ATEE Winter Conference

Science and Mathematics Education in the 21st century

15 to 17 April 2019

CONFERENCE REPORT

University of Minho, June 2019

1 - Introduction

The University of Minho, Braga, Portugal, has hosted the Winter Conference 2019 of the Association for Teacher Education in Europe (ATEE), 15 to 17 April 2019.

Founded in 1973, the University of Minho has two major poles: the campus of Gualtar in Braga, and the campus of Azurém in Guimarães. It is currently among the most prestigious institutions of higher education in the country, and it has also gradually come to assert itself in the international level. The University organisational structure is flexible and conducive to innovation and interdisciplinary practices, favouring the exploration of emerging research areas. The teaching and research units - Schools and Institutes - are the basic structures of the University: School of Architecture, Sciences, Medicine, Law, Economics and Management, Engineering, Psychology and School of Nursing, and Institute of Social Sciences, Education and Arts and Humanities. A research unit –I3B's was recently created. The courses and research projects have been gaining an increasingly strong international recognition. The University of Minho is a research university, committed to the valorisation of Knowledge, Research, Development and Innovation, and it is also focused on the socio-economic environment, with many successful partnerships in research, cultural and socio-economic development projects. The European University Association has considered this University a case study of good practices at the European. The university occupies important places in several international rankings, for its performance at the teaching, research and sustainability levels.

Science and Mathematics teacher education are key educational projects of the University both at the graduation and the post-graduation levels, and they are supported by the research produced by the CIEd's research group on Science Education for Sustainability. Some researchers of this group are members of ATEE and belong to the RDC on Science and Mathematics Education. Hence, it was an honour to locally organize the ATEE Winter Conference 2019 at the University of Minho which was an initiative of the previously mentioned RDC.

2 - Conference Committees

A local organizing committee and a scientific committee were appointed for the conference.

The Academic Committee included 36 outstanding science and mathematics education researchers from all over the world. It was co-coordinated by the chair and co-chair of the organized by RDC, Laurinda Leite, a science educator from the University of Minho, and Elizabeth Oldham, a mathematics educator from Trinity College Dublin.

The Organizing Committee included the following UMinho staff members: Laurinda Leite (Coordinator), Ana S. Afonso, Floriano Viseu, Luís Dourado and Maria Helena Martinho.

Luísa Carvalho (UMinho) and Sofia Morgado (UMinho) were permanent secretariat members.

3 - Conference theme

The 2019 ATEE Winter Conference focused on Science and Mathematics Education in the 21st Century.

Nowadays, Science and Mathematics Education is an area of interest to policy-makers worldwide. It is a relevant area not only for the ongoing scientific and technological development of modern, globalised and digital societies, but also for citizenship education and the sustainability of the Planet. Moreover, it contributes to the full development of the individual learner. Science and Mathematics teachers, teacher educators and researchers can therefore help to make a difference beyond the classroom.

However, Science and Mathematics Education is under pressure. It has been unable to develop good levels of literacy and numeracy, to lead enough youngsters to engage in science and technology careers, and to overcome many people's dislike and even fear of the subjects.

Thus, the goal of the Conference was essentially to promote forward-looking approaches that combine engagement and enjoyment with effectiveness in developing knowledge and skills, and hence to foster ways of overcoming the challenges that the area has been facing.

Within this frame, the sub-themes were intended to provide structure and focus to the Conference, but also to allow people to make submissions in their own areas of interest and to encourage multidisciplinary discussions.

The 2019 ATEE Winter Conference focused on Science and Mathematics Education in the 21st century. It aimed at fostering a deep discussion of the following issues related to the conference theme:

- Innovative approaches to teaching science / mathematics
- Technologically enhanced science / mathematics education
- Science / mathematics education and the STEM agenda
- Science / mathematics education in multicultural and inclusive schools
- Science / mathematics teacher education in a changing world
- 21st century assessment in science / mathematics education

4- Conference programme

The **Opening Ceremony** included short addresses by the Coordinator of the local organizing committee, Laurinda Leite, The Vice-president of ATEE, Davide Parmigiani, The President of the Municipality of Braga, Ricardo Rio, and The rector of the university of Minho, Rui Vieira de Castro. A special welcome was given by the music students of the University of Minho that played Portuguese guitar and guitar and sang Fado.

