of empathy and attention to what is real… we expect more from technology and less from each other" (ivi).

Accessibility of ICT should not only be recognized in the telecommunications policy should be implemented in an effective way, this means that it has become a cultural style in the knowledge that it is an advantage for all. This recognition will allows the web can transformed from an accessible environment to an inclusive environment and, therefore, contribute to transition from an integrated society for an inclusive society

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Section 5

Insegnare e apprendere con le tecnologie

Tecnologie digitali per l'apprendimento: iniziativa per la valorizzazione e l'ampliamento della didattica digitale

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Abstract
Progetto biennale per la digitalizzazione della didattica d'istituto al fine di produrre stimoli e spinte motivazionali per una piena e reale funzionalità degli ambienti attrezzati con le nuove tecnologie (LIM, computer e laboratori con rete didattica) indispensabili per una rigenerazione della didattica graduale e partecipata da parte di docenti e studenti. Strumento di concretizzazione è la realizzazione di una struttura di apprendimento che si svincoli dalle mura scolastiche e accompagni gli studenti a realizzare un continuum didattico-educativo tra scuola e ambiente domestico, non più di tipo costrittivo o prescrittivo, ma che derivi dalla volontà degli stessi studenti di ricercare nuovi stimoli o nuove soluzioni per uno studio sempre più consapevole ed articolato. Al termine del processo si auspica che l'Istituto si scopra arricchito di preziosi materiali di studio digitali, riutilizzabili e spendibili in ogni contesto didattico ad essi attinente, ma anche di competenze disciplinari, digitali e trasversali, sia dei docenti che degli studenti.

Keywords
Social Learning Network, Digital Repository, Technological Innovation

1. Introduzione

Nell'attuale orizzonte formativo tutte le agenzie educative sono chiamate ad un compito che forse non ha precedenti: cambiare rapidamente l'assetto didattico per adeguare le mete formative agli obiettivi imposti dalla *Knowledge Society*. Infatti l'odierna società della conoscenza si sviluppa con l'obiettivo trasversale delle competenze sociali respirando e vivendo in un tessuto tecnologico che trae nuova linfa dalle conoscenze digitali. (Baldassarre M. , Averna A.L., 2010).

Insegnare nell'era digitale necessita di nuovi strumenti, nuovi metodi, nuovi obiettivi per nuove competenze da gestire in tempi sempre più ristretti, ritmi sempre più serrati, con cambiamenti sempre più improvvisi ed imprevedibili. Perciò sono indispensabili anche tempi e spazi nuovi. Ciò non vuol dire semplicemente uscire dalle aule per entrare nei laboratori durante le ore di scuola, implica piuttosto l'abbandono delle mura scolastiche come unico riferimento di ambito formativo. Questo perché le nuove frontiere della formazione muovono sempre più verso un approccio pluriparadigmatico della conoscenza che si traduce in un apprendimento tout court che parte dalle aule scolastiche, con il cosiddetto apprendimento formale, fino ad arrivare nei mondi e nelle aule virtuali degli *LMS* e dei *Social Network*, "luogo" permanente e privilegiato di continui apprendimenti informali attraverso situazioni di scambio e condivisione di esperienze, idee e contatti sociali. (Baldassarre M. , Averna A.L., 2011).

Gli ambienti scolastici, quindi, si stanno rinnovando gradualmente, dotandosi delle più recenti apparecchiature e dotazioni capaci di ampliare i contesti di apprendimento. Al fine di produrre quegli stimoli e spinte motivazionali per una piena e reale funzionalità degli ambienti attrezzati con le nuove tecnologie (LIM, computer e laboratori con rete didattica) nel liceo "Tito Livio" di Martina Franca (Taranto) si è pensato alla strutturazione di un percorso che, attuato per tappe, conduca i docenti al conseguimento di competenze didattico/digitali avanzate.

2. Il contesto e le motivazioni: ampliamento e rinnovamento delle dotazioni tecnologiche

Il percorso che si descrive prevede un'estensione del contesto tecnologico dell'istituto interessato al processo sia dal punto di vista strutturale che metodologico-didattico.

L'ampliamento delle dotazioni tecnologiche, iniziato nei due anni che precedono l'ideazione del progetto, continuerà nel prossimo biennio con un'integrazione massiccia di apparecchiature hardware/software e fornirà il supporto indispensabile per il rinnovamento delle strutture pedagogico-didattiche della scuola.

Il Liceo Statale "Tito Livio", polo liceale della cittadina di Martina Franca in provincia di Taranto, è un'istituzione scolastica di lunga tradizione. Nato ufficialmente nel 1923 come Ginnasio Comunale Superiore, è uno dei più antichi licei del territorio tarantino e dell'intera Puglia. Da allora, attraverso una serie di vicende, accorpamenti e riforme del sistema scolastico, l'offerta formativa dell'originario Liceo Classico si è allargata fino ad arrivare all'odierno assetto che comprende quattro indirizzi liceali: Classico, Scientifico, Linguistico e, ultimo arrivato, il Liceo delle Scienze Umane. Le classi dei quattro indirizzi sono suddivise tra due sedi, entrambe dotate di laboratori linguistici, informatici, multimediali e scientifici e biblioteche informatizzate.

Gli alunni dell'istituto sono, in genere, abituati ad uno studio teorico in tutte le discipline e quindi hanno sempre espresso la necessità di avvicinarsi allo studio delle materie scientifiche in modo più pratico. Dunque nelle discipline scientifiche e linguistiche l'aspetto laboratoriale

diventa indispensabile, ma viene spesso trascurato per mancanza di tempo o di strumenti. Con questo progetto i docenti intendono anche proporre agli alunni un metodo più pratico ed efficace con attività interessanti e utili per chiarire ed approfondire alcuni argomenti.

3. Ampliamento strutturale

Nei due anni precedenti sono stati realizzati tre laboratori:
1. Laboratorio linguistico multimediale
2. Laboratorio scientifico per la sezione del liceo scientifico
3. Laboratorio scientifico per la sezione del liceo classico/linguistico

Sono state dotate aule di LIM e Notebook.

Il quadro delle dotazioni, in relazione alla popolazione studentesca è riepilogato nel seguente grafico (vedi Fig.1):
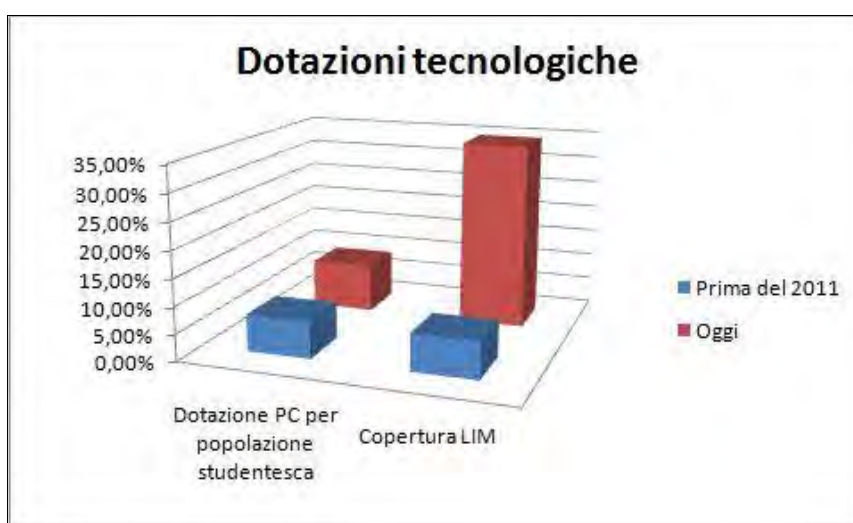
Figura 1. Dotazioni tecnologiche - Oggi

Nel prossimo biennio si prevede la realizzazione di un piano ripartito in una pluralità di iniziative finalizzate a creare ambienti di apprendimento innovativi, in cui il concetto tradizionale di classe risulti arricchito da dotazioni tecnologiche concepite in modo specifico per la didattica e in cui si possa organizzare l'uso e l'integrazione di nuovi contenuti, materiali e strumenti estesi a tutto l'Istituto. Il piano prevede il rinnovamento di tre laboratori multimediali:
1. Laboratorio multimediale - Liceo scientifico
2. Laboratorio d'informatica - Liceo scientifico
3. Laboratorio d'informatica - Liceo classico/linguistico

Questi nuovi ambienti consentiranno di fornire apparecchiature più moderne e performanti per l'intera utenza delle due sedi del Liceo, costituita da studenti significativamente motivati allo studio teorico e poco avvezzi all'applicazione pragmatica delle conoscenze e che, pertanto, necessitano di crescenti stimoli collegati ad attività di tipo tecnico-laboratoriale al fine di potenziare le loro capacità applicative. Al tempo stesso, il rinnovamento del parco macchine dei tre laboratori permetterà di distribuire i PC sostituiti in tutte le aule ancora non dotate delle nuove strumentazioni, anche in vista della sopraggiunta necessità di gestione dei registri elettronici.

Inoltre si prevede un incremento di N. 10 kit LIM (prevedono essenzialmente l'acquisto di notebook e Lavagne Interattive con videoproiettore e software incorporato) e di N. 10 postazioni mobili (costituite da notebook).

Questi strumenti, che potranno essere utilizzati da tutti i docenti e gli studenti della scuola, costituiranno un efficace strumento per l'attività didattica quotidiana, considerata anche l'adozione di libri di testo misti con contenuti, aggiornamenti e attività multimediali, plurisensoriali e interattive, disponibili on-line. Le postazioni mobili saranno destinate a docenti e studenti le cui classi sono dislocate in aule inadeguate a ospitare soluzioni tecnologiche particolarmente voluminose e articolate come le LIM.

Si prevede dunque che al termine del processo di arricchimento delle strutture il quadro delle dotazioni, in relazione alla popolazione studentesca, si presenterà come riepilogato nel seguente grafico (vedi Fig.2):
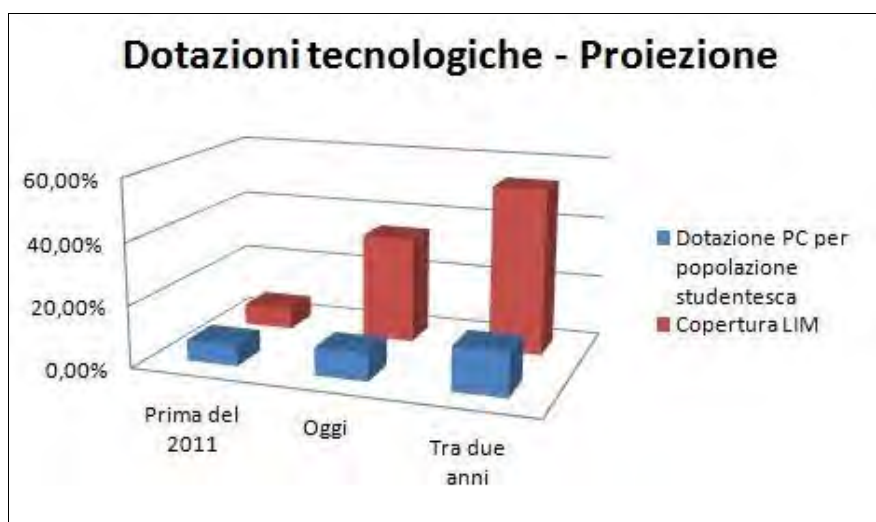
Figura 2. Dotazioni tecnologiche – Proiezione diacronica

4. Rinnovamento metodologico/didattico

L'esigenza di aggiornare le metodologie e gli strumenti didattici, resa più cogente dall'avanzare delle capacità digitali delle nuove generazioni di studenti, trova spinta e vigore da alcune recenti esperienze realizzate dagli insegnanti e studenti dell'istituto e proposte nel panorama locale e nazionale tra le *best practices* (http://gold.indire.it/gold2/) delle scuole italiane di ogni ordine e grado. I nuovi strumenti a disposizione e l'innovativa visione di alcuni insegnanti stanno innescando un processo di motivazione di una collettività verso il cambiamento, che si realizza per mezzo dell'integrazione della didattica tradizionale con l'aspetto formativo dell'attuale Social Learning, supportato dagli ambienti di apprendimento personalizzabili attraverso il Web 2.0, piegato verso una strutturazione consapevole delle competenze degli allievi.

Inoltre sono state svolte alcune attività di formazione dei docenti promosse dal Dirigente scolastico al fine di stimolare il rinnovamento della progettazione curriculare anche nell'ottica della didattica per competenze (Averna A.L., Carducci G., 2013).

Infatti in questi ultimi due anni di attività didattica il corpo docente del Liceo è stato coinvolto in un percorso di formazione specifica sulla didattica per competenze per i nuovi licei: inizialmente è stato richiesto ai docenti di individuare alcune tra le scelte didattiche seleziona-

te in fase di programmazione che abbiano contribuito all'acquisizione di almeno due delle 16 competenze previste dagli assi culturali, come dimostrato dalla relativa prova di verifica.

Dopo l'individuazione di questi materiali interessanti, ogni docente è stato chiamato a predisporre una presentazione in formato digitale, possibilmente multimediale, che ne riassumesse le caratteristiche in base ad un format prestabilito.

Nei successivi incontri, suddivisi in piccoli gruppi, sono stati condivisi i materiali, allo scopo di verificare negli apprendimenti degli studenti l'effettiva incidenza delle attività progettate con riferimento alle specifiche competenze perseguite.

I materiali così selezionati sono stati raccolti in uno spazio dedicato sul sito della scuola, prima in un'area riservata per consentirne l'analisi e l'ottimizzazione e, in seguito, sono stati aperti a tutta la comunità scolastica per una proficua condivisione (http://www.titoliviomartinafranca.it/index.php?option=com_content&view=article&id=573 &Itemid=270&lang=it).

4.1. Descrizione del progetto

Il progetto nasce dalla esigenza primaria di utilizzare tutti gli strumenti disponibili per mettere i giovani in condizioni di apprendere con i più moderni mezzi messi a disposizione dalla tecnologia e di accedere a tools educativi più versatili e accattivanti, quali ebook, software didattici e interattivi, LMS utili per l'e-learning, nonché gli strumenti del web 2.0, come blog e wiki.

Inoltre, questo ambizioso obiettivo si inserisce in un ambito di più ampio respiro che coinvolge anche tutto il corpo docente in un notevole sforzo di rinnovamento delle strategie didattiche, senza il quale il processo di innovazione proposto non potrebbe evolversi né compiersi.

Pertanto la richiesta di proposta del progetto è stata unanimemente approvata sia dal Collegio dei docenti che da ogni Consiglio di Classe con apposite delibere opportunamente verbalizzate e condivise con le componenti di studenti e genitori.

Il progetto è articolato in quattro fasi da realizzarsi nell'arco di un biennio.

Ciascuna fase coincide con l'implementazione di un modello riconducibile ad un livello sempre più avanzato di didattica multimediale.

FASE 1 – Modello "Repository base":
  a) Sensibilizzazione dei Consigli di classe sulla possibilità di realizzare CDD (Contenuti Didattici Digitali) disciplinari che dovranno essere di ottimo livello. Sotto la guida dell'insegnante ogni classe è chiamata a realizzare uno o più CDD sulla base di spunti e stimoli attuativi utili per i percorsi disciplinari.
  b) Progettazione e costruzione dei lavori multimediali la cui tecnologia deve essere liberamente scelta dai realizzatori (studenti e docenti) in base agli obiettivi che il CDD intende perseguire, ma anche in rapporto alla confidenza dei realizzatori nei confronti dei diversi supporti digitali.

FASE 2 – Modello "Repository strutturato":
  a) Predisposizione di uno spazio sul portale d'Istituto che raccolga tutti i lavori proposti e ne valorizzi la realizzazione attraverso un'adeguata pubblicazione e condivisione.
  b) Analisi dei lavori pubblicati finalizzata ad individuare possibili collegamenti tra le conoscenze proposte. Il collegamento può essere realizzato attraverso mappe concettuali o ipertesti che consentano un ampliamento dei singoli percorsi di conoscenza.

FASE 3 – Modello "Collaborazione di base":

a) Sensibilizzazione dei Consigli di classe sulla possibilità di realizzare un ambiente didattico on-line per il deposito, la condivisione, l'interazione e l'integrazione dei CDD prodotti durante l'a.s. precedente (ad esempio blog, wiki, siti web, gruppi Google o Facebook, ecc). L'idea di partenza può essere di un insegnante o di uno o più studenti di una classe, ma può essere implementato attraverso il lavoro collaborativo anche di più gruppi classe.

b) Progettazione e costruzione degli ambienti on-line (interfaccia grafica, attivazione di strumenti e funzioni didatticamente rilevanti ed utili dal punto di vista didattico). La migliore implementazione proposta viene scelta come "*Social Learning Network*" d'Istituto.

FASE 4 – Modello "Collaborazione strutturata":

a) La pratica didattica, a questo livello, si fonda sulla partecipazione e sulla costruzione attiva delle conoscenze, sulla ricerca e sulla scoperta, avviando percorsi che siano soprattutto interdisciplinari.

b) Per tale modello si prevede lo svolgimento di attività di tipo collaborativo, in aula, in laboratori scientifici e informatici, ma soprattutto a distanza attraverso sessioni online e mediante l'uso di tools di comunicazione sincrona e asincrona, messi a disposizione dell'Ambiente Didattico concretamente implementato.

c) In questa fase il lavoro di tutti i gruppi-classe del liceo interessati confluisce nell'unico Ambiente premiato che diventa volano per attività di e-learning dell'istituto, ma anche capace, nel futuro, di aprirsi ad altre realtà scolastiche e di ampliare le possibilità di condivisione di contenuti e costruzione collaborativa di conoscenze con altre scuole del territorio.

Al termine del processo l'Istituto si scopre arricchito di materiali di studio digitali, riutilizzabili e spendibili in ogni contesto didattico ad essi attinente, ma anche di competenze disciplinari, digitali e trasversali, sia dei docenti che degli studenti.

Si ritiene che un ulteriore elemento qualificante del percorso presentato sia la possibilità di trarre vantaggi didattico-educativi concreti anche solo da un'eventuale parziale esecuzione del processo.

4.2. Futuri sviluppi

Sono previste alcune attività di verifica che consentiranno di valutare l'intero percorso di rinnovamento nel tempo.

Una sezione delle attività sarà orientata verso una valutazione degli apprendimenti, un'altra verso un monitoraggio dei processi.

Si prevede la costituzione di due gruppi di valutazione che saranno coordinati dal referente della valutazione interna e dei percorsi PON.

Il gruppo di valutazione degli apprendimenti valuterà i lavori prodotti durante le prime due fasi del percorso al duplice fine di considerare l'effettiva ricaduta delle attività intraprese sulle conoscenze/competenze degli studenti e di individuare i migliori CDD prodotti che costituiranno la base per le strutturazioni future. Nella seconda parte del progetto lo stesso gruppo effettuerà un'ulteriore verifica per testare gli eventuali miglioramenti intervenuti sugli studenti e per identificare il Learning Social Network vincitore.

Al gruppo di valutazione dei processi sarà invece assegnato il compito di strutturare, somministrare (ad allievi e docenti) ed analizzare i questionari per il rilevamento delle esigenze, delle aspettative e del gradimento delle attività che nel corso delle varie fasi saranno sviluppate allo scopo di ottimizzare i processi in atto e, all'occorrenza, riorientare le proposte progettuali alla luce delle evidenze segnalate.

Lo stato attuale dei lavori consta di un certo numero di lavori prodotti da vari gruppi classe, raccolti in una sezione dedicata del portale d'Istituto. Al termine dell'anno scolastico si procederà alla valutazione dei CDD che diventeranno il punto di partenza per i vari percorsi multidisciplinari interattivi.

Nel prossimo anno scolastico si prevede la prosecuzione del progetto con la sensibilizzazione dei consigli di classe affinché, dopo le esperienze di produzione digitale condotte quest'anno, attivino ulteriori iniziative di motivazione verso gli studenti e i docenti più versatili e capaci di cogliere idee e stimoli creativi provenienti dalle inesauribili risorse disponibili nella Rete.

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Dal Q.I. al Q.E. Traiettorie emozionali nei contesti organizzativi. Una proposta per la formazione

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1. Introduzione

Qualsiasi pratica formativa è condita, e condotta, da eventi emozionali.

Non è un mistero che i contesti di apprendimento e insegnamento si sostanziano di altro, rispetto al valore del loro contenuto informativo che difatti, non riuscirà a spiegare mai abbastanza del significato complessivo che il soggetto in formazione attribuirà all'attività didattica a seguito di essa. Il modo in cui egli interpreterà tale significato influenzerà la sua rielaborazione, a cui sommerà le precedenti esperienze. E' bene tener presente, dunque, che ogni situazione verrà anche "commentata" interiormente dal suo circuito emozionale.

Le emozioni, infatti, ad eccezione di quelle provocate da una particolare condizione biochimica dell'organismo o da riflessi condizionati, derivano dalle considerazioni che facciamo sugli eventi. E qualunque percorso formativo, potenzialmente destinato ad incidere sui ragionamenti e sulle scelte che progettiamo di compiere, non può non tenerne conto.

Portare questa consapevolezza all'interno del dibattito educativo e formativo implica una delicata revisione delle pratiche, supportate da nuove teorie scientifiche in campo pedagogico, psicologico e neurologico. Significa interrogarsi su una possibile nuova progettualità e sulle conseguenze che assumerebbe oggi per le nostre istituzioni educative alla ricerca di ciò che fa la differenza tra un processo formativo andato a buon fine ed uno inefficace.

2. Come favorire l'apprendimento?

Molto probabilmente si può definire connettivo ogni processo in cui è presente un intento formativo. Un workshop o un training tra dirigenti e collaboratori di un'azienda, un lavoro di ricerca presso il dipartimento, ma anche e soprattutto una lezione in aula (in presenza o a distanza, non fa differenza), presuppone una complessa sinergia di forze, come condivisione di esperienza, memoria e immaginazione.

L'obiettivo infatti rimane sempre lo stesso: lavorare in comune per raggiungere una destinazione. Tale caratterizzazione è ancora più evidente se pensiamo alle tecnologie dell'istruzione e dell'apprendimento, dal momento in cui, come sostiene De Kerckhove (2002), la formazione a distanza si struttura attraverso "luoghi in cui il pensiero viene scritto, condiviso ed elaborato da diverse persone che possono incontrarsi da qualunque posto si trovino, quando vogliono per dare il proprio contributo ad un processo di pensiero comune".

Poter conoscere (ex ante rispetto al processo) in che modo tutti gli ingranaggi coinvolti possano integrarsi al meglio per cooperare al massimo delle potenzialità è, in estrema sintesi, tutto ciò che desideriamo sapere.

Come possiamo incidere sulle motivazioni ad apprendere? Quali condizioni è indispensabile porre in essere per poter generare, durante le attività, quel coinvolgimento ottimale in grado di far perdere la cognizione del tempo che passa?

3. Il circuito emozionale

Per comprendere la nostra realtà, dunque, è necessario porre in relazione le azioni, i concetti e i significati che le stesse azioni esprimono (Flavell, 1963).

Il funzionamento del sistema intellettivo passa attraverso l'adattamento inteso come aspetto del funzionamento biologico dinamico, più esterno, aperto agli scambi con l'ambiente. Per dirla con Piaget (1952), l'adattamento rappresenta il funzionamento intellettuale nel suo aspetto dinamico e come si organizza è il prodotto dei vari adattamenti. Sono due aspetti indissociabili in quanto è adattandosi alle cose che il pensiero organizza se stesso ed è organizzando se stesso che struttura le cose.

Al centro dell'analisi psicologica possiamo ritrovare alcune nozioni che ci aiutano a comprendere meglio il modo in cui le emozioni diventano decisive in ogni singola esperienza.

Il concetto di *appraisal*, ad esempio, ci spiega come si definisce la valutazione cognitiva della situazione stimolo: il principio di fondo è rappresentato dalla consapevolezza che ogni singolo evento non è di per sé in grado di provocare un'emozione senza l'intermediazione di un processo valutativo interno ed esperienziale che consideri quel determinato evento come capace di influenzare il nostro benessere. L'esperienza diventa determinante e con essa, quindi, la memoria e il ricordo come termini di paragone attraverso il quale attribuire significato all'evento vissuto nel presente (Bellelli, 2008).

Nel circuito emozionale viaggiano insieme tutte le caratteristiche proprie dell'emozione e con esse la rappresentazione degli eventi in cui si è sperimentata quella data emozione. In questo modo, è spiegato anche il fenomeno della dipendenza degli stati di umore, che vengono richiamati dallo stato emotivo corrente, attivando gli stimoli appresi nelle circostanze in cui l'individuo si trovava nel medesimo stato emozionale.

In definitiva, la valutazione di un evento (appraisal) suscita anche un particolare modo di affrontarlo (coping) e il modo in cui si reagisce all'evento contribuisce a modificare la valutazione della situazione (reappraisal), dando avvio ad un processo che continua fino a che il problema non è risolto, oppure l'individuo non cessa di considerarlo un problema (Bellelli, 2008). È ampiamente documentato che noi non apprendiamo solamente dai contenuti, ma anche da percezioni ed emozioni che proviamo, magari inconsapevolmente. Vien da se che utilizzare processi emotivamente coinvolgenti risulta, non solo un metodo utile per rendere più veloce e piacevole l'apprendere, ma soprattutto un processo indispensabile per generare apprendimenti efficaci (Rotondi, 2002).

Più passano gli anni e più si rafforza all'interno del panorama scientifico, la condivisione circa l'ipotesi che l'uomo agisce spinto dalle sue emozioni. Per questo risulta estremamente interessante, conoscere il sentiero secondo il quale il circuito emozionale agisce sulle motivazioni. In questa prospettiva le emozioni "non sono più soltanto una reazione fisiologica a determinate situazioni ma una variabile che interagisce con tutti i piani dell'organismo, da quello neurologico a quello viscerale, da quello cognitivo a quello comportamentale, dando significato e spessore a tutti gli eventi della nostra vita" (Varani, 2000).

D'altra parte, il dominio stesso dell'intelligenza sull'emozione è in crisi. Per dirla con Spaltro (2002) sarebbe più corretto parlare di "emozione intellettiva" e imparare ad apprendere dalle emozioni. La prima conseguenza di ciò è l'auspicio che si sviluppi una "didattica emotiva" con dei "formatori emotivi" (Spaltro, 2002). All'interno del processo di apprendimento, una delle abilità essenziali di ogni educatore e formatore è saper scegliere la giusta metodologia per ogni situazione; un po' come il golfista sceglie il bastone con il quale effettuare il tiro a seconda del tipo di lancio, del terreno di gioco e delle condizioni climatiche.

Un progetto educativo che tenga conto anche del circuito emozionale di chi ne fruisce, sarà meglio calibrato sulle esigenze e sulle peculiarità individuali e/o di gruppo. Difatti una delle lacune più presenti all'interno del nostro sistema educativo, riguarda la progettualità

rivolta quasi esclusivamente all'aspetto cognitivo degli allievi, nella misura in cui non si riconoscono all'educabilità tutte le sue specificità. Molto spesso infatti l'intento formativo fallisce, non si concretizza o viene reso vano dalla scarsa considerazione che viene posta nei confronti della gestione dell'emozionalità e delle abilità intellettive che con l'emozione interagiscono e che danno forma, come abbiamo visto, alle sue motivazioni.

Diversi autori sostengono che le emozioni esercitano moltissimi effetti sul nostro apparato cognitivo, e uno dei loro ruoli è quello di stabilire gli obiettivi che vogliamo raggiungere.

Ogni emozione, quindi, predispone ad una azione successiva. Di fronte a un problema, a un obiettivo, ad un percorso che un individuo intraprende, possiamo avere diversi tipi di risultati.

Come sostiene Varani (2000) "è possibile che si vada incontro ad un blocco rispetto a quel progetto, con la conseguente formazione di emozioni di tipo negativo (frustrazione, ansia, insicurezza, ecc.). Nel migliore dei casi, ciò determina uno spostamento del progetto, una modifica, una rimodulazione o addirittura un ridimensionamento. Nel peggiore dei casi, è il ritirarsi, il fuggire dalla situazione che crea ansia. In entrambi i casi si possono manifestare significative modifiche della propria autostima o tentativi di affermazione del proprio ruolo in modo aggressivo o mediante il rifiuto del processo formativo.

Viceversa, se si riescono a intravedere i primi passi del percorso che si vuole intraprendere, i primi parziali successi in quella direzione, si ha una conferma delle capacità personali, si sviluppano emozioni di tipo positivo, di appagamento, di gioia, di soddisfazione, di sicurezza e ciò predispone alla tappa successiva, rafforzando la possibilità di procedere oltre".

Quest'ultimo caso rappresenta ciò a cui deve tendere nella propria progettualità ogni professionista della formazione. È bene notare che si passa dalla voglia all'intraprendenza quando si mette in gioco un'intenzionalità efficace, rispetto alle condizioni e ai fini, nella forma di propositi personali di apprendimento, formulati con consapevolezza; nella misura in cui l'intenzione di comprendere e desiderare è mossa da un giudizio che coinvolge il nucleo di valori nel quale lo studente ritrova la propria immagine di soggetto autonomo.

Difatti, alla base di una preferenza c'è l'esercizio di una logica affettiva (Ciompi, 1995) intesa come quel complesso di emozioni, sentimenti, passioni, inclinazioni, umori che un individuo prova davanti a tutto ciò con cui gli capita di rapportarsi. In quanto tale concerne una mobilitazione interiore dell'io provocato a un'adesione (o a un rifiuto) e a una partecipazione (o a un distacco) nei confronti delle cose. Oggi si tende a riconoscere negli stati affettivi un'energia di regolazione, di segnalazione, di attivazione e di guida dei processi cognitivi, in particolare della memoria e del comportamento (Caprara, 1988).

Si riconosce quindi che tra apprendimento, insegnamento e emozionalità c'è un rapporto inevitabile. Se attraverso l'intelligenza emozionale si controllano le nostre emozioni, si riconoscono le emozioni altrui e si impara a gestire le relazioni è chiaro che una pianificazione formativa in questa direzione risulti un passaggio fondamentale.

4. Gli studi sull'intelligenza emotiva

Per queste ed altre ragioni, l'interesse verso lo studio dei comportamenti umani non può prescindere dai più recenti studi sull'intelligenza emozionale, scanditi negli ultimi anni da contaminazioni interdisciplinari fino alle più recenti scoperte nel campo delle neuroscienze (ad es. Damasio, 1998; 2001). Si sta sempre più consolidando l'idea che tali teorie possano legarsi con efficacia ed efficienza agli obiettivi delle istituzioni educative e formative odierne, oltre che delle organizzazioni del lavoro. tradurre nella pratica formativa approcci e tradizioni diverse relative all'intelligenza emotiva, per scoprire come possano incidere quando utilizzate per gli scopi che qui ci interessano. Approcci e tradizioni diverse connesse all'intelligenza emotiva si traducono nella pratica educativa e nel mondo della formazione, in continua e

tumultuosa trasformazione, nell'interesse degli operatori del settore interessati ai benefici prodotti dal lavoro teso al benessere.

Dall'inizio della teorizzazione e del testing sull'intelligenza, sono imperversate diverse opinioni non solo sulla natura dell'intelligenza ma anche su quante forme di intelligenza esistessero. Tuttavia, anche i più accaniti teorici che definivano l'intelligenza come un unico fattore generale di abilità mentale, ammettono l'esistenza di più fattori di abilità specifici.

Non convinti dalla tradizionale dicotomia fra intelligenza linguistico/propositiva e percettivo/organizzativa, per decenni, i ricercatori hanno cercato una terza via, nella convinzione che queste intelligenze principali da sole fossero insufficienti a delineare le differenze individuali delle abilità mentali.

Forse la terza intelligenza potrebbe davvero essere quella emotiva, che dopotutto, se paragonata all'intelligenza sociale, potrebbe avere un più distinto locus coeruleus nel sistema limbico e nelle sue proiezioni corticali (Damasio, 1994; LeDoux, 2000).

Il primo vero tentativo di formulazione del concetto di intelligenza emotiva lo dobbiamo ad Edward Lee Thorndike (1921), che introdusse il termine di "intelligenza sociale" riferendosi "alla capacità di gestire uomini e donne, ragazzi e ragazze, di agire saggiamente nelle relazioni umane".

Qualche anno dopo, David Wechsler (1940), propose un modello di intelligenza in cui erano presenti fattori affettivi, personali e sociali, ponend l'accento su elementi non cognitivi. Egli definì l'intelligenza come l'aggregato o la capacità globale dell'individuo di agire di proposito, di pensare razionalmente e di occuparsi efficacemente del suo ambiente. Più tardi arrivò addirittura ad affermare che le abilità non cognitive fossero essenziali per predire la capacità di un individuo di aver successo nella vita.

Si iniziò così ad accennare alla correlazione tra emozioni e funzioni intellettuali (Guilford, 1956) per esaminare come le emozioni interagissero con il pensiero.

Addirittura alcuni cercarono di capire, nel campo dell'intelligenza artificiale, come i computer avrebbero potuto ragionare sull'aspetto emotivo di racconti e testi scritti (P. Salovey e J. Mayer, 2000).

A questo punto la strada era spianata per coloro i quali saranno considerati i precursori dell'intelligenza emotiva. La teoria che segnò l'inizio di una nuova direzione di studio, che sancisce di fatto un punto di rottura da un primo filone di ricerche "fondativo", si deve ad Howard Gardner, docente di cognitivismo e pedagogia alla Harward School of Education, che per primo parlò di varie intelligenze definendole "multiple".

In "Frame of mind" pubblicato nel 1983 egli definì errata la convinzione che ci potesse essere qualcosa chiamata "intelligenza", misurata obiettivamente e ricondotta ad un singolo numero, ovvero il QI.

Di diversi tipi di intelligenze (analitica, pratica e creativa) parlò anche lo psicologo americano Robert J. Sternberg (1994) il quale, proponendo di considerare l'intelligenza in termini di componenti, ha pionieristicamente combinato il tradizionale approccio psicometrico-quantitativo, riferito allo studio e alla misurazione delle differenze individuali nelle abilità intellettive, con quello informazionale attinente allo studio dei processi di elaborazione dell'informazione (Miceli, Gangemi, 2011).

Laddove intelligenza ed emozioni erano state considerate campi separati, si cominciò ad assistere alla loro integrazione. L'influenza della emozioni sui processi di pensiero iniziò ad essere studiata in modo sistematico negli individui depressi, così come in quelli che soffrivano di disturbi maniaco-depressivi (J. Mayer, P. Salvey, D. Caruso, 2010).

Bisognerà aspettare gli anni novanta per la definitiva consacrazione del costrutto dell'intelligenza emotiva che avverrà grazie al lavoro di John Mayer e Peter Salovey (1990) nel quale verrà sviluppata una prima definizione formale del concetto e una spiegazione delle abilità coinvolte.

La loro idea originaria concepiva l'intelligenza emotiva come una serie di abilità in correlazione tra loro. Una prima definizione comprendeva: "l'abilità di controllare i sentimenti e le emozioni proprie ed altrui, di distinguere tra di esse e di utilizzare queste informazioni per guidare i propri pensieri e le proprie azioni" (J. Mayer, P. Salovey, 1990).

Successivamente si coinvolse maggiormente il ragionamento sui sentimenti, riconoscendo l'intelligenza emotiva come: "l'abilità di percepire, valutare ed esprimere un'emozione; l'abilità di accedere ai sentimenti e/o crearli quando facilitano i pensieri; l'abilità di capire l'emozione e la conoscenza emotiva e l'abilità di regolare le emozioni per promuovere la crescita emotiva ed intellettuale" (J. Mayer, P. Salovey, 1997).

Questa concezione comprende la capacità di elaborare informazioni complesse sulle proprie emozioni e su quelle degli altri e di utilizzare tali informazioni come guida per il proprio comportamento. Il che significa che gli individui con un'alta intelligenza emotiva prestano attenzione, utilizzano, comprendono e gestiscono le emozioni, e queste abilità svolgono una funzione adattativa potenzialmente benefica per sé stessi e per gli altri.

Il termine intelligenza emotiva in quest'uso può definirsi come un esempio standard di intelligenza che può arricchire il dibattito sulle capacità umane (Mayer, Salovey, Caruso & Sitarenios, 2001).

Gli studi di Paul Ekman, impressero un'accelerata decisiva in questa direzione.

La posizione darwiniana circa l'universalità delle espressioni facciali come un prodotto della nostra evoluzione, fu da egli ripresa per indagare la causa e l'effetto delle manifestazioni delle emozioni nel linguaggio del corpo, nella voce e nelle espressioni del volto.

Secondo il noto psicologo, ciascuna emozione scatena una sequenza di segnali che le è propria, uguale in tutto il mondo come comune denominatore biologico. Soprattutto le emozioni spontanee provocano dei cambiamenti in parti del cervello che ci stimolano a gestire l'evento scatenante, nonché del sistema nervoso autonomo che regola la frequenza cardiaca, la respirazione, la sudorazione e molti altri mutamenti corporei che ci predispongono a svariate azioni (Ekman, 2003).

Ad esempio, scoprì quante espressioni può produrre una faccia, più di diecimila, e identificò quelle più rilevanti per le emozioni. Più tardi, con la collaborazione di Wallace V. Friesen elaborò e pubblicò il Facial Action Coding System (FACS), un sistema di rilevazione delle espressioni emozionali sul volto, che implementarono con l'ausilio di Joseph C. Hager nel 2002.

Attraverso questo programma, tuttora usato nel mondo da centinaia di scienziati, i movimenti dei singoli muscoli facciali vengono codificati ed estratti per mezzo delle caratteristiche geometriche dei volti, producendo profili emozionali di ogni movimento del viso al fine di misurarli come vere e proprie fonti di informazione che possono rilevare l'emozione che la persona sta provando o, magari, cercando di celare (Ekman, 2003).

Paul Ekman ha fornito un contributo fondamentale alla comprensione dei meccanismi di regolazione e controllo dell'espressione delle emozioni. Oggi, infatti, siamo in grado di valutare il tipo di influenza che il nostro comportamento non verbale determina sugli altri e di giudicare la competenza delle persone ad inviare segnali non verbali o ad interpretarli.

5. Traiettorie Emozioni e new media

Come ci suggerisce Spaltro (2002) l'idea di gruppo ha dato vita ad una spirale pluralistica composta di gruppi, di comunità, virtualità intese come progressive espressioni di emozioni. L'accettazione delle opportunità offerte da una formazione plurale come è chiaramente quella telematica quando è gestita opportunamente, fanno diventare il passo dalla connettività delle intelligenze a quello della connettività dei vissuti intellettivi-esperenziali decisamente più

breve, a tutto vantaggio dei risultati formativi. L'evoluzione dell'ICT ci offre ambienti potenzialmente utili a questa delicata operazione. L'interazione con l'interfaccia di un ambiente informatico è comunque più "neutra" e meno ricca e meno mediata rispetto alla complessità di fattori che nel rapporto interpersonale sono sempre presenti. Alcune ricerche (cfr. Bettettini) hanno evidenziato interessanti effetti cognitivi dell'interazione col computer: una minore sensazione di essere giudicati; una minore consapevolezza dell'interlocutore; una dimensione ludica, inevitabilmente sviluppata nell'interazione col PC. Questi aspetti, possono essere vissuti con maggiore spontaneità e naturalezza navigando in rete come metafora della ricerca, della scoperta, del gioco mentale, dell'esplorazione come una sorta di caccia al tesoro cognitiva ed emozionale al tempo stesso. Ma anche, in negativo, come diminuzione dell'autocontrollo e dei freni inibitori, sono evidenti in numerosissimi aspetti dell'uso di Internet con i quali quotidianamente abbiamo a che fare.

6. Sviluppi e strumenti operativi

Dalla pubblicazione delle prime ricerche nei primi anni novanta, alcune scuole ed organizzazioni educative particolarmente innovative hanno iniziato ad integrare gli strumenti dell'intelligenza emotiva all'interno dei loro programmi didattici. Le attuali ricerche in campo educativo, psicologico e, più in generale, in tutte le sfere correlate a questi settori dimostrano i benefici dei programmi di apprendimento socio-emozionale (*Social Emotional Learning)* per i giovani. Alcuni studi dimostrano addirittura come l'intelligenza emotiva sia fortemente correlata al completamento degli studi, al prevenire i comportamenti a rischio e al miglioramento la salute generale dei giovani. Soprattutto oltreoceano (l'*American Psychologist* continua a pubblicare molti articoli sul tema) la consapevolezza sociale si sta allineando ai risultati delle ricerche tanto che recentemente anche il *New York Times* ha affermato che "…i programmi di apprendimento sociale ed emozionale migliorano significativamente la performance scolastica degli studenti."

Al di la dei progetti di alfabetizzazione emozionale nelle scuole e dei modelli empirici di insegnamento dell'intelligenza emotiva, l'obiettivo del lavoro è concepire una tecnologia dedicata all'utilizzo da parte degli insegnanti, educatori, formatori, psicologi delle scuole, per comprendere più agevolmente le regole di attivazione dei canali emozionali degli studenti ma più in generale di chiunque venga coinvolto in qualsiasi processo formativo.

Similarmente a ciò che già avviene per le HR durante alcuni processi di selezione, in cui vengono sondate esperienze, obiettivi e motivazioni, l'utilizzo di strumenti come il "Face Reader" in sede di colloquio, consentirebbe una lettura più approfondita dei medesimi aspetti.

Il Face Reader, ad esempio, è un software di rilevamento emozionale automatico che indaga cioè la relazione tra l'espressione facciale delle emozioni e quello che una persona sta provando. Il sistema, elaborato con l'aiuto, tra gli altri, di Ekman, è in grado di sfruttare il fatto che esistono espressioni specifiche che esprimono emozioni diverse e di catalogarle nel Facial Acting Coding System (FACS) dove vengono mappate le microespressioni che unite rilevano l'emozione. Il legame tra la muscolatura facciale e le emozioni viene identificato attraverso le Action Units (AUs): le unità fondamentali che rappresentano le azioni facciali minime, non ulteriormente scomponibili e costituite dall'azione combinata di uno o più muscoli. L' emozione indica cioè un particolare movimento corporeo, spontaneo o simulato, dettato da stati mentali e fisiologici associati a precisi stimoli interni o esterni. Il volto, come principale culla delle emozioni, risulta essere un sistema di risposta multisegnale, capace di un' enorme flessibilità e specificità. In grado di produrre decine di messaggi differenti (la durata di queste manifestazioni oscilla tra i 250 millisecondi e i 5 secondi) tramite l' uso dei muscoli facciali. L'insieme di questi segnali contribuisce al riconoscimento.

Lo strumento del "Face Reader", implementato nelle sue caratteristiche, potrebbe essere concepito non solo per la rilevazione e il riconoscimento delle singole espressioni emozionali del viso, ma soprattutto, per quel che qui ci interessa, per consentire agli educatori e ai formatori una traduzione più funzionale dell'impatto emozionale del progetto formativo nei confronti dei soggetti, e dei relativi significati comportamentali (Izard, 1971; 1990).

La possibilità di individuare e distinguere ciò che il loro volto manifesta viene data da tutti i gesti, i movimenti facciali e le misurazioni elettrofisiologiche che ci indicano quando siamo attivati da un'emozione, che può essere in armonia o in contraddizione con ciò che stiamo esprimendo volontariamente, magari a parole, in un dato momento.

E' quindi possibile che le nostre emozioni non seguano la narrazione del parlato. In questo caso la dissonanza si rivela attraverso micro espressioni facciali involontarie e incontrollabili, della durata di un quarto di secondo o meno.

Inoltre, integrare i risultati così ottenuti con quelli relativi alla misurazione generale dell'intelligenza emotiva attraverso il MSCEIT (Mayer, Salovey, Caruso, 2001; 2003), consentirebbe agli operatori della formazione, di dotarsi di uno strumento unico per conoscere maggiormente in tutte le sue specificità le risorse emotive degli individui.

Il Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) è progettato per misurare l'intelligenza emotiva[1] e come le persone svolgono compiti e risolvono problemi. Questo strumento in grado di eludere il giudizio soggettivo delle abilità emotive, del concetto di sé, da errori di risposta, dallo stato emotivo da parte del soggetto a cui viene somministrato il test, descrive l'intelligenza emotiva a partire da un punteggio generale di performance, per poi essere suddivisa in due sottodimensioni di IE esperienziale e IE strategica. Da queste viene strutturato il "Four Branch Model" che riporta punteggi validi in ognuna delle quattro aree di cui, secondo gli autori, è composta l'intelligenza emotiva: l'abilità nel percepire accuratamente le emozioni; l'uso delle emozioni per facilitare il pensiero, il problem solving e la creatività; la comprensione delle emozioni; la gestione delle emozioni per la crescita personale[2].

In particolare pensiamo che la possibilità di accordare le due diverse funzionalità degli strumenti appena descritti, connettendoli con le esigenze degli istituti educativi in sede di programmazione, possa essere funzionale a tutti i professionisti della formazione, di qualsiasi grado e scuola, per meglio calibrare le metodologie educative consentendo una maggiore comprensione dei bisogni emozionali al fine di gestire al meglio e con più consapevolezza i processi (Di Fabio, 2010). La prospettiva formativa a cui tendere sarà incentrata così non più solo sullo studio delle forme di apprendimento che riguardano la progettualità contenutistica della didattica, ma anche della sfera emozionale del singolo e dei gruppi che, come abbiamo visto, incidono così tanto sulle motivazioni ad apprendere.

Troppo spesso infatti molti istituti scolastici limitano i loro sforzi nella gestione della didattica in funzione della valutazione degli aspetti cognitivi in chiave docimologica, dimenticando tutte le traiettorie emozionali di cui abbiamo discusso.

Dedicando, al contrario, più attenzione alla sfera emozionale e motivazionale dello studente, si salvaguarderebbe la sua integrità e addirittura la si potrebbe orientare in maniera più consapevole, senza lasciarla al caso. Con la convinzione che una progettazione didattica orientata alla prevenzione e allo sviluppo dei giovani se studiata e implementata su basi scientifiche e serie influenza positivamente i risultati sociali, scolastici e sanitari.

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[1] Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT), 1990.
[2] Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT), 1997.

Slow food: analisi degli enunciati in "Alle origini del gusto"

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Abstract

Il presente studio è parte di una più ampia ricerca che coinvolge il laboratorio ERID dell'Università degli Studi di Foggia ed il Groupe de recherche en médiation des savoirs (GreMS) dell'UCL - Université catholique de Louvain (Louvain-La-Neuve, Belgique).

In particolare, il progetto sviluppa un'analisi semio-pragmatica di un cartone animato creato da Slow Food - associazione italiana senza scopo di lucro - che si occupa di programmi di educazione al gusto, al fine di comprenderne alcuni aspetti della scelta educativa e capire quale possa essere il modello didattico più adatto per educare alla sana alimentazione. In tal senso, si è cercato di identificare le caratteristiche peculiari dei processi comunicativi messi in atto da Slow food attraverso lo studio del video "Alle origini del gusto".

Si prenderanno in considerazione le modalità di presentazione e di elaborazione dei contenuti di testualità scritte, audio e materiali iconici, analizzando il rapporto tra testi, immagini e suono. Nello specifico, il lavoro intende indagare la seguente domanda di ricerca:

"Quale modello educativo emerge dall'analisi semiotica dei documenti utilizzati da Slow Food?"

Per rispondere a tale problema è stata realizzata un'esperienza di ricerca che ha permesso di definire il contesto teorico, il modello didattico e le possibili scelte metodologiche più idonee a migliorarlo.

Parole chiave
Slow food, educazione alimentare, pragmatica della comunicazione, enunciato

1. Introduzione

L'interesse per i temi dell'educazione alimentare e per le attività dell'associazione Slow food si è intensificato a seguito del meeting dell'Unione Europea sulla Politica Agricola Comune (PAC): quest'incontro che ha avuto ampi obiettivi tra i quali, riflettere sulle esigenze alimentari della popolazione ed interessarsi sempre più alle questioni legate alla relazione tra salute e alimentazione.

Uno dei primi obiettivi dell'attuale PAC è stato quello di sostenere la qualità e la sicurezza alimentare così come quello di sviluppare un settore agricolo che possa garantire la tutela dell'ambiente e il benessere alimentare. Ciò significa tendere verso un equilibrio tra un'agricoltura che rispetti l'ambiente, le tradizioni locali e una dieta gustosa e salutare.

Il 30 maggio 2007, la Commissione Europea ha pubblicato il Libro Bianco "Una strategia europea sugli aspetti sanitari connessi all'alimentazione, al sovrappeso e all'obesità": vi si affronta il tema dell'obesità dei bambini in Europa, la sua importanza per la salute pubblica e il suo impatto economico e sociale.

Questo documento ha evidenziato il ruolo chiave giocato dall'agricoltura e l'esigenza di impostare un'azione sinergica a livello europeo. Inoltre, si rende chiara l'importanza di educare i consumatori a un'alimentazione responsabile e di garantire la disponibilità di cibi salutari a tutta la popolazione.

Inoltre, una vasta gamma di attività della Direzione Generale della Commissione Europea per l'Agricoltura e lo Sviluppo Rurale è dedicata a diffondere la necessità di una dieta migliore e più equilibrata tra le nuove generazioni, con l'obiettivo di influire positivamente sulla salute delle fasce di popolazione in età scolare e ridurre la diffusione dell'obesità.

Al fine di correggere le abitudini alimentari dei bambini, la Commissione Europea ha poi realizzato il programma "Latte nelle scuole" e, più di recente, nell'ambito della riforma del 2007 del settore ortofrutticolo, ha presentato il programma "Frutta nelle scuole", lanciato poi nel 2009 (Commissione delle Comunità Europee, 2007).