Each of the two **Keynote speakers** addressed a key idea associated with the Conference theme, as follows:

- Merrilyn Goos (University of Limerick, Ireland) developed the theme 'Mathematics crossing borders: integrating mathematics with other disciplines in teacher education';
- Ilka Parchmann (Kiel University, Germany) dealt with 'The challenges of teaching science in the 21st century: the benefits of context-based interdisciplinary approaches'.

A **Panel** coordinated by Elsa Price, consisted of António Cachapuz (University of Aveiro), João Pedro da Ponte (University of Lisbon), and Maria Alessandra Mariotti (University of Siena), who brought their expertise to the discussion of "The challenges of 21st century science and mathematics education: ways forward".

Two **Plenary sessions**, by Vladimir Garkov (EC Commission representative) and Diana Freire (Ciência Viva), on "European and Portuguese policies for science and mathematics education" offered an opportunity for getting some insight on how the European Commission sees the future of science and mathematics education in Europe in the near future, and learning about Ciência Viva plans for science and mathematics education popularization in Portugal.

Paper and Poster proposals for presentation at the Conference were submitted in two categories: empirical research; theoretical study.

Abstracts for papers or posters, with no more than 500 words, were to be structured according to their category.

- Abstracts of papers or posters reporting on empirical research: Title of paper/poster; Name and affiliation of the author(s) of proposal; Context of the research; Research aim/question; Theoretical framework; Research methodology; Findings; Implications for teacher education; Relevance to European educational research and Conference theme.
- Abstracts of papers or posters focusing on a discussion of a theoretical issue: Name and affiliation of the author(s) of proposal; Introduction of the topic/theme; Aim or argument leading question; Theoretical argument/framework; Concluding remarks; Implications for teacher education; Relevance to European educational research and Conference theme.

Each participant was allowed to present two papers and/or posters maximum.

The ATEE Winter Conference Academic Committee members acted as peer reviewers for abstracts and they will also referee the full papers submitted to the 2019 Winter Conference Proceedings. Empirical and theoretical paper and poster proposals were evaluated based on two evaluation forms given in annexe 2. Table 1 shows the numbers of papers and posters, from submission to acceptance.

Table 1: From proposals submitted to papers and posters presented

Type of submission	Submitted	Rejected	To be improved	Accepted without reformulation	Accepted after reformulation	Dropouts	Abstracts published	Present-ations at the Conference
Papers	84	1	75	8	54	21	55	52
Posters	24	1	17	6	12	5	19	19
Total	108	2	92	14	66	26	74	71

As a **Pre-conference activity**, a visit to I3B's took place on the 15th afternoon. I3B'S is a research centre placed at Avepark, in Caldas das Taipas, Guimarães. The 3B's Research Group (Biomaterials, Biodegradables and Biomimetics) was established in 1998 at the University of Minho and supports a multidisciplinary and highly skilled team which works at the interface of biotechnology, biology, biomedical engineering and materials science. Major research areas at our group include, among others, new materials development, drug delivery, tissue engineering, regenerative medicine, nanomedicine, and stem cell isolation and differentiation. The group belongs to the new Portuguese Government Associate Laboratory ICVS/3B's, which is totally based in the UMinho. This a collaboration with the Institute of Health and Life sciences of UMinho. It also leads the European Institute of Excellence on Tissue Engineering and Regenerative Medicine that has branches in 22 locations in 13 different countries.

The goal of the 3B's Research Group is to develop novel biomaterials (hydrogels, scaffolds, membranes, nano/microparticles) based on natural polymers for applications in drug delivery and tissue engineering of bone, cartilage and skin. This is accomplished by developing several isolation/purification tools and processing methods, allowing the fabrication of integrated biomaterials. On the other hand, stem cell research is devoted to the differentiation of mesenchymal stem cells from different sources (adipose tissue, bone marrow, amniotic membrane and fluid, umbilical cord blood, Warthon's Jelly) and origins (human, goat, rat) towards the lineages of interest (bone, cartilage, skin) either using conventional methodologies or combined scaffolds/ biological signals.