Coerentemente con tali iniziative, l'associazione no-profit Slow Food si definisce promotrice di un cambiamento di modello culturale: da uno centralizzato, a uno basato sulla diversità e sulla produzione di piccola scala.

Al riguardo, sembra opportuno ricordare che oggi ci sono molte infanzie, contraddistinte da differenti risorse culturali e abitudini alimentari, ma anche da specifiche modalità di adattamento agli ecosistemi e da proprie capacità di definire identità e personalità attive in una società complessa. In tale prospettiva, l'educazione alla sana alimentazione dovrebbe assumere forme articolate e diversificate, in grado di raggiungere chiunque, abitante rurale o cittadino urbano, indipendentemente dal proprio stato economico o culturale.

2. Il modello teorico di riferimento: la pragmatica della comunicazione

La comunicazione è un atto che nasce dalla relazione sociale, la comunicazione forma, mantiene o trasforma la relazione. Le riflessioni avviate nell'ambito della pragmatica della comunicazione, pongono particolare attenzione alle strutture discorsive dell'enunciazione, validando l'importanza del ruolo dei temi, degli attori, dei tempi e dei luoghi dell'enunciazione (Austin, 1962). Non è facile dare una definizione univoca di "pragmatica" in quanto essa:

- presenta estrema complessità dei fenomeni e dei processi coinvolti;
- si caratterizza per una sostanziale interdisciplinarità;
- posiziona il proprio oggetto di studio all'incrocio di differenti domini, quali la filosofia, la linguistica, l'antropologia, la psicologia, la sociologia, ecc.

L'attuale impiego del termine pragmatica può riallacciarsi alle teorie di Morris (1938), secondo il quale l'oggetto di studio della pragmatica dovrebbe essere investigato nella relazione tra segni ed interpreti.

Lo studio di tale relazione si qualifica nei seguenti tre ambiti:

1. sintassi, ovvero la relazione tra i segni;
2. semantica, ovvero la relazione tra un segno e l'oggetto cui il segno fa riferimento;
3. pragmatica, ovvero la relazione tra i segni e il destinatario del messaggio (ivi).

In tale prospettiva, ogni atto comunicativo riguarda la creazione di reti intersoggettive che comportano:

*   l'instaurarsi di rapporti d'inclusione/esclusione costitutivi di entità più o meno coerenti;
*   l'organizzazione di queste entità attraverso specifici rapporti (Peraya, Meunier, 2001).

Per definire il significato di pragmatica è necessario quindi far riferimento ai processi di intenzionalizzazione, di scelta, di rappresentazione e inferenza (Balconi, 2008).

In un'ottica prettamente pragmaticista, tutti i differenti modi in cui la comunicazione "prende vita" hanno qualcosa che li lega alla relazione tra la parola e la gestualità non verbale, l'immagine e il suono. In tal senso, la "comunicazione mediatizzata" riguarda tutte le forme di comunicazione che utilizzano un dispositivo tecnologico: un messaggio televisivo, un film, una classe virtuale, una consultazione documentaria su internet, un forum di discussione, un giornale o un sito web scolastico per la trasmissione di specifici messaggi. In questa prospettiva, il media portatore di contenuti viene inteso come un "dispositivo di comunicazione mediatizzata" la cui definizione si è sviluppata grazie alla convergenza di correnti teoriche differenti, quali la psicologia cognitiva, la linguistica e le teorie sull'enunciazione (Peraya, Meunier, 2001).

Nell'approccio di Peraya (2000) "Un dispositivo di comunicazione mediatizzata è un'istanza, un luogo sociale di interazione e cooperazione dotato di intenzioni, di un funzionamento materiale e simbolico e di modi di interazione propri" (ivi, p.2) .

I dispositivi di comunicazione mediatizzata possono dunque produrre senso e significati in molteplici forme attraverso diversi registri semiotici: il linguaggio naturale, i linguaggi visivi, le scritture scriptovisuali, ecc. Essi contribuiscono, attraverso la loro configurazione tecnica, contemporaneamente alla definizione e alla costruzione del significato, prescrivendone forma e struttura. In tale prospettiva, con la pragmatica della comunicazione non è più possibile considerare la lingua e i sistemi di comunicazione come delle entità autonome, ma come strettamente connessi alla realtà, alla relazionalità e alla definizione di nuove alleanze tra le scienze della comunicazione e le scienze sociali in generale.

L'analisi pragmatica dei messaggi audio-scripto-visuali è pertanto, un'analisi di tipo qualitativo che prevede:

*   che si prendano in considerazione i possibili effetti di una relazione immediata con il destinatario;
*   che si pongano questi effetti in un quadro più generale di sistemi sociali nei quali il messaggio si inserisce;
*   che si possano analizzare questi effetti dal punto di vista potenziale e non reale.

Essa si colloca allo stesso livello dell'azione, dove il discorso è parte costitutiva dell'interazione sociale e dunque direttamente implicato nella maniera in cui le persone strutturano i rapporti, si attribuiscono dei ruoli, rappresentano l'immagine di sé.

In questa maniera, la realtà viene interpretata e "costruita" per mezzo sia di strumenti cognitivi che di tecnologie intellettuali; gli strumenti cognitivi non sono necessariamente degli oggetti materiali o tecnici, ma possono essere anche di natura prettamente simbolica come, per esempio il linguaggio (Peraya, Rickenmann, 1998).

Inoltre, uno studio dal punto di vista pragmatico implica l'identificazione della funzione che l'enunciazione sviluppa con il contesto, inteso sia come contesto verbale (le enunciazioni che precedono e seguono) sia come contesto situazionale (cfr. Annotazione pragmatica AVIP.pdf Annotazione morfosintattica e testuale-pragmatica, a cura di Giacomo Ferrari, Claudia Soria, Elisa Milos). Infatti, la produzione e la comprensione di un messaggio vede le persone impegnate attivamente in differenti compiti cognitivi diretti al raggiungimento di un "obiettivo comunicativo complesso ed articolato" (Balconi, Amenta, 2008, p.166).

Il sincretismo tra la pragmatica della comunicazione e la comunicazione educativa/pedagogica è nato con le prime analisi sui media comunicativi, soprattutto televisivi, giornalistici e pubblicitari, e con il loro uso nelle scuole. Questo campo di studi interdisciplinare è strettamente legato alla semiotica strutturale della fine degli anni '60 ed emerge sulla scia del linguistica post-saussuriana. Negli anni, la semiotica ha sostenuto il punto di vista pragmatico e ha assimilato le teorie dell'enunciazione per cui la comunicazione deve essere vista come un processo intenzionale che coinvolge questioni complesse - trasmettitori e ricevitori - ma anche le relazioni interpersonali, il contesto, i risvolti pedagogici.

Al riguardo, Bruner (1966) ha avvallato una posizione simile a quella di Vygotsky (1934): per quest'autore il linguaggio è un "amplificatore culturale" ed un dispositivo di comunicazione mediatizzato. Non è semplicemente un oggetto materiale ma possiede delle componenti simboliche, sociali e culturali. Anche la scrittura, svolge il ruolo di mediatore simbolico proprio perché è "una tecnologia intellettuale creatrice di significati sia sul piano dell'immaginario che su quello religioso, scientifico o estetico" (Lévy, 1987, p.9).

3. Analisi di un dispositivo: "Alle origini del gusto" di Slow food

Nel presente lavoro viene descritta un'analisi di un dispositivo mediale in relazione ad alcune specifiche variabili.

Lo studio si è svolto sulla base della griglia per l'analisi dei messaggi mediali di Peraya e Meunier (2001).

1. Il messaggio trasmesso (nella sua globalità) è *embrayè o non embrayè.*
La maggior parte dei messaggi prevede delle alternanze o interferenze di due registri e sono dunque suscettibili di un approccio che leghi due livelli di analisi (Racconto o discorso) (Maingueneau, 1998).
2. Nel caso di un messaggio *non-embrayè* qual è il registro del racconto, quale è la struttura della rete interrelazionale che lega i diversi personaggi?
- Quali sono le variabili di punto di vista (oculare e cognitivo)? (Ocularizzazione/Focalizzazione)   - Ci sono nei messaggi degli indici che denotano l'esistenza del narratore e del suo punto di vista e/o che rendono noto allo spettatore il suo punto di vista?   - A quale distanza soggettiva (modulata da differenti elementi tali che la scala dei piani, l'angolo di ripresa di vista) si situano i differenti personaggi in relazione agli spettatori?   - La rete interrelazionale appare centrata o decentrata? (Centrazione/decentrazione)   - Quali sono le caratteristiche psicosociologiche del personaggio principale?   - Si tratta di un personaggio socialmente consacrato - o piuttosto di un modello per il sé spettatoriale (fattore dell'egocentrismo)?   - Nel secondo caso, quali sono le differenze o opposizioni di punto di vista (in senso largo, implicando affetti, opinioni, rappresentazioni) tra i personaggi?   - Tenuto conto degli elementi di risposta ai punti precedenti, in quale maniera si configura l'identificazione spettatoriale (Empatia, fusione, proiezione/identificazione, mimetismo, identificazione immaginaria, proiettore)?   - Quali sono gli effetti possibili di questa identificazione dal punto di vista psicosociologico (ego o sociocentrismo, decentrazione sociale) e dal punto di vista cognitivo (decentrazione del punto di vista, necessità del passaggio ad un metalivello)?

Nel caso di un messaggio *embrayé* dove è il registro del "discorso" che prevale, quali sono le caratteristiche del dispositivo di enunciazione messo in atto?
a) Aspetti relativi alla configurazione globale (audio-scripto-visuale) del dispositivo
- Quale è la composizione globale del dispositivo: numero e qualità (presentatore, animatore, commentatore, intervistatore) dei diversi enunciatori, disposizione spaziale, decoro?
- L'autore del messaggio marca la sua esistenza nel dispositivo?
- Quale è il tipo ed il grado di presenza (visuale e/o sonora e/o scritta) del/degli enunciatori: off of on o alternativamente l'uno e l'altro con una certa frequenza?
- Quali sono le marche visuali di enunciazione che registrano i rapporti di enunciatori visibili agli spettatori enunciatari?
b) Aspetti discorsivi
• Quali sono le caratteristiche pragmatiche delle parole rivolte allo spettatore – enunciatario dall'enunciatore del messaggio? Sono da prendere in considerazione i diversi elementi:
- La prevalenza del registro del discorso o del registro del racconto
- Gli indicatori personali utilizzati (pronomi personali)
- Gli atti del discorso effettuati: atti illocutori, atti perlocutori, tipo di azione illocutoria, polifonia
• Il rapporto tra l'implicito e l'esplicito
c) Aspetti analogici
- Quali sono le caratteristiche vocaliche delle parole degli enunciatori?
- Quali sono le caratteristiche delle posture e dei gesti degli enunciatori?
Quali sono le caratteristiche del dispositivo cognitivo proposto dal messaggio?
a) Aspetti iconici
- Quali sono i differenti aspetti relativi ala componente iconica del senso: immagine figurativa, fisa o animata, fumetto, schermo)
- Quali sono le reti di significazione metonimiche e metaforiche costruite dalle immagini?
- Si tratta di significazioni fortemente codificate o aperte?
- Da quale tipo e di quale livello si rivelano le operazioni cognitive eventualmente sollecitate dal montaggio (usualmente l'organizzazione sintagmatica)?
b) Aspetti verbali
- Quali sono i differenti tipi di discorso (e di stili discorsivi) che intervengono nella componente verbale (discorso scientifico, didattico, giornalistico..)?
- Qual è l'importanza della dimensione retorica (immaginata) dei discorsi? E quali sono le principali metafore e metonimie soggiacenti?
- Si tratta di enunciati chiusi (espliciti) o relativamente aperti, cioà che richiedono l'intervento di processi inferenziali e che lasciano quindi allo spettatore una parte importante dell'elaborazione del senso?
c) Articolazione tra gli aspetti verbali ed iconici
- Quali sono le parti rispettivamente delle componenti verbali ed iconiche?
- Quali sono i rapporti tra le due componenti?

Tabella 1. Griglia per l'analisi dei messaggi mediali (Peraya, Meunier, 2001, p.446) (trad. nostra).

Il video "Alle origini del gusto" è stato realizzato da Slow Food nell'ambito di un più ampio programma: il "kit dell'educazione al gusto" è stato prodotto nel 2008 ed è stato utilizzato come strumento per le attività di Slow Food in tutto il mondo. Esso è disponibile in dodici lingue - inglese, italiano, tedesco, francese, spagnolo, portoghese, russo, bulgaro, rumeno, lettone, polacco e giapponese.

"Alle origini del gusto" costituisce un tassello fondamentale di un elaborato percorso che si articola in tre momenti: uno informativo (aula video), uno ludico-didattico (percorso sensoriale) e uno di degustazione (aula degustazione). Esso rappresenta un'articolata attività laboratoriale che prevede la presenza di un video introduttivo in cui i partecipanti all'attività possono familiarizzare con i concetti di base della sana alimentazione e acquisire consapevolezza dei principali descrittori sensoriali. L'iniziativa riguarda anche una serie di giochi interattivi e una degustazione a cinque stazioni: gusto, vista, olfatto, tatto e udito. I fruitori dell'attività possono utilizzare autonomamente il video preregistrato per essere guidati attraverso specifiche esperienze gustative.

In questo caso, l'enunciazione audiovisiva è stata impiegata per proporre nuove tipologie di rappresentazione dell'atto del nutrirsi, rivestendo un ruolo strategico nella ridefinizione del legame tra bambino e cibo. In particolare, questo dispositivo racchiude una grande varietà di elementi che concorrono alla costruzione del senso del messaggio: le parole, i gesti

dell'enunciazione, gli elementi del linguaggio cinematografico e fotografico che modulano la loro presenza all'interno del dispositivo.

Per ciò che concerne la tipologia di fruizione, se la strutturazione del testo scritto è dominata dalla logica della consequenzialità temporale degli elementi disposti sulla pagina, l'organizzazione dettata dallo schermo si fonda invece sulla logica dello spazio e della simultaneità degli "oggetti" rappresentati (Kress, 2003, pp. 1-2). Questi elementi giocano un ruolo centrale nella costruzione della relazione con lo spettatore (Veron, 1983); si ipotizza che l'enunciazione audiovisiva all'interno del testo venga impiegata per proporre uno specifico modo di comunicare il "mangiar sano", rivestendo un ruolo importante nella determinazione del rapporto tra il cibo e lo spettatore-bambino: questo video sembra in questo senso esemplare per tale riprogettazione basata l'uso dei cinque sensi.

Nello specifico, in "Alle origini del gusto", il messaggio ha un carattere di *embrayage* sin dal primo *frame* (Benveniste, 1966).

Parole	Audio-scripto-visuel
Discours embrayé	Messages avec marques d'addresse
Récit non embrayè	Messages sans marques d'addresse

Tabella 2. (Perayà, Meunier, 2001, p.308)

Lo sguardo dello spettatore resta legato a quello del personaggio principale. Sguardo che diventa, nel momento della ricezione, sguardo occhi negli occhi, nell'asse YY (Verón, 1983).

La prima inquadratura ci permette di fare la conoscenza del protagonista (tipo di quadro: macchina da presa fissa; inquadratura sull'asse YY a mezzobusto). Il corpo, il timbro della voce, la pettinatura fanno ipotizzare che il personaggio sia un uomo sulla trentina. Risultano assenti ulteriori elementi identificativi dell'età.

Dalla prima scena, egli saluta gli spettatori e presenta se stesso e i bambini che saranno, con lui protagonisti del video.

Figura 1. Video "Alle origini del gusto"
From http://www.slowfood.com/education/pagine/eng/pagina.lasso?-id_pg=41

L'asse YY con cui il personaggio principale è presentato, definisce un'operazione destinata in qualche maniera a rendere meno fittizio il discorso, tuttavia, tale inquadratura porta a un taglio di regime esplicitamente finzionale. Infatti, lo sguardo verso la camera produce una maggiore rottura della diegesi: lo spettatore è sì catturato dallo sguardo che viene dall'immagine del cartone animato, ma è anche più consapevole di essere parte di una situazione fittizia. Il destinatario (in questo caso, probabilmente un bambino) si sente interpellato solo fittiziamente e non si sente enunciatario se non in una maniera irreale.

Il personaggio principale è diegetico perché il narratore si mostra nell'atto di raccontare (Metz, 1991) e l'andamento narrativo viene percepito come familiare; a ciò concorre anche l'utilizzo della seconda persona singolare. L'identificazione spettatoriale si realizza in maniera empatica: Gustavo, il protagonista si mostra come un personaggio familiare, dai tratti morbidi e rassicuranti.

L'atto linguistico che è formalmente prevalente, è la constatazione. Austin (1962) considera gli enunciati performativi come contrapposti a quelli constativi (formulare un enunciato constativo significa fare un'asserzione). La distinzione preliminare tra performativo e constativo si fonda sul fatto che pronunciando un enunciato performativo si svolge un'azione in reazione al semplice dire qualcosa e sulla peculiarità del performativo di essere felice o infelice, in opposizione a vero o falso. In questo video "si dice" qualcosa piuttosto che "fare" qualcosa.

Di contro al "rivolgersi visivo" allo spettatore, le parole risultano "*débrayés*": il discorso si sviluppa infatti in un presente atemporale. Al minuto 2.25, la voce diventa *off* per dare spazio alle immagini che offrono una spiegazione semiscientifica all'atto del gustare i cibi ed il mondo della scienza appare come un mondo "separato" e perfettamente autosufficiente rispetto alla tipologia di racconto sviluppata nella prima parte del video.

Figura 2. Video "Alle origini del gusto".
From http://www.slowfood.com/education/pagine/eng/pagina.lasso?-id_pg=41

In questa maniera, si procede nell'alternanza di momenti esplicativi (sotto forma di messaggi *embrayés*) e sequenze narrative (sotto forma di messaggi *non-embrayés*): già dal 41-esimo secondo si passa da un tipo di messaggio rivolto direttamente allo spettatore, a

un'interazione del personaggio principale con i bambini protagonisti (si può presupporre che il discorso divulgativo sullo stile alimentare produca un *débrayage* nella misura in cui cessa di rivolgersi direttamente al destinatario e la narrativizzazione delle azioni trasforma una parte dell'informazione in una sorta di spettacolo immaginario relativamente autonomo in rapporto al reale da cui deriva).

Figura 3. Video "Alle origini del gusto".
From http://www.slowfood.com/education/pagine/eng/pagina.lasso?-id_pg=41

Nella costruzione del messaggio viene assegnato un ruolo preponderante al discorso verbale che non si limita solo a guidare le associazioni delle immagini, ma orienta lo spettatore verso campi cognitivi a forte carattere concreto. Le immagini percepite s'integrano nel modello mentale indotto dagli enunciati linguistici a titolo illustrativo (fortemente metonimico).

Per ciò che concerne l'ocularizzazione che Jost (2004) ha definito come la rappresentazione del punto di vista visivo come diverso dal punto di vista del personaggio ("focalizzazione"), in "Alle origini del gusto", vi è focalizzazione da parte di un personaggio-narratore al 15-esimo secondo quando il narratore, attraverso il proprio sguardo presenta i quattro bambini dal proprio punto di vista: il narratore assume il punto di vista di un personaggio principale dicendo solo quello che il personaggio sa (narratore=personaggio=focalizzazione interna). L'ocularizzazione attiene alla dimensione del vedere e riguarda esclusivamente il fatto che si possa mettere in relazione un'immagine con un personaggio a seguito di precisi indicatori.

In particolar modo, questo tipo di ocularizzazione descrive, più precisamente, la relazione tra il modo in cui la camera mostra il personaggio e come si crede che il personaggio guardi le cose o come l'eroe è visto dall'esterno. In questa maniera, è possibile mettere in relazione un'immagine con il personaggio.

Figura 4. Video "Alle origini del gusto".
From http://www.slowfood.com/education/pagine/eng/pagina.lasso?-id_pg=41

La presentazione in primo piano dei bambini ci introduce a una visione "obbligata" attraverso l'assunzione dello particolare punto di vista del personaggio principale e la predisposizione di una specifica situazione (personaggio-narratore-spettatori, personaggio-narratore-bambini del video).

Il narratore non marca la sua presenza all'interno del dispositivo se non attraverso un personaggio adeguatamente costruito sulla base di specifici intenti. Il modello di interazione principale è quello dell'intervista: si realizza una percezione multipla dei livelli d'enunciazione, che vede la sequenza dell'intervista intercalata all'interno di una cornice in cui il personaggio principale, attraverso un'operazione di *débrayage* enunciazionale, innesca la spiegazione, che si struttura come una narrazione vera e propria con tempi, spazi e attori propri, collocati nell'istanza di enunciazione.

In tal maniera, si determinano due diversi piani referenziali in cui esistono diversi contratti enunciazionali con gli enunciatari. Si tratta di due discorsi: il primo situato sull'asse comunicativo io-tu e caratterizzato da un fare-narrativo e da un rapporto conversazionale diretto con lo spettatore; il secondo, caratterizzato dall'asse relazionale io-tu che si stabilisce tra il personaggio principale e i bambini ma che si arricchisce anche della dimensione io-loro (contraddistinto dalla descrizione delle attività legate all'assaporare i cibi).

La presenza del contenuto informativo essenziale alla comprensione del video, è preponderante rispetto alla costruzione della storia e questo può creare le premesse per una visione abbastanza passiva. Una simile costruzione audiovisiva sembra richiedere al suo destinatario una motivazione alla fruizione molto forte, per la quale ogni azione che riguardi l'atto del mangiare si configura come luogo di iscrizione ed esercizio della propria dedizione.

4. Conclusioni

L'intento di quest'analisi è stato quello di ampliare l'interesse verso quegli elementi che hanno determinato il senso pragmatico di uno specifico dispositivo di comunicazione educativa.

Il messaggio costruito e trasmesso dal video, può essere definito come un messaggio riflessivo a significazione precostituita (Peraya, Meunier; 2001) e viene collocato tra il polo verbale e l'asse apertura-chiusura in cui la tendenza generale è la riflessività imposta.

Le immagini si completano nel modello mentale indotto dagli enunciati linguistici, spesso a titolo informativo con delle categorie più o meno astratte corrispondenti alle parole. In questo caso, le immagini hanno un carattere descrittivo e mostrano in che maniera assaporare i cibi: anche i bambini fittiziamente intervistati manifestano in modo tipico i fatti, le emozioni, le relazioni di cui le parole assicurano l'esplicitazione.

Il destinatario, incluso nella pluralità degli enunciatari, si vede attribuire un posto poco attivo nella comunicazione. La costruzione semiotica del media esaminato è quindi risultata piuttosto semplice: non vi è un meta-livello di comprensione.

Il lavoro svolto, dunque, consente di elaborare alcune riflessioni per rilanciare l'intervento futuro evidenziando la necessità di una progettazione di dispositivi più complessi che salvaguardino un'elaborazione maggiormente intersoggettiva del senso, del confronto, dei vissuti, e dei discorsi. In questa maniera, resterebbe manifesta una pluralità di prospettive e rappresentazioni.

Ciò che dovrebbe quindi essere ridiscusso è sicuramente la carenza di situazioni partecipative, ossia di momenti in cui allontanarsi da un modello prioritariamente trasmissivo per muoversi verso una tipologia di comunicazione più partecipativa, facendo riferimento a ciò che gli stessi aderenti a *Slow Food* definiscono come anima costitutiva dell'associazione:

"The task of education would be, first and foremost, the transmission of ideas and value, of what to do with our lives…more education can help us only if it produces more wisdom….but values do not help us pick our way through life unless they have become our own…this means that they are more than mere formulae or dogmatic assertions: that we think and feel with them, that they are the very instruments through which we look at, interpret and experience the world…"[1]

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1 "Il compito dell'educazione dovrebbe consistere, prima di tutto, nella trasmissione di idee e di valori, di ciò che ha a che fare con la nostra vita ... la formazione ci può aiutare solo se produce più grande saggezza .... i valori non ci aiuteranno a scegliere la nostra strada attraverso la vita a meno che essi non diventino i nostri valori ... questo significa che: essi dovrebbero essere qualcosa di più che mere formule o asserzioni dogmatiche; dovremmo pensare e sentire grazie ad essi; essi dovrebbero essere gli strumenti con cui guardiamo, interpretiamo e viviamo il mondo.." (trad. nostra). Retrieved from "http://www.slowfood.com/education/pagine/eng/pagina.lasso?-id_pg=6"

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La scrittura multimediale: una strategia didattica all'interno del progetto cl@ssi 2.0

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Abstract
Il presente contributo intende descrivere un'esperienza didattica realizzata nell'ambito del progetto cl@ssi 2.0, presso l'Istituto Maria Immacolata a San Giovanni Rotondo (FG), focalizzata sull'utilizzo della scrittura multimediale intesa come strategia didattica.
 La progettazione didattica prevista, concordata con l'èquipe di ricerca dell'ERIDLab (Educational Research & Interaction Design) afferente al Dipartimento di Studi Umanistici (Università degli Studi di Foggia) e con i docenti della classe coinvolta, ha comportato la realizzazione di azioni finalizzate alla promozione di un approccio dialogico (costruzione di un continuo confronto tra le conoscenze e l'esperienza dei media) e un approccio dinamico (costante passaggio tra diverse forme di apprendimento: azione e riflessione, pratica e teoria).
La sperimentazione didattica coordinata dell'èquipe dell'ERIDlab è stata suddivisa nelle seguenti fasi: presentazione dell'èquipe di ricerca alla classe e lezioni frontali sull'utilizzo della scrittura multimediale; realizzazione di contenuti multimediali concordati dai docenti; revisione dei materiali da parte dei docenti e dell'èquipe di ricerca dell'EridLab; somministrazione di questionari agli studenti; condivisione della ricerca e pubblicazione dei risultati.
La metodologia didattica utilizzata è stata lo studio di caso: nello specifico la classe suddivisa in tre gruppi ha analizzato politica, la scuola siciliana e l'architettura nel periodo di Federico II di Svevia.

Parole chiave
classi2.0, scrittura multimediale, sperimentazione, partecipazione

1. Premessa teorica del progetto

La sperimentazione condotta nell'ambito del progetto cl@ssi2.0 ha coinvolto la classe 3° D dell'Istituto Maria Immacolata di San Giovanni Rotondo.

Il progetto scritto e realizzato in collaborazione con i docenti appartenenti all'Istituto menzionato e dall'èquipe di ricerca dell'ERIDLab ha avuto l'obiettivo di realizzare contenuti digitali utilizzando la scrittura multimediale.

Sulla base del modello pedagogico costruttivista, associato all'inclusione delle tecnologie intese come amplificatori, il percorso didattico ha previsto la realizzazione di contesti di apprendimento attivi, situati e collaborativi.

I focus della ricerca nell'ambito di tale progetto non si è concentrato solo sull'utilizzo delle tecnologie in classe ma sulle modifiche che esse hanno apportato nell'ambito delle metodologie didattiche.

Gli obiettivi da raggiungere nell'ambito della sperimentazione sono stati i seguenti:
- utilizzare la scrittura multimediale come pratica didattica;
- creare un clima collaborativo in classe tra studenti e docenti;
- realizzare contenuti digitali;
- acquisire competenze digitali specifiche;
- pubblicare i risultati e renderli fruibili in rete.

La scrittura, identificata come processo, ossia un insieme di comportamenti e di operazioni, migliora il pensiero attraverso la metacognizione (riflessione sul proprio processo di scrittura).

Con l'introduzione dei media, la scrittura consente lo sviluppo di ulteriori abilità.

A tal proposito, Rossana Costa delinea in uno schema le abilità che sviluppa l'utilizzo della scrittura multimediale:

Figura 1. Fasi operative per la scrittura multimediale (Costa, 1999, p. 20)

Le fasi indicate dimostrano che il percorso di scrittura multimediale è inteso come "un percorso non lineare, non sequenziale ma reticolare, in cui ogni stadio, ogni tappa operativa, non inizia e si conclude necessariamente quando la precedente è terminata, ma può sia procedere in parallelo, sia essere interrotta in qualsiasi momento". (Costa, 1999, p. 19).

La prima fase, la progettazione prevede la scelta dell'argomento, del titolo del multimedia, la costruzione della mappa concettuale, la definizione degli obiettivi generali e degli obiettivi specifici di scrittura, la scelta del tipo di testo, la previsione del tempo di realizzazione e adattamento al calendario scolastico, le condizioni organizzative, la realizzazione dei materiali guida, l'identificazione degli indicatori.

La fase successiva (propositiva) comprende la ricerca e l'approfondimento dei contenuti, la raccolta dei materiali, la definizione dell'architettura del multimedia, a partire dai nodi e dai legami della mappa concettuale elaborata durante la fase quadro, la redazione dello storyboard con assegnazione di materiali ai singoli nodi dell'ipermedia e organizzazione delle singole schermate secondo logiche plurilinguistiche.

In questa fase infatti, sono coinvolte competenze legate al linguaggio: i processi mentali associativi e i processi immaginativi e inferenziali legati alla formulazione delle ipotesi, processi di analisi/valutazione (revisione in itinere) rispetto ai diversi piani costitutivi del testo, processi tesi al continuo riaggiustamento del testo rispetto agli obiettivi scelti.

La fase successiva, organizzativa prevede la definizione dell'hardware, la predisposizione delle dotazioni di bordo, la razionalizzazione degli ambienti operativi

(le attrezzature per lo sviluppo del multimedia), le attrezzature per la masterizzazione e la scelta del software di grafica.

Le diverse tecnologie e i relativi software richiedono capacità d'uso specifiche: conoscenza dei formati grafici e delle tecniche di conversione, conoscenza dei processi di digitalizzazione audio-video.

 Questo processo è propedeutico per il successivo, la fase realizzativa che consiste nel realizzare il progetto di scrittura.

Durante la realizzazione si procede alla revisione dell'elaborato, al confronto con obiettivi iniziali, alla revisione critica, alla distribuzione dei compiti, al processo di realizzazione testuale che è suddiviso in otto fasi: realizzazione di fotografie, di disegni, di riprese video, della formattazione del testo scritto, acquisizione di immagini da scanner, fotografiche, televisive, suoni, ecc.

L'ultima fase, quella valutativa prevede un controllo accurato di tutte le diverse fasi: i processi meta cognitivi (autoregolazione della scrittura), e conoscenze meta cognitive, (convenzioni che regolano i testi multimediali, tipologie testuali) attraverso interventi di tipo riabilitativo che possono produrre modifiche sostanziali.

Decisivo in tale contesto è il ruolo del gruppo che si costruisce.

Partendo dall'ipotesi teorica formulata da Kaye, il gruppo consente determinati risultati:

-l'interazione con il gruppo permette di costruire nuovi significati del mondo e di accedere a domini di conoscenza più avanzati;

-l'interazione con gli altri è un mezzo per conoscere se stessi e per esprimere se stessi (Kaye,1994).

Particolare importanza nella costruzione dei gruppi assume il docente che dovrebbe decidere le dimensioni dei gruppi, assegnare i ruoli, organizzare il setting dell'aula, spiegare il compito da svolgere agli alunni, i criteri di valutazione, strutturare l'interdipendenza positiva, la cooperazione intergruppo, la responsabilità individuale, monitorare il comportamento degli studenti, intervenire per migliorare il lavoro del gruppo.

La fase finale comprende la valutazione dell'apprendimento e con esso il funzionamento dei gruppi.

2. Descrizione delle fasi della sperimentazione

La sperimentazione è stata articolata nelle seguenti fasi:
- Presentazione del progetto;
- Lezioni frontali inerenti al scrittura multimediale;
- Realizzazione di contenuti multimediali da parte degli studenti;
- Revisione da parte dei docenti degli realizzati dagli studenti;
- Somministrazione di questionari di valutazione agli studenti;
- Condivisione della ricerca e pubblicazione dei risultati.

Inizialmente l'èquipe di ricerca dell'ERIDLab (Educational Research and Interaction Design) ha presentato il progetto di ricerca ai docenti indicando fasi, obiettivi, tempi ed attrezzature necessarie per la realizzazione. Dopo essere stato approvato, il percorso didattico illustrato ai docenti, l'èquipe di ricerca dell'ERIDLab si è recato nuovamente presso l'Istituto Immacolata per incontrare gli studenti coinvolti nella sperimentazione e presentare il progetto.

La durata della sperimentazione ha avuto come tempi tre mesi (Dicembre 2012-Marzo 2013) nel corso dei quali gli studenti ed i docenti si incontravano due volte a settimana.

Le ore previste sono state extracurriculari ed ogni singolo incontro durava tre ore.

Dopo una breve lezione teorica sui principi della scrittura multimediale (la multi sequenzialità o multimedialità, la non sequenzialità, l'accesso aperto, la messa in rete dei contenuti, una gerarchia variabile dei contenuti, la frammentazione delle unità formative, l'indefinibilità dei confini) e sul suo utilizzo, gli studenti sono stati suddivisi in gruppi, precisamente tre ed hanno scelto gli argomenti su cui realizzare contenuti multimediali.

Il percorso didattico realizzato ha avuto come punto di riferimento le fasi individuate da Rossana Costa per la realizzazione di contenuti multimediali.

I docenti e l'èquipe di ricerca avevano precedentemente scelto un tema trasversale: la figura di Federico II re di Svevia.

La prima fase (la progettazione) ha previsto la scelta dell'argomento (storia e politica, cultura e letteratura, architettura nel periodo di Federico II).

Ogni gruppo ha individuato questi macrotemi concordati con i docenti e con l'esperto esterno.

All'interno di ogni gruppo costituito da 5-6 alunni, gli studenti hanno approfondito le seguenti tematiche: biografia, politica interne ed estera per il macrotema storia e politica; la poesia siciliana ed il rapporto tra Dante e Federco II per la cultura e la letteratura; il Castello Fiorentino, Castel del Monte ed il Palatium di Lucera e di Foggia per la sezione dedicata all'architettura.

Individuati i temi gli studenti hanno cercato le immagini sul web, hanno completato lo storyboard con le eventuali di materiali ai singoli nodi dell'ipermedia e organizzazione delle singole schermate secondo logiche plurilinguistiche (fase propositiva).

Successivamente gli studenti si sono soffermati sull'utilizzo di prezi (applicazione web che consente di creare presentazioni) per il montaggio delle immagini associate alla scrittura.

La fase successiva (realizzativa) ha previsto la revisione dell'elaborato, al confronto con obiettivi iniziali, alla revisione critica, alla distribuzione dei compiti, al processo di realizzazione testuale che è suddiviso in otto fasi: realizzazione di fotografie, di disegni, di riprese video, della formattazione del testo scritto, acquisizione di immagini da scanner, fotografiche, televisive, suoni, ecc.

Sono state utilizzate le attrezzature presenti nell'aula della classe 3° D, Cl@ssi 2.0: Lavagna Interattiva Mulitmediale, Netbook in dotazione a tutti gli alunni ed a tutti i docenti.

I software utilizzati sono stati i principali programmmi del pacchetto Office di Microsoft, programmi specifici come Prezi, Geogebra, Audacity, iMovie e Dreamweawer; inoltre si é utilizzata la piattaforma Windows Live.

Al termine del percorso, i docenti e l'esperto esterno hanno effettuato la revisione dei materiali valutandoli mediante una griglia convalidata all'interno del progetto Cl@ssi 2.0.

	Mediocre (5)	Sufficiente (6)	Soddisfacente (7)	Buono (8)	Distinto (9)	Ottimo (10)
Contenuti Pluridisciplinari						
Usabilità navigabilità						
Aspetti e contenuti multimediali						
Intefaccia grafica, originalità						
Arhitettura complessiva						
TOTALE	In lettere				In cifre:	

Tabella 2. Rubrica di valutazione convalidata all'interno del progetto cl@ssi2.0.

Lo schema rappresentato costituisce una rubric. La scelta di tale strumento è stata motivata in quanto le rubriche "sono intese come dispositivi in grado di promuovere l'apprendimento degli studenti e contemporaneamente come strumenti che possono avere ricadute positive nell'intero sistema educativo". (Limone, 2012, p. 66).

Gli studenti ed i docenti con le rubric sono stimolati all'esercizio della pratica riflessiva anche attraverso i criteri elencati che sono stati condivisi dai docenti e dall'esperto esterno.

I docenti e l'esperto esterno che hanno preso parte alla sperimentazione non hanno avuto un ruolo marginale.

In particolare, entrambi hanno fornito indicazioni nella fase preliminare: definire gli obiettivi della sperimentazione, decidere le dimensioni dei gruppi, assegnare i ruoli agli studenti (scelta delle immagini, stesura dei testi, elaborazione sui software, montaggio video, ecc.), sistemazione dell'aula ed organizzazione dei materiali (utilizzo dei software ed assegnazione dei temi da svolgere).

Sono intervenuti spesso nelle dinamiche di gruppo stimolando l'interdipendenza positiva e strutturando la cooperazione di intere gruppo, la responsabilità individuale e la responsabilità sociale (principi teorizzati da David W. e Roger T. Johnson e da Edythe J. Holubec , 1996).

Anche l'esperto esterno è stato presente collegandosi online su skype con orari stabiliti e concordati con gli studenti.

Si è creato a tal proposito, uno spazio di discussione tra docenti, studenti ed esperto esterno per monitorare il percorso didattico.

Tale contesto ha agevolato scambio e condivisione tra tutti i soggetti coinvolti nella sperimentazione.

Le metodologie didattiche utilizzate sono state lo studio di caso, il learning by doing.

La scelta della prima metodologia è stata motivata dal lavoro specifico svolto dagli studenti: lo studio sull'epoca storica di Federico II, argomento svolto attraverso criteri trans-disciplinari. Sono state coinvolte tutte le materie (ogni gruppo ha individuato una propria specificità) e tutti i docenti hanno fornito il loro contributo.

L'apprendimento, in tale contesto fondato su matrice socio-costruttivista è considerato situato, legato ad un contesto ed in questo caso, l'apporto dei media ha costituito una valida risorsa in termini di mezzi (fotografie, lucidi, software che gli studenti hanno utilizzato) e considerando la realizzazione di ambiente di apprendimento (processi di progettazione e produzione legati alla realizzazione degli elaborati).

Come afferma Nicola Paparella, "considerare le tecnologie come ambiente di apprendimento significa attribuire ad esse il significato di contesto relazionale nel quale è compresa la persona posta al centro del flusso transattivo entro il quale può crescere il soggetto" (Celentano- Colazzo 2008, p. 12).

La sperimentazione didattica realizzata ha costituito dunque un esempio di condivisione di conoscenze tra gli alunni finalizzata all'acquisizione di abilità trasversali e al miglioramento del livello di apprendimento dell'intero gruppo classe.

I contenuti multimediali realizzati mediante il software prezy, al termine del percorso sono stati esportati sul sito della scuola www.magistarle-immacolata.it.

Figura 3. Screenshot del portale dell' Istituto Maria Immacolata.

La sperimentazione si è conclusa con la consegna degli attesati agli studenti con il riconoscimento di 1 credito formativo per gli studenti che si iscriveranno al corso di laurea in Scienze dell'Educazione.

3. Osservazioni

Negli anni '70, l'utilizzo della scrittura era intesa come processo. Successivamente lo studio di Hayes e Flower negli anni '80, ha consentito l'articolazione di questo processo in fasi: pianificazione (organizzazione e definizione dei criteri), stesura, revisione (lettura e correzione), controllo.

La nascita del costruttivismo sociale ha posto maggiore attenzione sull'attività pratica di tale processo inteso come attività contestualizzata. Tale studio si è concentrato sulle relative abilità che essa sviluppa.

Bereiter e Scardamalia (1987) individuarono lo sviluppo di sei abilità specifiche attraverso il processo di scrittura: fluidità nella produzione del linguaggio scritto, fluidità nel genere di idee, padronanza delle convenzioni della scrittura; sensibilità sociale (capacità di tenere conto del lettore), capacità di apprezzamento e discriminazione; pensiero riflessivo.

Tale processo è agevolato con l'utilizzo dei software associati al processo di scrittura, come afferma Rossana Costa, definendola scrittura elettronica " è sempre collocata nel quadro di obiettivi generali volti alla crescita dello studente, all'acquisizione di nuove competenze e saperi e collocata nel quadro di un progetto formativo complessivo che parte da un problema, si fonda su ipotesi da verificare, sulla ricerca di soluzioni e la realizzazione di compiti operativi per i quali adotta logiche trasversali, superando la parcellizzazione delle materie. Questo comporta una dimensione collegiale di scambio confronto fra docenti tesa all'analisi delle diverse discipline e alla valutazione delle possibili interazioni; alla definizione di metodologie di indagine e all'uso di una pluralità di strumenti diversi (procedure, linguaggi, ecc.); al reperimento di competenze specifiche da mettere in comune, oltre che all'individuazione delle dirette responsabilità di ognuno (con le proprie specificità disciplinari) all'interno del progetto" (Costa, 1999, p. 19-20).

La definizione attribuita alla scrittura multimediale è stata ampiamente confermata nell'ambito di questa sperimentazione didattica. Le competenze acquisite da parte degli studenti sono state specifiche (legate al processo di scrittura), tecniche (o digitali) ed extratestuali (il lavoro di gruppo ha consentito lo sviluppo di competenze relazionali e progettuali, problem solving).

Gli studenti hanno infatti acquisito competenze di scrittura: impostare il compito di scrittura elettronica definendone i parametri essenziali (argomento, obiettivi, destinatari, tipo di multimedia, ecc.); saper mettere a punto dati e idee attraverso la consultazione di materiali e attraverso ricerche; saper organizzare e pianificare i contenuti elaborando scalette e storyboard; saper scegliere e realizzare i materiali audio e video; saper utilizzare gli ambienti di sviluppo multimediali per la messa in forma finale del multimedia; saper utilizzare forme di revisione del testo in itinere e finali.

Le competenze che riguardano la sfera più tecnica e digitale son legate principalmente all'utilizzo delle tecnologie: tool di authoring (power point, prezy) per slide elettroniche; tool di grafica bitmap (adobe illustrator, Photoshop), gallery e digital bank (clipart vettoriali, foto, suoni video).

Per quanto riguarda la competenza digitale è complesso identificare tutte le abilità che essa sviluppa.

Tra le Raccomandazioni dell'Unione Europea (2006) è la quarta delle competenze chiave per l'apprendimento permanente; consiste *[...]* "nel saper utilizzare, con dimestichezza e spirito critico, le tecnologie della società dell'informazione (TSI) per il lavoro, il tempo libero e la comunicazione. Essa è supportata dalle abilità di base nelle TIC (Tecnologie di Informazione e di Comunicazione): l'uso del computer per reperire, valutare, conservare, produrre, presentare e scambiare informazioni nonché per comunicare e partecipare a reti collaborative tramite Internet" (2006/962/CE).

Se la competenza digitale assume una rilevanza pedagogica (come in questa esperienza didattica) "deve implicare una visione quadro, la capacità di saper valutare una varietà di soluzioni tecnologiche e il possesso di un'attrezzatura cognitiva e culturale di riferimento da conseguire, in particolare, sotto forma di capacità di selezione e trattamento delle informazioni, delle loro fonti e affidabilità" (Calvani, Fini Ranieri, p. 46-47).

Dunque, la competenza digitale racchiude più dimensione dell'agire educativo. Antonio Calvani, Antonio Fini e Maria Ranieri individuano tre dimensioni: tecnologica, cognitiva ed etica.

La prima dimensione riguarda un set di abilità che e nozioni di base che consentono di valutare, conservare, produrre, presentare e conservare informazioni integrate con la capacità di scegliere tecnologie opportune per affrontare problemi reali, la dimensione cognitiva racchiude la capacità di leggere, selezionare, interpretare e valutare dati, costruire modelli astratti e valutare informazioni considerando la loro pertinenza e affidabilità, l'ultima dimensione (etica) implica una responsabilità sociale nel sapersi comportare adeguatamente nel cyberspazio rispetto della privacy, netiquette e socioquette. (Calvani, Fini, Ranieri, 2010, pag. 50-51).

Le tre dimensioni possono integrare situazioni più complesse e racchiudere competenze diversificate.

Come afferma Antonio Calvani "di competenza si parla sempre più oggi nel dibattito educativo (…) ma indipendentemente dal lessico che si usa, è importante prendere spunto per spostare l'attenzione dal puro contenuto (inerte) della conoscenza alla sua applicabilità, usabilità, spendibilità come elemento socialmente significativo e alla consapevolezza che deve accompagnare il soggetto circa criteri, spazi e forme della sua applicabilità: questa dimensione metaconoscitiva è il punto chiave che offre un varco alla trasversalità della conoscenza in contesti sociali diversi" (Calvani, Fini, Ranieri, 2010, pag. 60).

La sperimentazione didattica presentata ha avuto l'obiettivo di trasferire i sapere e le conoscenze degli alunni ad una dimensione che andasse oltre i contenuti delle singole discipline.

La realizzazione degli elaborati multimediali pur avendo dei temi stabiliti ha consentito di approfondire le loro conoscenze sia dal punto di vista dei contenuti (ricerche sul periodo storico), sia dal punto di vista delle abilità (utilizzare i software).

Anche le dinamiche di gruppo che si sono verificate tra gli studenti (sviluppo di competenze extratestuali) hanno consentito una confronto ed una verifica costante sul rapporto relazionale all'interno della classe.

I docenti hanno avuto la possibilità di confrontarsi tra di loro sui contenuti e di assumere il ruolo di facilitatori dell'apprendimento lasciando ampio spazio all'autonomia degli studenti.

4. Conclusioni

L'esperienza didattica raccontata in tale contributo ha raggiunto i seguenti obiettivi:
- sperimentare metodologie didattiche innovative per promuovere lo sviluppo di competenze meta cognitive;
- favorire il rapporto tra tecnologie e didattica per migliorare i processi di insegnamento-apprendimento;
- educare alla riflessività professionale per formare individui consapevoli sulle loro competenze;
- favorire il confronto dialettico e la collaborazione tra istituzioni (scuola ed Università) per co-progettare azioni formative;
- produrre e validare materiali didattici in spazi virtuali di socializzazione e condivisione.

I risultati conseguiti sono visibili nel seguente istogramma:
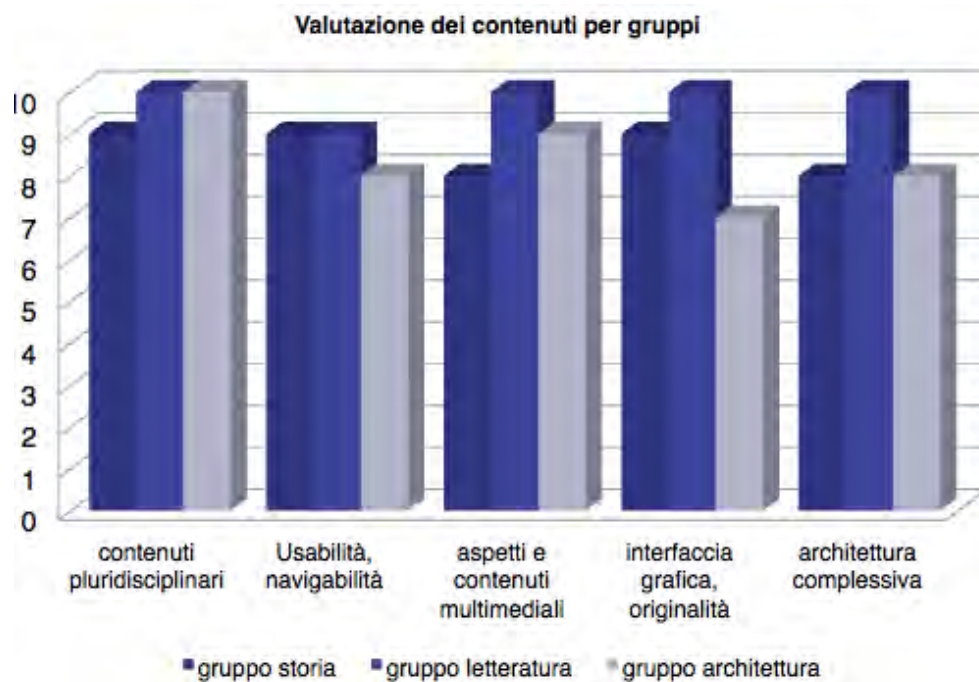
Figura 4. Istogramma della valutazione degli elaborati mutimediali.

Il gruppo che ha raggiunto maggior punteggio è stato quello di letteratura. Quest'ultimo schema rende maggiormente visibili i risultati in decimi:
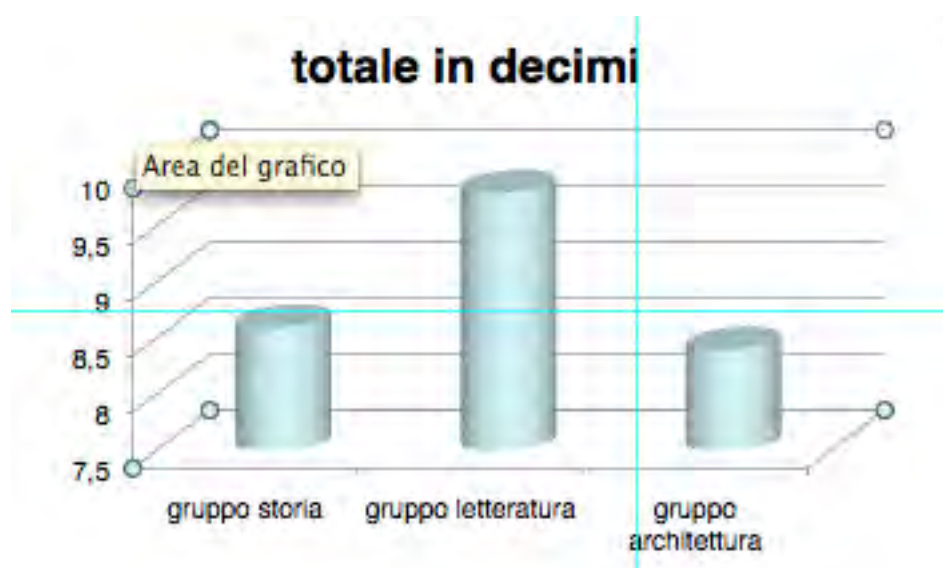
Figura 5. Istogramma valutazione in decimi per ogni gruppo di studente.

La rubrica utilizzata per valutare ha rappresentato per i docenti e l'esperto esterno uno strumento utile per allineare tre variabili chiave della formazione: apprendimento, insegnamento e valutazione (teacher-centred).

Per le dinamiche di gruppo i docenti hanno proposto una griglia di valutazione specifica per analizzare l'influenza del lavoro di gruppo sulle competenze relazionali.

La griglia è stata scelta all'interno del sito www.scuola.zanichelli.it dopo un'accurata analisi sulla pertinenza degli indicatori in relazione agli obiettivi del progetto.

	GRUPPO STORIA	GRUPPO LETTERATURA	GRUPPO ARCHITETTURA
PARTECIPAZIONE ALLE ATTIVITA' DEL GRUPPO			
La partecipazione alle attività avviene spontaneamente	quasi sempre	quasi sempre	spesso
La divisione del lavoro tra i partecipanti	spesso	quasi sempre	spesso
Il confronto è onesto senza interruzioni e prevaricazione da parte dei componenti	spesso	quasi sempre	qualche volta
PERTINENZA AL TEMA PROPOSTO			
L'attenzione a ciò che viene detto è positiva	spesso	quasi sempre	qualche volta
Gli interventi proposti sono pertinenti al tema	quasi sempre	quasi sempre	spesso
Il gruppo va fuori tema o cambia il soggetto	raramente	raramente	qualche volta
CONTRIBUTO AL LAVORO DI GRUPPO			
Le idee e i suggerimenti proposti aiutano il gruppo	quasi sempre	quasi sempre	qualche volta
Le osservazioni critiche e i commenti sono costruttivi	quasi sempre	quasi sempre	quasi sempre
Gli interventi influenzano positivamente le decisioni del gruppoe la sua programmazione	quasi sempre	quasi sempre	quasi sempre
CONSIDERAZIONE DEGLI ALTRI			
Le considerazioni sui comportamenti del gruppo e le idee sono positive e di incoraggiamento	spesso	quasi sempre	qualche volta
Il riconoscimento degli altri e delle loro idee è espresso apertamente	raramente	raramente	raramente
Le considerazioni negative sui componenti del gruppo sono comunicate apertamente	qualche volta	raramente	qualche volta
COINVOLGIMENTO DEGLI ALTRI			
Il coinvolgimento degli altri è richiesto con domande dirette e precise			
Il far lavorare insieme il gruppo è un obiettivo condiviso	spesso	Spesso	qualche volta
Le idee degli altri sono prese seriamente in considerazione	quasi sempre	quasi sempre	quasi sempre
COMUNICAZIONE			
La comunicazione è chiara, corretta e scomoda	quasi sempre	quasi sempre	qualche volta
Le idee sono espresse con chiarezza e in modo efficace	quasi sempre	quasi sempre	qualche volta

Figura 6. Griglia adattata dal sito
http://scuola.zanichelli.it/online/frontoffice/files/2010/07/scheda-valutazione-lavoro-di-gruppo.pdf.

Come si evince dalla griglia, la sperimentazione ha prodotto degli ottimi risultati nell'ambito dell'interazione tra gli studenti sviluppando un'efficace comunicazione e un'attiva partecipazione alle attività svolte con il coinvolgimento da parte di tutti.

Per concludere, l'esperienza didattica realizzata ha rappresentato un nuovo ambiente di apprendimento inteso come comunità integrata tra le diverse competenze e conoscenze nell'ambito della transdisciplinarità dei saperi transmultimedialià dei linguaggi.

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Sviluppare conoscenze e competenze per l'espressione verbo-sonora attraverso il medium radio. L'insegnamento laboratoriale di scrittura radiofonica del Corso di Studi in Teorie e Metodologie dell'e-learning e della media education (E-Media)

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Abstract
Questo contributo vuole descrivere, analizzare e proporre una significativa storia di caso relativa ad un'esperienza didattico-formativa che si è progressivamente evoluta, a partire dal suo momento iniziale di erogazione svolto esclusivamente in presenza, lungo i dieci anni della sua attivazione, per arrivare, dall'anno accademico 2008/2009, alla sua specifica attuale formulazione *blended*. Si tratta di un insegnamento laboratoriale di un corso di laurea magistrale *online* che abbiamo progettato, che abbiamo condotto e che conduciamo tutt'oggi. In quanto insegnamento *online* esso si basa operativamente per la parte a distanza su di una piattaforma digitale di comunicazione formativa (moodle) che permette di mantenere consultabile nel tempo ogni sua edizione. Così, alla base di questo nostro saggio, oltre ai diversi riferimenti teorici, vi sono anche i dati accumulati nel tempo durante l'attuazione di questa esperienza, oltre alle trasmissioni radiofoniche realizzate negli anni dagli studenti in quanto obiettivi/risultati formativi dell'azione didattico-formativa. Gli scopi che ci riproponiamo con questo contributo, oltre alla storicizzazione di tale attività/modalità di formazione, sono soprattutto quelli di delineare questo modello didattico-formativo, risultato di successo, al contempo documentando e sollecitando il potenziale valore educativo del medium radio e del suo linguaggio attraverso la 'lettura' e, come in questo caso, la 'scrittura' e quindi il 'fare radio'. Si tratta a nostro avviso di una Buona Pratica che come tale speriamo possa essere adottata e si possa diffondere anche in altre istituzioni socio-educativo-culturali formali e non formali.

Parole chiave
media, education, radio, linguaggio verbo-sonoro, e-learning

1. Alcuni dati quantitativi relativi alla storia di caso didattico-formativo dell'insegnamento laboratoriale di scrittura radiofonica

Prima di mostrare i dati, che permettono di dare una prima configurazione quantitativa di questa esperienza didattica, è secondo noi necessario precisare che se questi dati non fossero anche collegati ad un successo formativo e culturale di tale proposta didattico-educativa, verificabile innanzitutto dai risultati ottenuti nella realizzazione in prima persona da parte degli studenti delle diverse trasmissioni radiofoniche prodotte in ogni edizione del corso, questi perderebbero sostanzialmente di significato e consistenza. Considerati invece i risultati ottenuti nel tempo in relazione agli obiettivi didattico-formativi che sono stati delineati per questa azione formativa, possiamo ragionevolmente pensare che essi consentano oggi di sostanziare significativamente questa esperienza del suo valore.

Iniziamo dal numero di studenti che in questi anni hanno fruito di questa esperienza formativa. Si tratta di cinquantadue studenti nei cinque anni di erogazione del master MEAM - Master in Educazione Audiovisiva e Mutimediale, che hanno seguito l'insegnamento laboratoriale completamente in presenza. Per quanto riguarda invece l'esperienza *blended* a distanza e in presenza, inserita nel Corso di Laurea in Teorie e Metodologie dell'E-Learning e della Media Education (E-Media), che è poi il *focus* di questo contributo, fino all'anno accademico 2011/2012 compreso, il numero è di duecentonovanta studenti. Altri trentotto lo svolgeranno durante l'a.a. 2012/2013. Nell'insieme si tratta di trecentottanta studenti. Per quanto riguarda quelli del solo percorso *blended* è invece di trecentoventotto.

Le trasmissioni tematiche radiofoniche di durata di ca 1h30' ciascuna realizzate nei primi quattro anni di erogazione di questo corso di laurea magistrale nel loro complesso sono state sette. Sette è anche il numero dei laboratori svolti in questi primi quattro anni dell'insegnamento laboratoriale di scrittura radiofonica. La differenza tra il numero delle edizioni (4), corrispondente al numero degli anni accademici in cui il corso è stato fin qui erogato, e il numero dei laboratori (7), è dovuto alla diversa quantità annuale degli iscritti al corso di laurea che hanno reso necessario, a seconda degli anni accademici, sdoppiamenti e triplicamenti. Ciascun laboratorio prevede una durata di ca cinque settimane di durata per la sua attuazione *online* più una giornata conclusiva *full immersion* in presenza. La parte in presenza, in relazione alle condizioni date, relative agli spazi e alla presenza certa del singolo docente, è stata progettata per un massimo di trenta persone alla volta. Mentre per quanto riguarda la parte *online* il numero dei *tutor* è variato da uno a tre a seconda della quantità annuale degli iscritti. All'interno delle singole 'classi' di laboratorio, che come abbiamo appena riferito sono state composte da un massimo di circa trenta studenti, questi vengono suddivisi in gruppi che in media sono composti da sei persone (variano a seconda delle condizioni operative dalle quattro -si cerca di non scendere mai sotto questo numero, considerato minimo per un lavoro di gruppo di questo tipo- alle 7/8 unità). Questi gruppi di lavoro nel complesso dei quattro anni di attivazione di E-Media sono stati cinquantuno così suddivisi nei diversi anni: 5 gruppi/I° anno; 30 gruppi/II° anno; 5 gruppi/III° anno, 11 gruppi IV° anno).

2. Dal modello laboratoriale in presenza a quello online *blended*: nuove modalità di interazione comunicativa tra attori del processo didattico-formativo (docente, tutor, studenti)

Le prime sperimentazioni di questa tipologia di laboratorio mediale si sono svolte nei cinque precedenti anni di erogazione del master MEAM - Educazione Audiovisiva e Multimediale (Luciani, 2005) sempre nell'ambito della stessa università e da parte dello stesso

gruppo di ricerca e di azione didattica (Settore Tecnologie Educative - Dipartimento di Scienze dell'Educazione - Facoltà di Scienze della Formazione). Master, le cui attività didattico-formative hanno contribuito, e sono state per diversi aspetti all'origine dell'attivazione del nuovo corso di laurea E-Media a partire dall'anno accademico 2008/2009. Il passaggio dal precedente modello didattico in presenza del master a quello *online* del corso di laurea ha obbligato ad una ridefinizione generale della struttura didattica, delle modalità di interazione comunicativa tra gli attori del processo (docenti, tutor, discenti) e in parte degli obiettivi formativi.

Così, confermando ancora una volta nel solco didattico-pedagogico tracciato in Italia almeno a partire dagli anni 60' del secolo scorso, anche in coincidenza con l'avvento di nuove, più accessibili, e più gestibili strumentazioni tecniche per la realizzazione espressiva mediale 'dal basso' (*bottom up*), l'esperienza formativa di 'attraversamento dei media' e quindi la conferma nell'ambito dell'educazione mediale del modello di azione didattica di lettura-scrittura (Galliani, 2002), il laboratorio, nel passaggio alla dimensione *online* del nuovo corso di laurea, è stato 'adattato' alle nuove condizioni operative. Questa ha ovviamente riguardato la dimensione temporale, vista la nuova situazione di comunicazione educativa asincrona e sempre disponibile dell'Open Distance Learning (ODL) che consente l'individualizzazione dei processi di apprendimento (Galliani, 2005a), la struttura erogativa modulare, alcuni contenuti/materiali didattici multimediali, ma soprattutto la dinamica comunicativa tra gli attori del processo. E' anche il caso di accennare brevemente in questo frangente che il *focus* formativo sulla scrittura radiofonica di E-Media si svolge, in modo distinto ma temporalmente correlato, a quello di scrittura video-filmica.

La mediazione didattico-comunicativa dell'insegnamento laboratoriale è strutturata in modo significativo sulla piattaforma di comunicazione 'moodle'. Questo comporta una dinamica comunicativa attiva e proattiva grazie a strumenti asincroni come i forum tematici che si situano all'interno dei singoli moduli formativi e, non solo in quest'area comunicativa della piattaforma, alla congiunta indispensabile azione di 'coordinamento sul campo' dei tutor. Queste figure sono mediatori esperti, che proprio per le dinamiche collaborativo-cooperative insite nell'ODL (Galliani, 2005b), devono possedere importanti capacità comunicative, competenze, e conoscenze, sia in relazione ai processi che in relazione a contenuti disciplinari così specifici e al contempo ampi nella loro complessa articolazione. Queste importanti figure di riferimento del processo di comunicazione educativa che si svolge *online* si configurano come mediatori-stimolatori nell'ambito di una comunità di pari dove "... viene messo in rilievo, quale elemento fondamentale, lo studio e il lavoro in gruppo e comunità [grazie ad un] processo integrato di azioni comunicative e apprenditive che riguardano il trasferimento di contenuti + lavoro di comunità" (Galliani, 2005b, p. 25).

La struttura erogativa modulare segna e scandisce lo sviluppo temporale dell'insegnamento. Tale necessaria dinamica temporale, pur procedendo senza interruzioni e/o slittamenti, tiene sempre conto di una certa flessibilità in relazione allo sviluppo dei forum tematici, alle consegne e alla produzione di materiali mediali, che non siano essenziali allo sviluppo progettuale e realizzativo della trasmissione. Si cerca di mantenere il più possibile, ovviamente entro i limiti dettati dalle necessità realizzative di gruppo nell'ambito di un insegnamento laboratoriale produttivo, la possibilità di personalizzazione dell'esperienza formativa. Ciò avviene anche grazie alla maggiore possibile flessibilità nella gestione dello spazio-tempo sempre con l'obiettivo di evitare l'esclusione o la difficoltà che spesso si incontra nei percorsi universitari in presenza. (Galliani, 2005a)

All'insegna del costante utilizzo di metodologie/strategie di comunicazione educativa interattiva online, della costruzione di conoscenza nonché della realizzazione attiva mediale di tipo collaborativo-cooperativo da parte degli studenti, si indirizza e si sostiene un'utilizzazione dinamica attiva e proattiva degli strumenti asincroni come i forum tematici.

La loro cadenza è regolata dallo svolgersi temporale della struttura erogativa modulare. Di questi strumenti se ne sollecitano le potenziali funzioni comunicativo-formative di riflessione sulle risorse, sui materiali didattico-formativi e sulle tematiche proposte, quelle di stimolazione/coinvolgimento all'attività proposta, oltre ad indurre riconoscimento/valorizzazione delle conoscenze, delle esperienze, delle competenze 'tacite' dei partecipanti e di coordinamento logistico-realizzativo tra i partecipanti in vista della fase produttiva in presenza, di approfondimento personale, e di confronto collaborativo. Lo strumento di co-scrittura/progettazione/produzione wiki utilizzato nelle fasi produttive *online* di co-costruzione della struttura/scaletta e della sceneggiatura complessiva della trasmissione ha già insito nella sua dimensione operativa le dinamiche cooperative che contraddistinguono i lavori dei gruppi. Completano questo complesso di strumenti/obiettivi/azioni i materiali didattici *online*, spesso selezionati da internet, che permettono di introdurre/esemplificare la ricerca della tipologia espressiva radiofonica che i partecipanti vorranno adottare nel loro 'fare radio' e che vengono utilizzati nel modo più interattivo possibile. Il 'magazzino' dei file audio realizzati dai singoli partecipanti, che diventano oggetto di discorso collaborativo nella comunità di apprendimento, se di sufficiente qualità saranno poi utilizzati nella fase di montaggio audio in presenza [1]. Infine, sono presenti i sempre attivi strumenti di comunicazione con il docente e il/i tutor (linea diretta e bacheca).

3. Struttura didattico-organizzativa

La durata complessiva del laboratorio radiofonico in modalità *blended* può variare da un mese ad un mese ed una settimana di durata per l'erogazione dei moduli *online* più una intera giornata *full immersion* finale in presenza.

La parte online è suddivisa in moduli temporalmente e tematicamente determinati. Il primo modulo che può durare dai sette ai nove giorni è dedicato alle ricerche sulla tematica unicizzante di raccordo per la realizzazione della/delle trasmissioni che di anno in anno viene proposta ai corsisti, alla riflessione sui generi espressivi della radio e all'ideazione/strutturazione della trasmissione. Il secondo modulo, che ha una durata variabile dai dodici giorni ai quattordici giorni è dedicato alla riflessione/scrittura collaborativa-cooperativa della scaletta/sceneggiatura della trasmissione. Il terzo modulo, che dura anch'esso dai dodici ai quattordici giorni, è dedicato alla produzione/valutazione/raccolta dei materiali audio.

A partire dall'attivazione del secondo modulo gli studenti vengono suddivisi in gruppi di lavoro autonomi ma tra di loro correlati ed in continua comunicazione grazie ad uno specifico forum di coordinamento/raccordo tra i gruppi. Questi gruppi sono composti in media da 6 studenti. Peraltro abbiamo già riferito, in apertura di questo contributo, come il numero complessivo degli iscritti sia molto variato nei diversi anni accademici di attivazione del corso. Così, in base al numero degli iscritti e al relativo numero di tutor, si è deciso di anno in anno sia la quantità di trasmissioni da realizzare, considerando che ogni gruppo deve sviluppare, sempre a seconda delle annate, dai dieci ai quindici minuti di porzione di trasmissione, sia il numero complessivo dei laboratori da attivare ogni anno. In questo modo il numero dei componenti del gruppo di lavoro, che potremmo definire come una 'unità minima operativa', è stato testato anche con gruppi poco più numerosi o un pò meno numerosi[2] ottenendo in ogni caso i risultati didatticamente definiti.

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[1] In caso contrario le tracce audio che comportino l'intervento vocale di uno o più partecipanti vengono nuovamente realizzate grazie a strumentazioni tecniche di trasmissione/registrazione del suono più performanti.
[2] Il minimo sotto il quale si è deciso di non scendere nella composizione del gruppo è di quattro persone; il massimo oltre il quale non si è voluto salire è di otto.

Conclude l'esperienza una intera giornata *full immersion* di lavoro in presenza che si sviluppa con un momento iniziale collettivo per poi proseguire con gli stessi gruppi che sono stati formati e che hanno già collaborato-cooperato online. La giornata in presenza ha lo scopo, sia di ripercorrere insieme il significato dell'esperienza laboratoriale nell'ambito di E-Media, sia per riassumere ed esplorare nuovamente la struttura del linguaggio verbo-sonoro in relazione alle finalità comunicative stabilite durante la parte *online*. Inoltre, consente l'esplorazione degli strumenti tecnici messi a disposizione dei corsisti, oltre ad essere il momento per un'ulteriore verifica e per l'eventuale rifinitura dei materiali audio realizzati in precedenza a livello personale, in questo caso grazie all'utilizzo di attrezzature tecniche professionali e prosumer. Si situa poi in questa fase il montaggio e l'equalizzazione definitiva delle varie tracce che andranno a comporre la porzione di trasmissione di cui lo stesso gruppo è responsabile, e che nel loro 'ordinato' insieme andranno poi a costituire la trasmissione radiofonica completa.

4. Modalità didattico-formative

Questa esperienza formativa si colloca chiaramente in una dimensione attiva dell'agire pedagogico-didattico. Nello svolgimento del processo educativo la centralità dei partecipanti e la dimensione operativa collaborativa-cooperativa del fare mediale (*learning by doing*)[3] assumono un fondamentale rilievo procedurale. Il lavoro/studio come anche la valutazione/stimolazione di tutto l'insieme del processo formativo e le dinamiche di comunicazione educativa correlate si basano su azioni didattico-cognitive essenzialmente di tipo collaborativo e cooperativo. Allo stesso tempo tutto il percorso è permeato, proprio anche grazie agli strumenti offerti dalla piattaforma di comunicazione e gestiti nell'ottica *dell'Open Distance Learning*, da una dimensione educativa significativamente riflessiva[4]. Ciò avviene in relazione alle azioni realizzativo-espressivo-conoscitive dei partecipanti, essendo questo loro agire discorsivo e produttivo continuamente e quasi immediatamente sottoposto a risposte, osservazioni, argomentazioni, nuove proposizioni tra pari da parte dell'insieme della comunità di pratiche che si è costituita. Alla dimensione riflessiva correlata all'azione fa da 'contrappunto' quella necessariamente metariflessiva sul percorso del laboratorio nel suo complesso e sulle varie fasi di tale percorso. Il suo svolgersi modulare *online*, come processo didattico-formativo finalizzato ad un compito significativamente 'performativo', coinvolgente, responsabilizzante, che con diverse gradazioni ha incontrato in questi quattro anni di erogazione una adesione ed un forte coinvolgimento nella quasi totalità assoluta dei partecipanti, comporta una significativa partecipazione propositiva e una compartecipazione attiva di co-costruzione in itinere del processo e allo stesso tempo del progetto/obiettivo formativo-espressivo.

[3] Nel senso di attivare processi creativo-espressivi esperienziali come delineato da John Dewey quando afferma che: "La sola attività non costituisce esperienza. E' dispersiva, centrifuga, dissipante. L'esperienza come tentativo implica un cambiamento, ma il cambiamento non è che una transizione senza significato a meno che non sia coscientemente connesso con l'ondata di ritorno delle conseguenze che ne defluiscono" (2012, p. 151).
[4] Anche in questo caso nel senso espresso da John Dewey che pur indicando come nessuna esperienza significante possa esistere senza correlati elementi di pensiero, da un punto di vista di un maggiore e più performante risultato cognitivo-conoscitivo ci dice che solo quella che comporta un maggiore e più approfondito livello riflessivo non resta alla "mercè delle circostanze" (2012, p. 157). Quando si scoprono le connessioni dettagliate delle attività e di ciò che comportano come conseguenze, il pensiero implicito nell'esperienza acquisisce un rilievo quantitativo e un valore molto diverso. Questo fa sì che cambi la qualità dell'esperienza e "... il cambiamento è così significativo che possiamo chiamare questo tipo di esperienza riflessivo, cioè riflessivo eminentemente. Il coltivare deliberatamente questa fase di pensiero costituisce il pensare come esperienza a sé. Pensare è, in altre parole, il tentativo intenzionale di scoprire connessioni *specifiche* fra qualche cosa che facciamo e le conseguenze che ne risultano, in modo che le due cose diventino continue." (Dewey 2012, p. 158).

Se, come abbiamo già precedentemente accennato, il paradigma pedagogico ispirativo del laboratorio ci dice "che la dicotomia 'educazione ai media/educazione con i media, ovvero *paradigma semiotico-ideologico* versus *paradigma tecnologico-funzionalista*, trova soluzione nell'azione didattica di lettura-scrittura, cioè nella comunicazione educativa mediatizzata (attraverso i media), che è allo stesso tempo conoscenza critica dei linguaggi mediali contestualizzati socialmente, uso dei media tecnologici nello studio-apprendimento individuale e collaborativo dei saperi, forma espressivo-artistica originale di comunicazione tecnologica e sociale" [5] (Galliani 2002, pp. 568-569), allora risulta evidente come sia necessario prevedere dei momenti di approfondimento dedicati alla 'lettura' dei testi mediali audiovisivi[6] specificatamente correlati con i momenti formativi riservati alla 'scrittura'. Per questo l'inquadramento didattico del laboratorio nel contesto del Corso di laurea magistrale E-Media è correlato e contemporaneo, anche se ovviamente contenutisticamente distinto, all'insegnamento laboratoriale di scrittura video-filmica ed è direttamente consequenziale all'insegnamento di Teorie e tecniche del linguaggio radiotelevisivo, che nell'insieme costituiscono insegnamento unitario. E' nell'ambito di questo insegnamento più teorico[7] che vengono affrontate le specifiche tecnologie/contenuti/conoscenze/problematiche relative al linguaggio radiofonico (verbo-sonoro, sul piano sintattico) e a quello televisivo (audiovisivo-cinetico, sul piano sintattico), oltre alla contestualizzazione socio-comunicativa dei relativi testi mediali sia sul piano semantico-pragmatico che su quello storico-evolutivo. L'insegnamento poi si svolge come insegnamento obbligatorio alla fine del secondo semestre del primo dei due anni complessivi di durata del Corso. Tale collocazione temporale consente di farlo precedere da almeno due insegnamenti teorici che sono ad esso significativamente correlati e che contribuiscono a dare rilievo al piano della 'lettura' dei media audiovisivi: Semiotica dei testi audiovisivi e multimediali e Formati culturali ed educativi della produzione audiovisiva. In realtà, trattandosi di un Corso di studi significativamente specialistico, e che trae origine sia da un *corpus* di studi educativi e comunicativi intrecciati e per certi aspetti affini[8], sia da un insieme di precedenti esperienze didattico-formative universitarie (master, corsi di perfezionamento, corsi universitari) tra loro sufficientemente in contatto e in qualche modo reciprocamente influenzate, tutti gli insegnamenti teorici e laboratoriali che precedono quello in questione, come anche questo, in relazione agli insegnamenti che lo seguono nel secondo anno, si riverberano e si 'contagiano' reciprocamente sia sul piano dei contenuti teorici che su quello esperienziale-realizzativo[9].

Anche l'aspetto tecnico, dopo un momento introduttivo, che si svolge nella parte teorica dell'insegnamento unitario grazie ad un modulo dedicato, è proposto come esplorazione e sperimentazione diretta delle tecnologie con un costante supporto/guida sia per la parte *online*, quanto ovviamente per quella in presenza. Il software utilizzato per il montaggio delle varie porzioni di trasmissione e per il trasferimento delle registrazioni di prova è Audacity[10], un sufficientemente performante strumento *open source*. Si tratta quindi di una risorsa al

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[5] Queste considerazioni, a firma dello stesso autore, compaiono anche nel n. 5 e nel n.9 della rivista *Audiovisivi* del 1972 in un articolo dal titolo *Per una didattica del messaggio iconico* e poi nel saggio del 1979 dal titolo *Il processo è il messaggio*.

[6] Per 'audiovisivi' in questo contesto intendiamo sia i testi mediali video-filmici (delle immagini in movimento, audiovisivo-cinetici) che quelli audio (verbo-sonori ovvero radiofonici).

[7] La modalità di studio-apprendimento scelta è così significativamente attiva e permeata costantemente di stimoli riflessivo-esecutivi che trovano attuazione su base necessariamente tecnologico-mediale *(online)*, che è problematico definirlo un insegnamento di tipo specificatamente o esclusivamente teorico.

[8] E' nostra opinione che quando non si vuole che lo siano o quando si fa in modo che non appaiano proposti in questo modo, in realtà accade soltanto, o per mancanza di comunicazione (anche volontà di comunicazione), o per mancanza di conoscenza reciproca tra i due ambiti scientifico-culturali.

[9] Per maggiori approfondimenti relativi all'insieme della struttura didattica del Corso di studi E-Media vedi il sito all'indirizzo: http://espertimedialinrete.formazione.unipd.it/

[10] http://audacity.sourceforge.net/

momento gratuita e disponibile anche in contesti non universitari. Questo software viene fatto scaricare, installare, esplorare ed utilizzare fin dalla parte teorica dell'insegnamento unitario all'interno del modulo dedicato ai linguaggi mediali, e specificatamente nell'ambito del *thread* dedicato a quello verbo-sonoro. Già in questo precedente contesto didattico, quindi, si stimolano i partecipanti ad eseguire direttamente delle prove di registrazione della propria voce con gli strumenti di registrazione di cui sono in possesso e successivamente si invitano ad editarle attraverso il montaggio con l'aggiunta di eventuali rumori, musiche e in qualche caso effetti sonori, soprattutto in funzione di rendere il più 'pulito' e 'chiaro' possibile il suono. Si tratta di un primo momento di contatto con la tecnologia audio (tipologie microfoniche e relativi utilizzi, risposta sonora dell'ambiente dove si effettua la ripresa, varie forme di registrazione digitale e/o eventualmente analogiche, *software* per il montaggio/elaborazione audio), le sue potenzialità, e i relativi limiti per la dimensione espressiva attraverso il linguaggio verbo-sonoro. In questo frangente si esplorano anche le possibilità di conversione di un segnale audio analogico in uno digitale nel caso in cui la registrazione sia avvenuta, per l'appunto, attraverso un registratore analogico, così come si affrontano anche le problematiche legate ai *codec* e alle possibili conversioni/compressioni di un segnale audio digitale. Questo consente di riprendere in parte ed approfondire ancora la tematica delle 'varianti/invarianti tecnologiche' [11] oltre a testare il livello della strumentazione tecnica in dotazione ai partecipanti, le loro pre-competenze/conoscenze in questo campo, le loro abilità iniziali e le potenzialità di evoluzione/sviluppo. Se nella parte teorica dell'insegnamento unitario queste esperienze non sono ancora di fatto obbligatorie, ma solo suggerite con una certa determinazione - e l'esperienza ci dice che la quasi totalità dei partecipanti le svolge -, nel momento dell'insegnamento laboratoriale queste vengono riprese e diventano tali nel modulo dedicato specificatamente alla produzione audio. In questo caso la valutazione sia della quantità di lavoro eseguita dal singolo in coordinamento con il gruppo e tra i diversi gruppi, sia la 'qualità' sonora ed espressiva della sua realizzazione, viene significativamente considerata ed evidenziata dal tutor in continuo contatto col docente. Uniche eccezioni ovviamente le eventuali limitazioni tecniche e tecnologico-esperienziali che non dovessero riuscire a trovare immediata soluzione nella parte *online*.

Il 'valore aggiunto' di questa particolare dimensione formativa attiva e di questo, crediamo, originale processo di didattica-apprendimento mediale risiede anche nell'obiettivo didattico produttivo-realizzativo motivante, che grazie alla collaborazione istituita con una delle ultime 'radio comunitarie' italiane (Radio Cooperativa), viene posto agli studenti di questo insegnamento laboratoriale. Ai partecipanti viene quindi chiesto di assumere tutti i diversi 'ruoli' produttivo-realizzativi del 'fare radio', in modo particolare 'di parola' (ideazione, ricerca, scrittura dei testi, definizione scaletta temporale/sceneggiatura, 'speakeraggio'/conduzione, registrazione/montaggio audio), e viene loro posto l'obiettivo di collaborare nel gruppo e tra gruppi al fine di realizzare una trasmissione radiofonica di 1h30 di durata su di una tematica comune unificante[12], che cambia ogni anno, per essere poi effettivamente messa in onda da questa Radio.

Anche le tematiche unificanti delle trasmissioni fin qui scelte, normalmente di tipo metariflessivo su tematiche che riguardano in modo specifico i contenuti affrontati dal Corso di studi[13], o a questi correlati, sono funzionali e finalizzate al raggiungimento da parte dei partecipanti della massima consapevolezza del processo formativo di cui sono protagonisti.

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[11] Si tratta di un'altro*thread* di discussione nell'ambito del modulo di approfondimento tecnologico inserito nella parte teorica dell'insegnamento unitario.

[12] Questa tematica è comune anche al laboratorio di scrittura video-filmica che anche se in modo distinto si svolge contemporaneamente a questo.

[13] Il primo anno di attivazione del corso l'argomento della prima trasmissione è stato lo stesso corso di laurea nella sua denominazione istituzionale: "Teorie e metodologie dell'e-learning e della media education". Il secondo

5. Finalità formative

Tra gli scopi formativi dell'insegnamento laboratoriale vi è innanzitutto quello di far conoscere ai partecipanti la specificità del linguaggio mediale della radio in connessione, come abbiamo precedentemente delineato, allo sviluppo delle competenze espressivo-creative mediali dei partecipanti stessi. Sul piano comunicativo sintattico vengono quindi evidenziati ed esplorati i codici compositivi verbo-sonori del linguaggio radiofonico. Anche se non così centrale rispetto all'impostazione di questo saggio, vogliamo comunque ricordarli brevemente: il concetto di immagine sonora o auditiva della voce/rumore; le inquadrature sonore -1- i piani sonori (primissimo piano, primo piano, secondo piano), -2- il campo sonoro trasmesso, immaginato nelle sue diverse dimensioni, in relazione alla distanza del suono/i dal punto della ripresa correlato alla risonanza dell'ambiente (profondità sonora); l'effetto del movimento, trasmettibile attraverso l'avvicinamento e il relativo allontanamento di uno o più suoni dal punto in cui avviene la registrazione sonora (ovviamente potrà anche variare la velocità del movimento); il montaggio interno all'inquadratura sonora e quello in relazione al tempo tra diverse inquadrature sonore (a stacco, dissolvenza/transizione in apertura, in chiusura, incrociata, montaggio alternato, parallelo); l'inscindibilità segnica della musica e del rumore in rapporto alla voce e le conseguenti modalità/funzioni (in relazione alla voce) del sincronismo parallelo (quindi come immagine sonora significante in modo 'realistico' e 'diretto') e dell'asincronismo parallelo (significante come accompagnamento, sfondo, intermezzo, collocazione spazio-temporale, non 'realmente' e 'direttamente' collegato alla narrazione); il concetto di scena e quello di sequenza radiofonica. (Arnheim 1936; Cottone 1952; McWhinnie 1959; Guarrera 1975; Amplatz 1984).

Sul piano comunicativo semantico-pragmatico invece, in diretta connessione con la parte teorica dell'insegnamento unitario, il fine formativo è quello di cogliere la dimensione comunicativa socio-culturale della radio: il suo sviluppo storico, le tipologie delle radio contemporanee, il flusso e il palinsesto radiofonico, i generi radiofonici e la loro evoluzione, oltre alle tipologie testuali della produzione radiofonica e ai formati della radio. (Menduni E. 2008; Perrotta M. 2004)

Altre finalità formative sono quelle relative allo sviluppo di conoscenze e competenze tecnico-tecnologiche. Viene esplorata la dimensione digitale (codec audio) e analogica del suono in relazione alla possibilità di conversione/codificazione digitale; vengono esplorate e testate varie strumentazioni tecniche di registrazione del suono sia analogiche che digitali; si approfondiscono le varie tipologie microfoniche in relazione alle condizioni/necessità delle registrazioni audio valutando anche la risposta sonora degli ambienti; viene utilizzato in modo sufficientemente approfondito il software di montaggio audio audacity (forma d'onda sonora e capacità di riconoscimento/intervento in questa, volume sonoro e necessità di equalizzazione tra le parti, effetti sonori, ritmo, composizione multitraccia e sua gestione, ecc.). A queste, di tipo sostanzialmente tecnico, si affiancano lo sviluppo di competenze e conoscenze 'tecnologiche'. Ciò avviene quando i 'discorsi sulle tecniche' vanno nel senso del raggiungimento della consapevolezza da parte dei partecipanti che la loro azione mediale si raccorda e si sostanzia anche come 'tecnologia di processo' (Galliani, 2000a), e cioè quando 'coscientizzano' di far parte ed essere parte produttivamente attiva di un flusso di processi

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anno è stata la volta di "Internet for peace", iniziativa intrapresa dalla rivista Wired Italia per candidare Internet al premio nobel per la pace. Il terzo anno, in occasione del referendum sull'acqua come bene pubblico, ci si è discostati un po' e la tematica è stata per l'appunto l'acqua da esplorare in tutte le sue dimensioni valoriali. Il quarto anno di attivazione del Corso, cogliendo l'occasione dell'istituzione in quell'anno (13 febbraio) da parte dell'Unesco della prima giornata mondiale della radio, la tematica offerta è stata proprio il "World radio day". Per scelta metodologico-didattica tutte queste tematiche sono comunque esplorabili da parte dei partecipanti con la massima libertà creativo-progettuale, interpretativa, produttiva, e nel solo vincolante rispetto delle effettive possibilità realizzative.

didattico-formativi finalizzati (individuazione degli obiettivi comunicativi/target, ideazione, progettazione/pre-produzione, realizzazione espressiva, dinamiche/problematiche operative di gruppo).

Come ha ben delineato e spiegato Ong (1982), la cultura chirografica e, da Gutenberg in poi, soprattutto quella tipografica hanno progressivamente ridefinito sia i nostri processi cognitivi legati alla parola, che anche, rispetto all'era ad oralità primaria, il senso, il valore 'funzionale' e 'attivo', la forma espressiva della comunicazione orale, oltre a favorire maggiormente lo sviluppo del senso della vista rispetto a quello originariamente più importante dell'udito. Con l'avvento dei media elettronici della comunicazione, sebbene ancora vincolati alla parola scritta per la loro produzione/attuazione, stiamo sperimentando un periodo di oralità secondaria. Tra questi media, in relazione all'espressione orale, il medium radio, essendo la voce umana la 'sostanza' essenziale di cui è costituita la sua 'materia comunicativa', è quello ad essa più immediatamente riconducibile. Anche per questo motivo, in funzione educativa, permette di sviluppare in modo consapevole la dimensione comunicativa orale. Il riconoscimento, la scoperta, lo sviluppo dell'espressività orale a partire dalla 'messa a punto' della propria voce e delle sue qualità uniche e di quelle potenzialmente allenabili, costituiscono altre finalità formative dell'esperienza (timbro; registro -acuto, grave, medio, gutturale, nasale-; intensità di emissione -debole, forte, stentorea, sottile-; ritmo; portata; intonazione/tono; articolazione; respirazione) (CLEMI, 2002).

Già il MEAM[14], e di conseguenza anche questo insegnamento laboratoriale nella sua modalità in presenza, era fortemente improntato all'idea della 'convergenza mediale' (digitalizzazione dei contenuti della comunicazione mediale e loro veicolazione multipiattaforma), che poi era ed è anche una effettiva linea di sviluppo tecnologica. Come anche era già chiaramente permeato da un'idea di partecipazione interattiva diretta, 'dal basso', che ci proviene in linea di sostanziale continuità dagli anni 50'/60' del secolo scorso. Intesa questa sia come sviluppo cognitivo-espressivo, e quindi educativo-formativo, sia da un punto di vista di una auspicabile maggiore e più consapevole cittadinanza attiva, e quindi di una spinta di istanze di democratizzazione nei confronti del *mainstream* mediale e dei sistemi socio-politici, che fa dire a Galliani (2000b, p. 47), riferendosi alle speranze di Enzerberger, che l'evoluzione tecnologico-mediale permette oggi di "... trasformare ogni utente in un manipolatore di informazione in grado di personalizzare i media". E in realtà, aggiungiamo noi oggi, finalmente anche di esprimersi compiutamente in modi e forme autonome.

Oltre a questi paradigmi nell'attuale versione *blended* dell'insegnamento laboratoriale vengono tenuti in considerazione la dimensione antropologico-culturale dell'intelligenza collettiva (Levy, 1994) e la corposa sistematizzazione di tutti questi paradigmi/costrutti offerta da Henry Jenkins con la denominazione da lui proposta di 'cultura convergente' (2006). L'insieme di questo orizzonte teorico mira a far acquisire ai partecipanti una consapevolezza critica sia sul piano socio-culturale, che soprattutto su quello linguistico-espressivo-processuale, attivando la capacità di collocare la radio nel sistema mediale in relazione alle contemporanee dinamiche di sviluppo comunicativo.

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[14] La prima edizione del Master in Educazione Audiovisiva e Multimediale si è svolta nel 2003.

6. Sviluppo di nuove competenze e conoscenze per le attività didattico-formative formali

In conclusione ricordiamo che l'inizio di questo quinto anno accademico di consecutiva erogazione vede ancora gli insegnanti significativamente maggioritari in percentuale tra gli iscritti ad E-Media. Questo Corso di laurea, e ovviamente anche l'insegnamento laboratoriale, portano di conseguenza una responsabilità formativa, certo non esclusiva, ma indubbiamente significativa, nei loro confronti e si rivolge quindi con una particolare attenzione didattica anche agli insegnanti in servizio come a quelli in formazione.

Non abbiamo qui lo spazio sufficiente per trattare in modo esteso questo aspetto dell'esperienza, ma rileviamo come grazie a questo laboratorio gli insegnanti acquisiscano la capacità formativa necessaria a sviluppare a loro volta in ambito scolastico con i discenti un approcio critico alla radio anche attraverso l'utilizzazione della sua dimensione tecnologico-espressiva e quindi proponendo azioni di educazione mediale attiva. Infine vi segnaliamo che è stato aperto uno spazio sul *software* sociale 'Spreaker' dove poter ascoltare e commentare le trasmissioni realizzate. Buon ascolto!: http://www.spreaker.com/user/4771312

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Cambiamenti in atto: dallo "spazio" fisico allo "spazio" virtuale. Riflessioni pedagogiche attorno al tema

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Abstract
Pensare in termini spaziali è proprio dell'attualità. Se la pedagogia moderna aveva posto attenzione allo spazio quale variabile fondamentale dell'intervento educativo professionale, oggi si tratta di pensare come sia lo spazio fisico che lo spazio virtuale siano condizione di possibilità dell'evento educativo.
Agli occhi del pedagogista, infatti, entrambi appaiono il doppio della vita: già artificialità, già virtualità.
Cambia davvero la scuola per il fatto che si popola di macchine? Che cosa è propriamente una "macchina per insegnare"? E che cosa significa che ogni tecnica è portatrice d'esperienza oltre che sua strumento di custodia, allargamento e perfettibilità?

Parole chiave
spazio virtuale, dispositivo, tecnica, formazione

1. Introduzione

L'Ottocento, com'è noto, è stato il secolo della storia. La nostra, forse, è «l'epoca dello spazio» (Foucault, 1994/1998, p. 307). Ha scritto a proposito Michel Foucault: «Viviamo in un momento in cui - credo - il mondo si percepisce di più come una rete che collega dei punti e che intreccia la sua matassa, che come una grande vita che si sviluppa nel tempo» (Foucault, 1994, p. 307).

Anche in pedagogia veniamo da una tradizione di «devoti discendenti del tempo» (Foucault, 1994/1998, p. 307) e in genere continuiamo a considerare l'esistenza un viaggio lungo il quale si compiono peripezie o soste. Tutta la vita è pensata come una grande avventura formativa. Per gli «accaniti abitanti dello spazio» (Foucault, 1994/1998, p. 307), invece, comincia a farsi sentire la distinzione tra tempo della vita e tempo della formazione. Quando non è più ovvio, o naturale, che la vita sia in sé formativa, si apre la possibilità per noi occidentali, non solo di distinguere il piano dell'educazione da quello esistenziale, ma anche di pensare che cosa qualifichi davvero un intervento di tipo pedagogico. Se essere contemporanei, non solo per i filosofi, significa pensare in termini *spaziali* (più che temporali) la realtà in cui viviamo, allora i pedagogisti hanno da indagare quale tipo di esperienza sia quella formativa; più precisamente quale *spazio* abitiamo quando siamo in formazione. Michel Foucault ha potuto parlare del presente in quanto cartografo. Secondo Deleuze, ha visto scintillare altre visibilità oltre quelle a cui siamo abituati e le ha mappate. Scrive: «Che cos'è che Foucault chiama macchina, astratta o concreta (parlerà infatti della "macchina-prigione", ma anche della macchina-scuola, della macchina-ospedale...)? Le macchine concrete sono i concatenamenti, i dispositivi biformi, la macchina astratta è il diagramma informale. In breve, le macchine sono sociali ancor prima di essere tecniche. O meglio, c'è una tecnologia umana che precede la tecnologia materiale» (Deleuze 1986/1987, p. 47). Lo sguardo di Foucault si fissa sullo *spazio esterno*, cioè in modo sbieco rispetto alla tradizione guarda alle condizioni di possibilità della realtà. Scrive Foucault (1994/1998): «L'immensa opera di Bachelard e le descrizioni dei fenomenologi ci hanno insegnato che non viviamo in uno spazio omogeneo e vuoto, ma, al contrario, in uno spazio completamente intriso di qualità, in uno spazio che, forse, è anche abitato da fantasmi; lo spazio della nostra percezione primaria, quello delle nostre fantasie, quello delle nostre passioni […] uno spazio leggero, etereo, trasparente oppure con uno spazio buio, spigoloso, affollato: con uno spazio alto, delle cime o, al contrario, con uno spazio basso, del fango, con uno spazio che può scorrere come l'acqua sorgiva o con uno spazio che può essere rigido, duro come la pietra o il cristallo. Tuttavia, queste analisi, anche se sono fondamentali per la riflessione contemporanea, riguardano soprattutto lo spazio interno. Ora vorrei parlare dello spazio esterno» (Foucault, 1994/1998, p. 309).

Guardare lo spazio nella sua esteriorità, da fuori, sganciato dal soggetto che lo vive, lo percepisce e ne fa esperienza, significa frequentare una novità. Si tratta di fare esperienza *dello* spazio, piuttosto che nello spazio. Ecco la scommessa foucaultiana. È questa prospettiva estranea ai discorsi pedagogici? Non lo crediamo.

2. Lo spazio come oggetto pedagogico

In un lontano, ma ancora attuale, intervento Riccardo Massa (1986) affermava che la pedagogia ha saputo pensare lo spazio in quanto esistenziale, transattivo, naturale, sociale, catartico, espressivo, comunicativo, psico-motorio, istituzionale, tecnologico e normativo. Riassumendo brevemente il filo di quel discorso e piegandolo verso i nodi della nostra riflessione, possiamo dire che lo spazio - solo di recente - è emerso quale oggetto di

attenzione per la riflessione pedagogica anche se dai riti iniziatici, ai collegi dei Gesuiti e ai campi scout sempre è stato modulato, attraversato e vissuto.

Abbiamo già accennato al fatto che lo spazio sia stato messo a tema in letteratura, ma anche in filosofia dalla Fenomenologia e dall'Esistenzialismo come tempo della vita, cioè romanzo di formazione. La vita è quello spazio di tempo, quell'intervallo (*spatium*) tra la nascita e la morte di cui le nostre biografie e autobiografie parlano. Le esperienze che facciamo durante un tale percorso, saranno i ricordi che potremo raccontare. In senso lato tutto il sapere della nostra tradizione, origina dal senso che noi attribuiamo alla morte.

Novità della pedagogia moderna, invece, è stato il pensare lo spazio come ambiente adattivo. Pragmatismo, Funzionalismo e Attivismo hanno tematizzato le condizioni di possibilità dell'esperienza educativa. In particolare Maria Montessori ha strutturato pedagogicamente uno spazio a misura di bambino e tutta una seria di arredi e di materiali che sviluppassero le sue possibilità sensoriali. Si situa a questo livello lo scarto rispetto alla tradizione, anche pedagogica, cui alludevamo all'inizio attraverso le parole di Michel Foucault.

Un tale smarcarsi ha le sue radici nella discontinuità operata da Jean Jacques Rousseau quando ha pensato la campagna come utopia, cioè altrove o primo spazio virtuale in cui far crescere e sviluppare naturalmente Emilio. Se questi ha scritto solo un libro, molti dopo di lui hanno cercato di rendere concreto quello spazio naturale frutto della finzione letteraria creando autentiche eterotopie pedagogiche.

Una tale traiettoria finisce con il mettere a nudo l'educazione come teatro. Non solo nel senso di una didattica del teatro, cioè di quello di una messa in pratica di uno spazio ludico, espressivo e catartico. Si pensi allo spazio agito da Arno Stern nei suoi *closlieu*, all'animazione teatrale in generale, ma soprattutto al teatro di Antonin Artaud e alla rarefazione scenica operata da Jerzy Grotowsky. Fino al limite in cui lo spazio educante è il vuoto. Da questo punto di vista una scuola non si qualifica tanto per le aule attrezzate o la palestra, ma per gli spazi nudi in cui sia garantito compiere autentici giochi di espressione. In questo secondo senso l'educazione appare essa stessa una macchina teatrale o uno spazio regolato, cioè istituzionale, come dimostrato dalla pedagogia che si è ispirata all'opera di Jacques Lacan, e normativo, come visto attraverso gli occhi di Michel Foucault. Risulta essere così un'altra scena, dotata di regole proprie ma non meno vitale della vita, da architettare, allestire, predisporre affinché chi la abita possa mettere alla prova se stesso in modo protetto.

3. Lo spazio tecnologico

Fino a questo punto abbiamo intenzionalmente non ancora parlato dello spazio tecnologico anche se in questo ultimo passaggio è già emersa la natura macchinica e artificiale del lavoro educativo; sofisticata tecnologia immaginaria capace di produrre effetti reali di autenticità e autonomia. Oggi, al di là di tale tecnologia umana, come la chiamerebbe Gilles Deleuze, la nostra attualità si va popolando sempre più di vecchi e nuovi media, cioè di macchine o dispositivi tecnologicamente sempre più avanzati.

Prima di porre la questione della differenza oppure della continuità tra lo spazio fisico - l'esperienza educativa possibile della/nella natura - e lo spazio virtuale - l'esperienza possibile grazie alla tecnica, dobbiamo ricordare che lo spazio è uno, e non il solo, degli elementi di struttura dell'evento e dell'intervento educativo. Si dà educazione, infatti, dove gli spazi e i tempi della formazione costituiscono il perimetro di un'esperienza, regolata e popolata di segni, per i corpi dell'educatore e dell'educando. L'educazione non può che istituire uno spazio finzionale - *né irreale* perchè ancorato a una materialità, situato nell'esistenza, esistenza esso stesso - *né reale* perchè protetto, di allenamento ed esercizio. Uno «spazio

doppio» (Massa, 1987, p. 21; Artaud, 1964) rispetto all'esistenza quotidiana. Il che impone un'analisi dello spazio in quanto virtuale.

Possiamo partire dal domandarci come in molti hanno già fatto fin dagli anni Cinquanta quando stava nascendo la tecnologizzazione dell'insegnamento, cioè dell'impiego di apparati tecnologico-strumentali nei processi di istruzione, se oggi siamo davanti a una rivoluzione nel modo di fare scuola oppure, arretrando nel nostro procedere inquirente, dovremmo chiederci se esistono altre tecniche, magari in uso da tempo, altri dispositivi che fanno scuola *prima* che questo moderno ambiente formativo abbia incominciato a essere saturo di macchine. Infine, possiamo dubitare di aver posto la questione in modo corretto, in quanto *da sempre* la scuola è un luogo artificiale e tecnologico?

Studiosi come Jacques Derrida (1967b/2010) che ha analizzato gli effetti della voce umana, Carlo Sini (1990) che costruisce una rigorosa filosofia dell'esperienza a partire dallo studio del corpo o André Leroi-Gourhan (1964/1977) che ha descritto l'uso della mano e le conseguenze che ne sono scaturite per l'uomo e l'umanità, testimoniano come la voce, tutto il nostro corpo ma anche la sola mano siano già *tecniche* tanto quanto la scrittura che si impara a scuola. Esistono media che in genere non sono considerati come tali, molto più antichi. Prima di Internet, prima del PC, prima della TV, della radio e del cinema siamo andati a scuola col nostro corpo, cioè abbiamo usato quest'ultimo quale soglia della nostra esperienza. Da questo punto di vista, estremizzando, il corpo è già un ambiente virtuale: il grande mediatore della nostra crescita da bambini come da adulti; la nostra prima scuola.

Occorre, però, chiarire il valore pedagogico del fare scuola. Per noi c'è scuola sempre e solo dove si apre lo spazio metaforico di rielaborazione cognitiva e affettiva a partire da esperienze di stupore e di scoperta del mondo (Massa, 1997). Essere a scuola corrisponde a essere già nel doppio; nel virtuale. La scuola corrisponde a uno spazio artificiale che non è la vita. Il punto, lo ripetiamo, è quando la scuola si popola di macchine, cambia il modo di fare scuola?

Possiamo affermare con certezza che sia stato Frederic Skinner a introdurre il concetto e lo strumento della macchina per insegnare, convinto di aver individuato il mezzo ottimale per un insegnamento omogeneo, efficace e individualizzato (Massa, 1990). Ci potremmo chiedere se solo il PC sia una macchina per insegnare oppure se anche un libro possa funzionare come tale. Più in generale con Carlo Sini (2009) ci potremmo chiedere se la Cultura - tutta intera - non sia già in se stessa una grandiosa macchina; qualcosa di artificiale che interrompe un rapporto naturale con la vita. La cultura, come la scuola, non è la vita.

Davanti alla questione se sia possibile fare esperienza della natura, ci scopriamo già dislocati *fuori* rispetto allo spazio naturale e sempre collocati *dentro* uno spazio artificiale, culturale e propriamente umano. Il che appare chiaro se invece che seguire il flusso dei nostri vissuti, cioè interrogare lo spazio interno, guardiamo gli snodi in cui abitiamo, cioè ci lasciamo affascinare dallo spazio esterno. Come potessimo uscire dal tempo, da noi stessi in quanto soggetti al tempo e ci sforzassimo di vederci dallo spazio quali soggetti, effetti di un regime spaziale.

Questo guardare *da fuori* ci fa scoprire oggetti nuovi; anche per lo studio dell'educazione. Michel Foucault, per esempio, osservando la scuola moderna ha scoperto *lo spazio seriale*. La scuola come l'esercito, la fabbrica, l'ospedale e il carcere nel moderno appaiono come una grande macchina disciplinare. Scrive Foucault (1975/1993): «L'organizzazione di uno spazio seriale fu una delle grandi mutazioni tecniche dell'insegnamento elementare. Esso permise di superare il sistema tradizionale (un allievo che lavora qualche minuto col maestro, mentre il gruppo confuso di quelli che attendono rimane in ozio). Assegnare dei posti individuali, rese possibile il controllo di ciascuno ed il lavoro simultaneo di tutti; organizzò una nuova economia di tempi di apprendimento; fece funzionare lo spazio scolare come una macchina

per apprendere ma anche per sorvegliare, gerarchizzare, ricompensare» (Foucault 1975/1993, p. 160)

Lo sguardo di Foucault ci fa vedere oltre l'uso delle macchine per insegnare a scuola, la scuola come grande macchina. Non si sta pensando alla realizzazione dell'istruzione programmata su vasta scala, ma al marchingegno del funzionamento scolastico nella sua realtà; nella forma moderna e per noi ormai tradizionale.

L'operazione che consente di guardare con gli occhi di Foucault è quella che disarticola le unità alle quali siamo abituati: lo studente, l'insegnante, il banco, l'aula (potremmo allargare tale sguardo non solo al libro, al PC, alla scrittura alfabetica… ma anche la voce, il corpo, la mano…) per andare a scoprire nuove visibilità. Da questo inedito osservatorio la scuola appare quale macchina sociale molto prima che in essa siano visibili macchine per insegnare. E le tecnologiche scolastiche: il libro, il PC ma anche la scrittura alfabetica (ricordiamo il corpo), più che essere, come siamo abituati a pensare, *semplici mezzi* per trascrivere l'esperienza o per custodirla, depositarla e archiviarla, appariranno quali *dispositivi che producono esperienza.*

Lo sguardo di Foucault in pedagogia vede i dispositivi, cioè la realtà-educazione come una cosa da studiare prima che da fare, da assolvere come un compito necessario, urgente.

4. Il dispositivo

In italiano usiamo la parola *dispositivo* in più modi.

Generalmente come sinonimo di tecnica, strumento, mezzo-per (Heidegger, 1927/1976). Da questo punto di vista sono dispositivi l'interruttore, il PC o la scrittura come sistema di notazione; per esempio quella alfabetica. Anche la cultura pedagogica italiana usa diffusamente questo termine. Non sempre secondo l'accezione definita da Riccardo Massa sulla base dello studio di Michel Foucault. In questo senso specifico per dispositivo si intende «il sistema incorporeo delle procedure in atto nell'istruzione scolastica e in qualunque situazione educativa» (Massa, 1997, pp. 130-131). Ogni dispositivo pedagogico istituisce un campo d'esperienza educativa, ne struttura i modi specifici e le traiettorie proprie, producendo effetti di volta in volta diversi. Potremmo dire che è un mondo.

Il dispositivo per il pedagogista non è la vita; quella che viviamo tutti i giorni. È potenzialmente vita. È la possibilità di fare esperienza delle potenzialità della vita, delle sue virtualità, come direbbe Pierre Lévy (1995/1997). Infatti, c'è differenza tra il progettare un dispositivo pedagogicamente fondato e il vivere nei dispositivi diffusi, impersonali e materiali. Non smettiamo certo di vivere quando siamo immersi in un dispositivo. Abitiamo questa soglia in modo naturale e quasi inconsapevole, tuttavia è possibile sempre vivere altrimenti. È possibile sempre lo scarto, la differenza, il nuovo.

Ogni dispositivo pedagogico, poi, ha effetti più che reali, come direbbe Jean Baudrillard (1976/1979), sulla vita. È realtà aumentata; è l'esperienza dell'esperienza della vita. Si tratta della possibilità, una possibilità protetta che rimette in moto la vita. E vivere tutta la sua intensità.

La distinzione che abbiamo appena fatto tra un uso strumentale e un uso strutturale della parola dispositivo si complica se pensiamo che la tecnica non è semplicemente a servizio del vivente ma essa stessa lo configura. Il punto fondamentale è che tutti «i prodotti della tecnologia si riflettono indietro a foggiare l'umano» (Sini, 2009, p. 22).

5. Genealogia della scuola

La storia della scuola, allora, comincia quando entra in crisi, con le parole di Riccardo Massa che riecheggiano quelle di Walter Ong, Eric Havelock, Marshall McLuhan, «il primato dell'orecchio sulla vista», (Massa 1997, p. 164). Scrive: «L'alfabeto prima, la stampa poi, sono stati i due media, le due grandi tecnologie che hanno determinato i caratteri della nostra esperienza, configurando l'apprendimento come una visualizzazione di segni» (Massa, 1997, p. 164). Da allora istruire corrisponde a proiettare lo studente, grazie allo spazio della pagina bianca, in quel mondo con cui lo si intende familiarizzare. La scuola diventa libri e scrittura; *spazio letterario*. Continua: «le nuove tecniche di impaginatura e la scoperta della stampa renderanno possibile la comparsa dell'oggetto pedagogico per eccellenza: il libro» (Massa, 1997, p. 164).

Non solo andare a scuola corrisponde a pensare «come un libro stampato» (Harrison, Callari Galli, 1971, p. 42) ma la scuola stessa si configura come una grande operazione di scrittura. Come afferma Jacques Derrida a proposito dell'insegnamento della filosofia accademica in Francia, «dettare era sinonimo di insegnare» (Bonicalzi,Canivez, Dalmasso, Derrida et al., 1980, p. 28)

Continuando a tenere un occhio strabico e guardando sia ai materiali e agli arredi scolastici (le tecniche), sia alla forma-scuola nel suo complesso (la vita scolastica), leggiamo Jacques Derrida mentre descrive il funzionamento del programma. Scrive: «[…] una potente macchina dai meccanismi complessi. Essa comprende delle catene di tradizione o di ripetizione i cui funzionari non sono propri di una certa configurazione storica o ideologica particolare, e che si perpetuano fin dagli inizi della sofistica e della filosofia […] questa macchina profonda, questo programma fondamentale, è ogni volta rivestito, riformato, totalmente riutilizzato da ogni configurazione determinata» (Bonicalzi, Canivez, Dalmasso, Derrida et al., 1980, p. 20).

Questo programma funzionava già ben prima della realizzazione del sogno dell' istruzione programmata. Se insegnare corrisponde *a liberare segni* da parte di quel corpo detto appunto *in-segnante*, allora durante una lezione mentre il docente è in scena davanti ai suoi studenti, il sapere di cui questi è portatore, scivola nel restroscena. Gli insegnati produrranno, mostreranno, metteranno in scena solo delle «insegne», cioè dei vessilli, dei segni o significanti, mentre il sapere come il luogo del senso o significato sfuggirà ritirandosi nella latenza.

Il sapere mostrandosi si preserva; sorvegliando, si custodisce. L'interpretazione semiotica del rapporto pedagogico equivale a una «scena di seduzione cadaverizzante» (Bonicalzi, Canivez, Dalmasso, Derrida et al., 1980, p. 37). E Jacques Derrida non la chiama «simulacro di dileguamento» (Bonicalzi, Canivez, Dalmasso, Derrida et al., 1980, p. 37) in virtù di una qualche vaga equivalenza tra la negatività della morte e una rimozione della scrittura fonetica.

6. Filosofia e alfabeto

Giunti a questo punto dovremmo affrontare l'intricato rapporto tra filosofia e la pratica della scrittura in Occidente. Vi accenneremo solamente.

La tesi di fondo è che vi sia una correlazione tra l'uso e la diffusione della scrittura alfabetica e l'apertura e il dispiegamento dell'abito filosofico. La pratica alfabetica, scrive Carlo Sini (1994) «spezza la continuità della lingua, il suo corpo sensuale, e la ricompone, la riaggrega su tutt'altro piano, attraverso il sistema chiuso di pure relazioni grafico-concettuali» (Sini, 1994, p. 39).

L'alfabeto rende possibile «la desomatizzazione della parola e la decontestualizzazione universalizzante dell'esperienza» (Sini, 1994, p. 89). Per questo viene affermato che la soglia

inaugurata della scrittura alfabetica «non riproduce, piuttosto "spiega" la parola orale, e così ne produce l'effetto» (Sini, 1994, p. 39). L'oralità così come cerchiamo di rappresentacela, è un effetto della scrittura in cui siamo. Non potemmo mai avere esperienza pura dell'oralità, ma sempre e solo nostalgia dell'oralità.

La s-materializzazione dell'esperienza sensuale della vita e la sua possibile ri-materializzazione nell'esperienza letteraria e scolastica cui abbiamo alluso, sono possibili in quanto l'alfabeto per la natura strutturale della sua pratica, «[…] si cancella, si fa trasparente, si fa dimenticare sfumando nell'assenza ultrasensibile» (Sini, 1994, p. 39).

La scrittura alfabetica agisce da soglia il più possibile trasparente; secondo Carlo Sini (1994) è come un «vetro il più possibile terso» (p. 42-43). Tuttavia, ci ricorda Jacques Derrida (1967/1969), allo stesso modo «per ragioni strutturali o essenziali, una scrittura puramente fonetica è impossibile» (p. 105). La scrittura fonetica «non ha mai finito di ridurre il non fonetico» (Derrida, 1967/1969, p. 105).

Se è vero, infatti, che «i segni di scrittura che tuttora usiamo non sono una riproduzione empirica della parola parlata […] non ne sono la semplice registrazione. […] Essi fanno tutt'altro. […] inventano invece un sistema ideale di classificazione (questo è il nostro alfabeto): essi "definiscono" le lettere. I greci per primi scrissero suoni che nessuno pronuncia, che sono "letteralmente" impronunciabili e immaginari, ed è così, appunto scrivendo, che compirono l'audace salto dell'idealizzazione (essi videro per primi l'idea del suono). In quanto videro dei suoni ideali, che per sé non suonano, ma sono appunto "con-sonanti", videro anche le vocali come suoni di appoggio e di risoluzione dei primi. I greci […] inventarono le "lettere". Quella ventina di segni che costituiscono l'alfabeto sono la riproduzione grafico-convenzionale del concetto e dell'idea di lettera, cioè di qualcosa che di principio nessuno potrebbe pronunciare. […] La lettera è un segno scritto assolutamente astratto, cioè privo di ogni riferimento iconico» (Sini,1994, p. 37-39).

È vero anche che: «La scrittura in senso stretto - e soprattutto la scrittura fonetica - è radicata in un passato di scrittura non lineare. Si è dovuto vincerlo, e si può se si vuole parlare di riuscita tecnica […] ma ciò non è stato fatto soltanto una volta. Una guerra si è istallata, ed una rimozione di tutto ciò che resisteva alla linearizzazione» (Derrida, 1967/1969, p. 99).

A questo punto facendo un salto ci potremmo nuovamente chiedere, se la fine della scrittura lineare sia «esattamente la fine del libro» (Derrida, 1967/1989, p. 101) . Ci potremmo chiedere se la scuola in cui appare la tecnica, sia un'altra scuola. E potremmo rispondere che il PC ha aperto sicuramente a nuove forme di scrittura. Tuttavia è un fatto che il logocentrismo, cioè la metafisica della scrittura fonetica, sia «il più originale e il più potente etnocentrismo sul punto di imporsi oggi sul pianeta» (Derrida, 1967/1989, p. 5); oggi più che mai se pensiamo alle nuove frontiere dell'alfabetizzazione informatica. Il punto è, ancora una volta, non «confinare la scrittura in una funzione secondaria e strumentale» (Derrida, 1967/1969, p. 11), pensando che sia la traduttrice di una parola piena e presente; una tecnica al servizio del linguaggio (un *porta-voce*), ma vederla attiva in quanto dispositivo nel senso massiano del termine. È a questo livello che una riflessione sullo spazio risulta fondamentale.

Jacques Derrida ci ha invitato a pensare *la spaziatura* come differenza e differimento, cioè un intervallo (ancora nel senso dello *spatium* latino) che agisce all'interno della stessa scrittura. Questo spazio è da sempre non percepito, non pensato afferma Derrida che è in-conscio. Noi sulla scorta delle riflessioni di Riccardo Massa, preferiamo dire *latente*. Ora, questa spaziatura non può darsi come tale, non potrà mai offrirsi a un'esperienza fenomenologica. Di essa potremmo solo vedere gli effetti, le tracce. Mentre funziona non può essere vista se non attraverso quell'operazione di dislocamento dalle nostre abitudini, cui abbiamo alluso mettendo in atto quello che abbiamo chiamato "lo sguardo di Foucault".

7. Pensare la tecnica

Per riassumere il filo del nostro discorso potremmo esprimerci così: le nuove tecnologie della parola di ieri (la radio, il telefono, il cinema, la televisione) funzionano *come* lo spazio virtuale di oggi (i nuovi social media) ma anche il corpo da sempre, cioè sono portatrici d'esperienza; trasportano in un altrove, in un doppio che non è la vita. Hanno una rilevanza e suscitano un interesse pedagogico. In molti sarebbero d'accordo nell'affermare che queste tecnologie avrebbero determinato quella che è stata chiamata un'oralità di ritorno (ma anche lo spazio virtuale permette "un ritorno" di fisicità nella scuola). Se alcune caratteristiche delle società pre-alfabetiche possono "ritornare" oggi nella società planetaria post-alfabetica, anche lo spazio cibernetico sembra offrire, per alcuni, la possibilità di insegnare per immersione al posto che per traduzione e astrazione come nella scuola tradizionale. Tuttavia, per altri ancora, lo spazio virtuale ripropone e amplifica fino a esiti rischiosi, lo straniamento proprio del paradigma alfabetico. In questa seconda prospettiva per i detrattori dei nuovi media «lo spazio cibernetico diviene metafora di quello mentale, tutto si degrada a comunicazione» (Massa, 1997, p. 177). E non sono pochi coloro che riducono l'educazione alla comunicazione nel dibattito pedagogico attuale. Già Martin Heidegger ci ricordava che: «restiamo sempre prigionieri della tecnica e incatenati ad essa, sia che la accettiamo con entusiasmo, sia che la neghiamo con violenza. Ma siamo ancora più gravemente in suo potere quando la consideriamo qualcosa di neutrale» (Heidegger, 1954/1976, p. 5)

Sappiamo che se «la scrittura alfabetica pone in linea il suono della parola parlata; la definizione filosofica linearizza il loro significato» (Sini, 1994, p. 56). La prima digitalizzazione non è forse il pensiero dialettico? Tuttavia «se distinguiamo il testo dal libro, diremo che la distruzione del libro, così come si annuncia oggi in tutti i campi, mette a nudo la superficie del testo» (Derrida,1967/1989, p. 22). Si tratta del successo rivoluzionari e innovativo dell'ipertesto.

Nell'ipertesto - esperienza possibile solo grazie al supporto del PC - scrive Paolo D'Alessandro:

«manca un ordine che sia canonico e ogni percorso arriva a definire un legittimo ordine di lettura; questo fatto modifica radicalmente la relazione del lettore con il testo, inteso come rete, del tutto privo di un senso univoco» (D'Alessandro, Domanin, 2005, p. 36).

Con l'ipertesto, continua «ogni lettura è un atto di scrittura e [...] leggere è riscrivere e trascrivere. [...] La lettura appare così creativa, perché il senso del testo si rende presente soltanto nel momento in cui si esplica appieno l'atto di scrittura. Prima di esso non solo il senso, ma lo stesso testo digitale esistono soltanto virtualmente» (D'Alessandro, Domanin, 2005, p. 36-37).

Siamo tornati a interrogare il virtuale.

Convinti come siamo che già il libro apra *come* il PC a quello spazio virtuale che è lo spazio letterario (lo dimostrano i libri di Bruno Munari: un libro può essere *letto* anche solo perchè manipolato), ci chiediamo che cosa sia davvero un libro; «questa cosa smaterializzata capace di proiettarci non più in una tradizione vivente ma in un universo di concetti i cui tratti dominanti sono l'ordine e la sequenzialità, la linearità e la sistematicità. È questo che dà forma all'individuo moderno, ne trasforma lo stile di vita e di pensiero»? (Harrison, Callari Galli, 1971, p. 165) E rispondiamo che il libro è «tecnica» (Rossi, 2009), ri-produce la realtà in uno spazio, o mondo, che ha le regole proprie, modi e traiettorie specifiche, effetti determinati.

Ci possiamo domandare ancora una volta (Massa, 1997, p. 157) « che cosa ci sia di più pedagogico del virtuale? » Tuttavia da quando tutto può diventare binario, una pedagogia digitale supera nei fatto tutti i vecchi dualismi dell'educazione, ma ripropone la differenza tra il navigare in rete e il navigare nella vita. Ha scritto Michel Foucault (1994/1998) che la nave

è l'eterotopia per eccellenza, un «frammento di spazio fluttuante» (p. 316) che permette l'esperienza del fuori. Si tratta solo di una metafora oppure c'è un problema di spazio, cioè c'è da pensare lo spazio virtuale?

Sappiamo da Heiddegger (1954/1976) che «l'essenza della tecnica non è affatto qualcosa di tecnico» (Heiddegger, 1954/1976, p. 5). Proprio per questo è necessario portare il pensiero all'altezza della tecnica. Restiamo prigionieri di essa sia quando l'accettiamo con entusiasmo (in questo senso non sarebbe più vero che il mezzo è il messaggio perché "essere digitali" corrisponderebbe di fatto a essere "in formazione"), sia che neghiamo la tecnica con altrettanta determinazione, negandoci la possibilità di esplorare nuove forme d'esperienza (in questo altro senso anche se riconosciamo che il mezzo è il messaggio, non sappiamo dire quale tipo di esperienza sia quella virtuale). Il punto, abbiamo detto, non è essere favorevoli o contrari, entusiasti ammiratori della tecnica oppure suoi incalliti detrattori.

Noi abbiamo cercato, invece, di guardare con gli occhi di Foucault, cioè abbiamo provato a impostare altrimenti il rapporto tra spazio fisico e spazio virtuale. Lo spazio presunto naturale e quello saturato di tecnica agli occhi del pedagogista appaiono analoghi. In questo senso la lezione dell'attivismo ritorna a essere importante ma in una luce differente.

Mentre Dewey (1938/2004) affermava di preferire «all'imparare dai libri e dai maestri, l'apprendere dall'esperienza» (Dewey, 1938/2004, p. 6), Nietzsche (1882/1965) aveva già scritto nella *Gaia scienza* di non essere uno di «quelli che riescono a pensare solo in mezzo ai libri, sotto la scossa dei libri, - è nostra consuetudine pensare all'aria aperta, camminando saltando, salendo, danzando» (Nietzsche, 1882/1965, p. 241-242).

Non si tratta di alimentare un'antica polemica, un vecchio dualismo della pedagogia, vorremmo invece pensare quella potente macchina virtuale che è l'educazione. Essa, come è stato affermato più di trenta anni fa, «proviene dalla vita e ritorna ad essa, ma dopo di essersene distaccata come per reduplicarla entro un ambito di esperienza distinta dalla vita immediata e non per questo meno vitale, tale cioè da affondare in essa le proprie» (Massa, 1987, p. 21). In questo modo *doppia* la vita.

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Accessibilità e inclusione. Kirikù e la strega Karabà-AD: una ricerca intervento in classe

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Abstract
L'audio descrizione (AD) è una narrazione fuori campo che descrive alle persone non vedenti gli elementi afferenti alla componente visiva di un prodotto cinematografico/audiovisivo o di una *performance* artistico-culturale. Il contributo presenta i risultati di un progetto di ricerca sulle tecniche di AD applicate al lungometraggio *Kirikù e la strega Karabà*: audiovisivo del 1998 scritto e diretto da Michel Ocelot. La cornice teorica è rappresentata dalla letteratura scientifica sull'inclusione sociale e sull'accessibilità delle tecnologie per persone con bisogni specifici (© 2012 ECA) e, in particolar modo, dall'ICF (OMS, 2001): modello scientifico di lettura delle situazioni di svantaggio e di disabilità. Il lavoro di ricerca proposto, muovendosi in tale direzione, intende sottolineare i benefici che l'AD produce su due piani: quello della partecipazione e inclusione sociale e quello dell'apprendimento e del potenziamento culturale della persona non vedente. Muovendo da tale cornice, il contributo presenta i risultati della sperimentazione realizzata in differenti contesti formativi con un'utenza vedente di bambini e di adulti. L'indagine, nello specifico, intende esplorare i risultati in termini di miglioramento e di interferenza nei processi di comprensione e apprendimento dei messaggi legati alle proiezioni audio descritte e di valutarne le potenzialità inclusive e partecipative rispetto al setting formativo.

Parole chiave
audio descrizione, accessibilità, inclusione, disabilità visiva, audiovisivi

1. Introduzione. Cultura dell'accesso, disabilità visiva e audio descrizione

Negli ultimi anni grazie a numerosi interventi legislativi e a una marcata operazione culturale, è cresciuto il bisogno di riconoscere anche alle persone con disabilità la possibilità di essere, a tutti gli effetti, cittadini tecnologici, attori e fruitori di contesti allargati di interazione e di partecipazione globale. In ordine a questo, la riflessione scientifica ha alimentato un ampio e interessante dibattito interdisciplinare volto, da una parte, a identificare standard tecnologici di prestazione e, dall'altra, a riflettere circa i vincoli e le implicazioni psico-socio-pedagogiche del cambiamento e del suo impatto sulla persona.

Il tema dell'accessibilità, pertanto, costituisce la cornice concettuale di tale riflessione. La prospettiva culturale del concetto di accessibilità, nello specifico, rimanda in primo luogo, a un modello di *progettazione inclusiva* dello spazio informatico e telematico, che tenga conto della pluralità dei bisogni delle utenze e offra stessi servizi e stessi spazi di interazione e di partecipazione nella misura in cui esso è implementato in rispondenza ai criteri e alle linee guida ufficiali (*Recommendation del World Wide Web Consortium ed in particolare in quelle del progetto Web Accessibility Iniziative, WAI*) e in previsione dell'uso delle tecnologie assistive.

Accanto a questo primo aspetto - che sottolinea il perché le tecnologie devono diventare accessibili - si affianca la *funzione* che le tecnologie rivestono per migliorare la capacità inclusiva dei contesti sociali, per trasformare ambienti escludenti, potenziando la caratteristica partecipativa degli stessi.

Le tecnologie, in tal senso, sono strumenti di interazione che, in ragione di come vengono progettati, implementati e applicati diventano ambienti di facilitazione/compensazione o, al contrario, ostacoli/barriere nell'espletamento delle normali attività e nello svolgimento dei compiti di apprendimento, collocandosi, pertanto nel gap, indicato dalla Classificazione Internazionale del Funzionamento, della Disabilità e della Salute della persona, (OMS, 2001) tra capacità e performance.

Nel settore culturale una tappa importante è stata raggiunta nel 2003 con la *Risoluzione del Consiglio dell'Unione Europea del 5 maggio sulle pari opportunità per gli alunni e gli studenti disabili nel settore dell'istruzione e della formazione*. Essa riguarda l'accesso delle persone disabili alle infrastrutture e alle attività culturali e dedica specifica attenzione alla funzione delle nuove tecnologie in tale azione.

Nello specifico l'attenzione del contributo si focalizza sulle difficoltà e sugli ostacoli che le persone con disabilità visiva incontrano rispetto alla (libera e autonoma) fruizione degli audiovisivi.

In una società definita dell'immagine o "regno dell'occhio" (Maldonato, 1994) ancorata fondamentalmente ai contenuti visivi come fonte di informazione, intrattenimento ed educazione (Packer & Kirchner, 1997), le persone con una severa compromissione o assenza della vista rischiano di essere culturalmente e cognitivamente escluse (Braun, 2008).

Già da tempo, i musei e le gallerie d'arte offrono descrizioni verbali (audio guide) di dipinti, sculture e altri soggetti visivi combinate, spesso, a un "touch tour", al fine di offrire ai non vedenti la *possibilità di accedere* al mondo dell'arte (de Coster & Mühleis, 2007); possibilità resa vana dalla, oramai troppo nota, regola del "vedere ma non toccare".

Rispetto ai contenuti audiovisivi (programmi televisivi e film) o performances artistico-culturali (danza, teatro etc.) il contesto sociale di riferimento appare ancora meno "solerte" nell'offrire risposte concrete ai bisogni delle persone non vedenti. Dagli anni settanta in ambito soprattutto anglofono l'AD è considerata la più valida ed efficace risposta in questo senso.

L'AD si configura come uno specifico supporto, costituito da tecniche, metodologie e competenze il cui obiettivo è quello di ridurre il deficit rendendo accessibile ogni messaggio visivo con adeguate informazioni sostitutive audio pensate per il non vedente.

La cornice teorica del contributo è rappresentata oltre che dalla letteratura sull'inclusione sociale e sull'accessibilità delle tecnologie da parte di utenti con bisogni specifici (© 2012 ECA) in particolar modo all'ICF (OMS, 2001): modello scientifico di lettura delle situazioni di svantaggio e disabilità della persona. Ciò che collega l'AD all'ICF è l'attenzione che questo modello di classificazione pone alla "partecipazione della persona disabile" e alla valutazione della variabile contestuale e ambientale. L'AD si inserisce proprio in questa rivoluzione "copernicana". Per il disabile visivo andare al cinema, vedersi un documentario, seguire una commedia a teatro significa libertà, autonomia, potenziamento, cultura.

L'AD, pertanto, si configura come un processo e un progetto di potenziamento culturale e conoscitivo, ma soprattutto di inclusione sociale (Braun, 2008; Packer, 1996; Szarkowska, 2011). Tuttavia, a svantaggio di quanto detto sin ora, nel contesto italiano questo supporto appare, ancora, una pratica claudicante e poco sedimentata.

È da queste considerazioni e sollecitazioni che la riflessione intende partire.

2. Quadro teorico. L'AD: Dalla funzione strumentale a quella ermeneutica-culturale

2.1 Caratteristiche dell'AD

L'AD è una narrazione fuori campo (*voice over*), finalizzata a descrivere gli aspetti del prodotto audiovisivo che risultano non accessibili in quanto afferenti alla componente visiva (azioni, linguaggio del corpo, espressioni del viso, ambientazione, abiti/costumi di scena).

Tutto ciò che afferisce al "mondo visivo" è reso accessibile da una descrizione verbale che si inserisce tra i dialoghi, non sovrapponendosi agli effetti sonori e musicali significativi.

L'AD può includere informazioni relative alle azioni, ai cambi di scena, al testo che appare sullo schermo, alle descrizioni dei personaggi, ai loro movimenti e linguaggio del corpo, alla spiegazione degli effetti sonori, etc. (OFCOM, 2000; Vercauteren, 2007).

Essa è formata da diversi audio commenti: didascalie narrative generate al fine di rendere accessibili, al non vedente i momenti di silenzio dell'audiovisivo. Gli audio commenti, soggetti ai limiti di tempo (*time codes*) imposti dalla traccia madre, confluiscono in uno script (canovaccio) che viene successivamente letto da un narratore professionista e registrato da un tecnico audio. Le registrazioni degli audio commenti, associate ai rispettivi momenti di silenzio originano il nuovo prodotto audio descritto.

2.2. Potenzialità educative dell'AD

L'AD è uno strumento che si serve essenzialmente dell'uso della parola. L'esposizione continua da parte dei disabili visivi a un linguaggio verbale, nello specifico didascalico-descrittivo, orienta la riflessione su diversi aspetti.

L'AD permette ai disabili visivi di apprendere e di potenziare il linguaggio come strumento compensativo e di costruzione del reale. Il linguaggio, infatti, ha un notevole peso nella strutturazione delle rappresentazioni mentali, anzi, esso è lo strumento attraverso cui le immagini mentali prendono forma.

In relazione ai bisogni specifici del non vedente lavorare sull'AD permette di riflettere e di indagare sulle fonti e sulla strutturazione della costruzione del reale, cioè, sull'utilizzo degli

schemi mentali, delle categorie, delle euristiche, dei dispositivi esemplificativi di decodifica, espressi e strutturati dal linguaggio stesso. I non vedenti, come ogni persona, costruiscono modelli mentali per rappresentare il mondo circostante, i concetti astratti o le sequenze di eventi e li adoperano per dare una spiegazione ai propri eventi, per comprendere le proprie esperienze e fronteggiare le situazioni nuove. "Di conseguenza, la cecità non è solo un deficit, un difetto, una debolezza, ma […] origina anche nuove capacità, nuovi vantaggi, nuove forze" (Vygotskij, 1986: p. 277).

Inoltre, gli studi sull'AD svolti negli ultimi anni, (Ferrel & Siller 2006, Palomo 2008; Kirchner & Shmeidler, 2001; Snyder 2006), si sono concentrati, nello specifico, sulla valutazione dei benefici che tale supporto può avere sui processi di istruzione e di apprendimento dei bambini con difficoltà visive. Ad esempio, l'AD può facilitare l'apprendimento linguistico: il significato di alcune parole, infatti, viene compreso e appreso se associato a degli oggetti o a delle azioni, il che implica automaticamente un ritardo d'apprendimento nei bambini con limitate, o con totale assenza di esperienze visive, i quali sono impossibilitati a compiere tali associazioni.

Nello specifico, rendere accessibili degli audiovisivi a un pubblico di bambini non vedenti significa permettere loro di divertirsi apprendendo. Il bambino non vedente riceve un valido aiuto dai prodotti audio descritti, in cui sono designati oggetti, azioni o eventi particolari, in quanto essi apportano una dimensione ulteriore rafforzando il significato delle parole, agevolandone l'apprendimento. È importante che i bambini ascoltino suoni significativi in quanto questi aggiungono un significato alle parole (RNIB, 2009). I bambini non vedenti hanno più difficoltà a sviluppare rappresentazioni mentali di esperienze che non possono vedere (Ferrel & Siller, 2005). Un'AD può generare, attraverso poche parole ben scelte, immagini chiare e durature nella mente dei bambini non vedenti, in particolare attraverso l'uso di nuovi vocaboli, di paragoni e di semplici metafore, facilitandone così l'apprendimento e migliorando le loro competenze linguistiche (Snyder, 2006).

Inoltre, l'AD può contribuire a sviluppare o acquisire delle nuove conoscenze "visive" soprattutto per chi è non vedente sin dalla nascita: attraverso la descrizione di gesti abituali – come portarsi un dito sulle labbra – e di altre convenzioni culturali legate al mondo visivo – come l'apparenza fisica e lo stile di un certo tipo di abbigliamento – i disabili visivi possono facilmente imparare il significato di queste convenzioni e utilizzarle nella vita quotidiana, migliorando la loro capacità d'interazione sociale (Gonzàlez & Iorfida 2002, Hernández-Bartolomé & Mendiluce Cabrera 2004; Packer 1996).

L'AD si configura come uno strumento capace di sollecitare con le narrazioni fuori campo anche riflessioni inerenti agli stati d'animo, ai linguaggi non verbali, alle sensazioni e alle emozioni delle persone.

Spostandoci sul piano interpsichico-relazionale l'AD, parimenti, si configura come un valido strumento dalle alte capacità inclusive. Un cinema, un salotto di casa, un'aula multimediale divengono, così, dei luoghi di cultura, di istruzione e apprendimento, di svago e di interazione: luoghi fisici che, in una più ampia ridefinizione emotiva e sociale, generano nel non vedente sensazioni di libertà, autonomia, condivisione, divertimento etc.

L'AD, pertanto, divincola il non vedente dalla necessità di deleghe (Pinnelli, 2007) liberandoli dalla dipendenza e dal "buio" dell'isolamento e della segregazione promuovendo la loro capacità di autodeterminazione e di scelta.

3. Metodologia

3.1. Scelta dell'audiovisivo

Il contributo presenta un lavoro di sperimentazione e di ricerca sull'audiovisivo *Kirikù e la strega Karabà* (*Kirikou et la sorcière*): lungometraggio d'animazione per bambini scritto e diretto nel 1998 da Michel Ocelot e audio descritto dal gruppo di ricerca nel 2012[1].

Tre sono stati i criteri che hanno determinato la scelta dell'audiovisivo:

a) *Contenuti*. Kirikù è dalla nascita un "bambino speciale" e mette a frutto la sua specialità, lottando contro i pregiudizi del mondo e contro i feticci tecnologici e il motore di tale impegno è l'amore della famiglia. Lavorare su un prodotto con un ampio sfondo educativo ha permesso contemporaneamente di affrontare in "modo speciale" "contenuti speciali": la dimensione interculturale, la lotta fra il bene e il male, la saggezza dell'innocenza, la ricerca della verità e il dolore come causa del male del mondo.

b) *Quantità*. Gli audiovisivi accessibili ai bambini non vedenti sono rari.

c) *Obiettivi*. Rendere accessibili degli audiovisivi a un pubblico di bambini non vedenti significa permettere loro di divertirsi apprendendo. Il bambino non vedente ha un valido aiuto dai prodotti audio descritti, in cui sono designati oggetti, azioni o eventi particolari, in quanto essi apportano una dimensione ulteriore rafforzando il significato delle parole, agevolandone il loro apprendimento. Inoltre è importante che i bambini ascoltino suoni significativi in quanto questi aggiungono un significato a parole (Rnib, 2009). A differenza dei bambini vedenti i bambini ciechi hanno più difficoltà a sviluppare rappresentazioni mentali di esperienze che loro non possono vedere (Ferrel & Siller, 2005).

Un'AD può generare, attraverso poche parole ben scelte, immagini chiare e durature nella mente dei bambini non vedenti, in particolare attraverso l'uso di nuovi vocaboli, di paragoni e di semplici metafore, facilitandone così l'apprendimento e migliorando le loro competenze linguistiche (Snyder, 2006).

3.2. Domande di ricerca

La ricerca che si presenta, in accordo con le sollecitazioni provenienti da un diretto confronto con la letteratura scientifica di riferimento, intende esplorare i risultati in termini di miglioramento o di interferenza nei processi di comprensione e apprendimento dei messaggi legati alle produzioni con AD da parte di un'*audience* vedente e non e di esplorarne le potenzialità inclusive e di partecipazione con specifico interesse al contesto classe.

Le finalità della ricerca, nello specifico, sono così enucleate:

a) Costruire un prodotto fruibile in contesti e per obiettivi *educational* allo scopo di sperimentare percorsi integrati di lavoro con classi di bambini vedenti e non

b) Verificare la pregnanza di contenuti e significato veicolati anche a un pubblico di vedenti attraverso la doppia codifica (audio aggiunto dall'AD e visiva del prodotto originale), secondo la teoria del *dual coding* di Paivio (1971, 1986) ripresi da Mayer nell'elaborazione dei principi di comunicazione multimediale (2000).

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[1] Per un approfondimento sulle fasi di realizzazione e sulle metodologie utilizzate dal gruppo di ricerca per produrre l'audio descritto *Kirikù e la strega Karabà* vedi Pinnelli & Fiorucci (2012), Pinnelli (2012) e Fiorucci (2012).

c) Esplorare i risultati in termini di miglioramento e di interferenza nei processi di comprensione e apprendimento dei messaggi legati a tali produzioni e di esplorarne le opportunità inclusive.

3.3. Partecipanti, strumenti di ricerca e procedure

Hanno preso parte alla sperimentazione due diversi gruppi così divisi:

- *Gruppo A (adulti)*. Costituito da 30 studenti vedenti della quinta classe del Liceo delle Scienze Umane di Maglie (provincia di Lecce) e da 40 studenti vedenti della Facoltà di Scienze della Formazione Università del Salento (Lecce) . Età compresa tra i 17/30 anni.
- *Gruppo B (bambini)*. Costituito da 17 alunni vedenti di una quarta classe della scuola primaria di Copertino (provincia di Lecce). Un alunno del gruppo presentava una compromissione visiva e un severo deficit cognitivo.

Il lungometraggio è stato proposto integralmente ai due gruppi (A e B) e strutturato in tre fasi secondo tre distinte modalità di proiezione.

- I fase (15 min.). Fruizione al buio (4 item): modalità standard con AD senza video.
- II fase (20 min.). Fruizione integrata (8 item): modalità standard con AD.
- III fase (40 min.). Fruizione standard (4 item): modalità standard senza AD.

I laboratori sperimentali sono stati condotti attraverso l'utilizzo di interviste semistrutturate che prevedevano l'adattamento di alcuni materiali didattici facenti parte di un GiocoDossier messo a punto nell'ambito del Progetto "Lombardia Cinema Ragazzi" 1999-2000 (Servizio Promozione Culturale e Spettacolo, Dir. Generale Cultura, Regione Lombardia).

Lo strumento è stato modificato rispetto alle esigenze specifiche del campione. Le interviste semistrutturate, finalizzate a un target di bambini, sono state semplificate rispetto al linguaggio di espressione e rese quanto più vicine a un gioco didattico al fine di rendere "appetibile" e "avventurosa" la somministrazione.

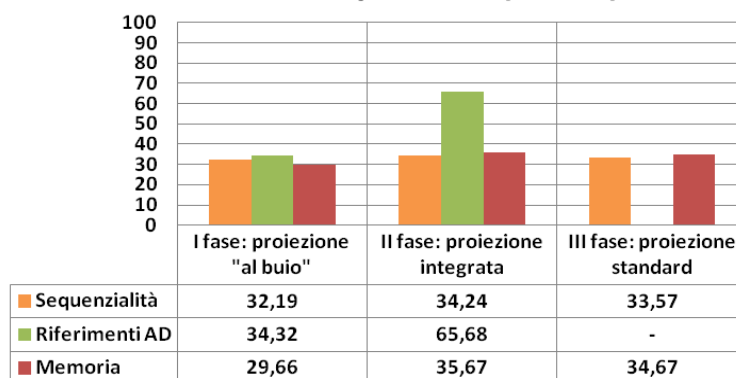Lo strumento, in relazione ai differenti obiettivi della ricerca, è stato strutturato secondo specifiche domande:

	I fase: proiezione "al buio"	II fase: proiezione integrata	III fase: proiezione standard
Sequenzialità	32,19	34,24	33,57
Riferimenti AD	34,32	65,68	-
Memoria	29,66	35,67	34,67

Fig. 1 Grafico gruppo A (adulti)

- Domande aperte finalizzate a raccogliere le impressioni e le sensazioni prodotte dall'esperienza della fruizione al buio e della fruizione integrata.
- Domande strutturate a risposta multipla (tre risposte) finalizzate a valutare la fruizione/comprensione dell'audiovisivo rispetto a tre variabili di valutazione:

- *Memoria*. Gli item relativi a questa variabile intendono valutare, in ogni fase, le capacità mnemoniche rispetto ai contenuti e agli elementi narrativi dell'audiovisivo.
- *Sequenzialità*. Gli item relativi a questa variabile intendono valutare, in ogni fase, la capacità di ricostruire la trama dell'audiovisivo secondo precisi segmenti narrativi.
- *Riferimenti AD*. Gli item relativi a questa variabile intendono valutare, nella fruizione al "buio" o in quella integrata, le capacità mnemoniche rispetto agli elementi narrativi attinenti esclusivamente agli audio commenti e, quindi, all'AD.

Nello specifico lo strumento per adulti consta di 16 item a risposta multipla e 8 item a risposta aperta mentre lo strumento per bambini consta di 22 item a risposta multipla e 8 item a risposta aperta.

4. Analisi dei dati

Il gruppo A (adulti vedenti) e il gruppo B (bambini vedenti), per le tre fasi e le tre variabili considerate, hanno fornito risposte e, quindi, performances dissimili.

Il gruppo A, secondo una decodifica e interpretazione dei dati organizzati in percentuali, ha "preferito" nell'insieme la fruizione in modalità integrata (fruizione standard con AD).

Dettagliando l'analisi, gli adulti, come si evince dal grafico (Fig. 1), hanno raggiunto migliori performances nella II fase (modalità integrata) rispetto a le variabili considerate. La variabile *riferimenti AD* sembra quella maggiormente discriminante (65,68%) mentre le variabili *sequenzialità* e *memoria,* seppur con uno scarto più debole, registrano allo stesso modo percentuali alte e, quindi, performances migliori (32,19% variabile *sequenzialità*, 29,66% variabile *memoria*).

La fase più critica, rispetto a tutte tre le variabili, risulta essere quella "al buio" (I fase) mentre la III fase – quella standard – seppur inferiore, a livello prestazionale, alla I fase registra buoni risultati.

Differenti e più articolati sono i dati ricavati dalla sperimentazione con i bambini.

Il gruppo B, infatti, come si evince dal grafico (Fig. 2) ha delle differenze prestazionali maggiormente connesse alle singole variabili piuttosto che alle fasi di fruizione.

Pur registrando, per ogni singola variabile, delle performances migliori nella terza fase (modalità standard) i bambini, nelle altre due fasi, hanno delle prestazioni dissimili rispetto alle singole variabili: la I fase registra apprezzabili risultati rispetto alle variabili *sequenzialità* (33,72%) e *riferimenti AD* (54,55%) mentre la II fase registra apprezzabili risultati rispetto alla variabile *memoria* (39,10%).
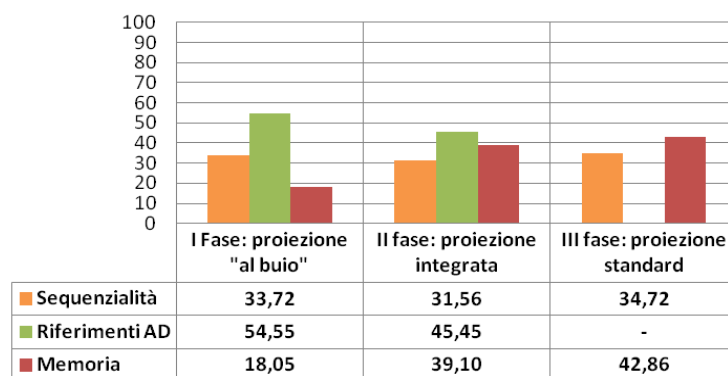

	I Fase: proiezione "al buio"	II fase: proiezione integrata	III fase: proiezione standard
Sequenzialità	33,72	31,56	34,72
Riferimenti AD	54,55	45,45	-
Memoria	18,05	39,10	42,86

Fig. 2 Grafico Gruppo B (bambini)

Nel gruppo B la variabile *memoria* è proporzionalmente crescente rispetto al susseguirsi delle differenti fasi mentre la variabile *riferimenti AD* è proporzionalmente decrescente rispetto alle fasi nelle quali è presente (I e II). Pertanto, pur attestando una performance migliore nella terza fase, i dati riferibili alle variabili *memoria* e *riferimenti AD* denotano, nel campione B, non una generica preferenza di fruizione legata alle tre fasi ma, piuttosto, una fruizione "sensibile" agli aspetti procedurali di dettaglio e, quindi, delle singole variabili.

5. Discussione

Le prestazioni dei due gruppi, come si evince dai due grafici (Fig. 1 e Fig. 2), sono differenti: il gruppo A risulta maggiormente prestante nella modalità integrata mentre il gruppo B nella modalità standard.

Per il gruppo A la modalità integrata - fruizione standard supportata da una narrazione fuori campo (AD) – non sembra essere minimamente d'ostacolo ai processi cognitivi di decodifica e, quindi, alla comprensione dell'intero audiovisivo. L'incontro tra la fruizione standard e l'AD agevola la comprensione del prodotto rendendo gli adulti capaci di seguire simultaneamente sia il prodotto filmico originale che l'AD ma, al tempo stesso, di discriminare i due elementi.

La fruizione della I fase è la più critica: le prestazioni risentono della "paura del buio", eufemismo con il quale si indica una inadeguatezza e inattitudine cognitiva a percepire la contingenza omettendo il canale visivo. La sperimentazione conferma il primato gnoseologico della vista sugli altri sensi (oculocentrismo). La vista, infatti, è lo strumento più dominante: un senso percettivo veloce, globale (registra diversi input) ma al contempo di sintesi (sceglie dove soffermarsi).

Il gruppo B, invece, è più prestante nella fase III (standard) anche se, a differenza degli adulti, le prestazioni nella I fase sono decisamente buone.

I bambini sembrano prediligere una fruizione non ibrida: apprezzano o una modalità standard o una modalità di sola narrazione (AD). La modalità integrata distoglie i piccoli fruitori in quanto non sembrano essere predisposti, ancora, a una decodifica bimodale ma piuttosto a una monomodale. Inoltre bisogna riconoscere che i bambini sono molto più allenati e, quindi, abituati degli adulti all'ascolto delle narrazioni (lettura di favole, audio storie, dettato etc.). La variabile riferimenti AD, più alta nella I fase, conferma questa idea. La variabile memoria, più alta nella II e III fase, di contro conferma l'idea che i bambini, come gli adulti, hanno prestazioni mnemoniche più solide se connesse al senso della vista: ricordano secondo una memoria visiva. Complessivamente, il dato forse più significativo è che i due gruppi, anche se con prestazioni differenti, ma non deficitarie, hanno riportato, in tutte le fasi, risultati che attestano comunque una buona comprensione globale dell'audiovisivo.

Infatti, guardando criticamente ogni singola fase e ogni singola variabile emerge che l'ipotesi di normalizzare la fruizione cinematografica con AD per tutti i fruitori, con una modalità diffusa, non comprometterebbe la comprensione e l'attenzione di nessuno delle tipologie di utenza, sebbene questa sia una ipotesi remota perché per realizzare un progetto di inclusione culturale e sociale, finalizzato a una libera e autonoma fruizione del prodotto audiovisivo, sarebbe sufficiente prevedere l'AD in ogni luogo adibito alle proiezioni.

L'AD, pertanto, si configura come uno strumento capace di rendere fruibile un prodotto audiovisivo secondo i dettami del *design for all* e della cultura dell'accessibilità, e come uno strumento atto a sollecitare in tutti gli utenti processi di apprendimento e di potenziamento culturale e, soprattutto, di immedesimazione esistenziale, di partecipazione e di inclusione sociale.

6. Conclusioni

Rispetto a una analisi più fenomenologica, cioè una analisi che considera le impressioni dei fruitori registrate a seguito delle proiezioni con AD (I e II fase), ogni gruppo (A e B) sembra diviso tra persone che riescono a ricostruire mentalmente le sequenze con un altissimo grado di precisione e zelo e altre persone che sono completamente disorientate dalla fruizione, manifestando stati di ansia e frustrazione: non riescono a seguire e ricordare i fatti e riferiscono in modo approssimativo la storia.

Occorre evidenziare, infine, sebbene questa idea sia presente come una filigrana in tutto contributo - che l'AD è uno strumento primariamente inclusivo e capacitante, poiché rendere accessibile un prodotto audiovisivo significa sollecitare una trasformazione che investe il contesto, la persona e la comunità. Questo è accaduto nelle classi della scuola primaria e nelle aule universitarie dove una "insolita proiezione" ha premesso, a molti fruitori, non solo di conoscere uno strumento inclusivo come l'AD ma, soprattutto, di immedesimarsi in chi, con una voce narrante, riesce a infrangere il muro del buio.

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