The **Social programme** started with a Newcomers Meeting (held at D. Diogo de Sousa archaeology Museum, Braga) aiming at introducing the first-time attenders to the ATEE organization and the RDC structure. They were identified with a different badge and were welcomed by the Coordinator of the Organizing Committee, Laurinda Leite, the President of ATEE, Åsa Morberg, the Coordinator of the RDC Chairs, Ronny Smet, and the Chair of the RDC on Science and Mathematics Education, Elizabeth Oldham. After, they were greeted with the music and entertainment of TUM - Tuna Universitária do Minho. Over 60 newcomers attended the Conference. Afterwards, a Welcome Reception was offered to all Conference participants and accompanying persons.

A Social Dinner (at Vila Galé Collection Hotel, Braga) was attended by more than 65 people. Entertainment was provided by the Folk group "Sinos da Sé", who sang and danced traditional folk songs.

The Conference overall programme is given in annexe 1.

The conference was accredited as in-service teacher education for Portuguese science and mathematics teachers.

5 - Participants

The Conference was attended by 102 participants and 3 accompanying persons. The ATEE Conference participants came from 25 countries (Australia, Belgium, Brazil, Colombia, Croatia, Cyprus, Czech Republic, Germany, Greece, Ireland, Israel, Italy, Kazakhstan, Latvia, Mozambique, Norway, Poland, Portugal, Serbia, Spain, Sweden, The Netherlands, Turkey, Ukraine, United States of America).

The ATEE Conference participants included ATEE members, ATEE non-members, and students, as shown in table 3. Portuguese school teachers were considered as ATEE members..

Table 3: Types of participants in the ATEE Winter Conference

Type of Participant		**Number**
Invited persons		9
ATEE Members	Early registration	33
	Late registration	0
ATEE Non-Members	Early registration	44
	Late registration	0
Students		16
Total of participants		102
Accompanying persons		3
Total of participants + Accompanying persons		105

Table 4 shows the characteristics of secretariat in the Conference.

Table 4: Secretariat of the ATEE Conference

Secretariat	**Number**
Permanent Members	2
Temporary Members	3

6 – Finance issues

Table 5 shows the total income from Conference registration fees. Keynote speakers and people invited for the panel and the plenary sessions were released from paying the conference fee. Members of the Academic and Organizing Committees, and Portuguese school teachers, were allowed to pay as ATEE members.

Table 5: Income from Conference registration fees

Income	Number	Euro per unit	Amount (Euro)
ATEE Members (early registration)	33	160,00	5280,00
ATEE Members (late registration)	0	0,00	0,00
ATEE non-Members (early registration)	44	210,00	9240,00
ATEE non-Members (late registration)	0	0,00	0,00
Students	16	120,00	1920,00
Accompanying Person	3	60,00	180,00
Total	96	——	16620,00

Table 6 shows the expenses, per item, according to the approved budget. The item "gift" is the single item added to the original budget which was not anticipated. No other unforeseen expense was incurred.

Table 6: Conference cost information

Conference cost	Amount Spent (Euro)	Budget * (Euro)
Cultural Events (Opening ceremony - Guitar and fado, Welcome Reception - TUM + Social dinner – Sinos da Sé)	1 341,00	1500
Meals (Lunch + Welcome party + Coffee Breaks)	2541,00	7000
Material (Copy and printing services + ATEE flags)	1188,00	5000
Invited people (keynotes, panel, plenary sessions)	4639,52	4500
Staff costs	870,73	3600
Transportations (bus)	0,00	1400
Facilities (UMinho)	1300,00	2000
Website and materials design	1000,00	1000
Overheads (UMinho)	1800,00	5190
Gift (Magnets)	399,75	00
Unforeseen expenses	0,00	610
Total Conference costs	15080,00	31180

* For 150 paying participants

Table 7 shows the Conference finances balance. Due to the fact that the number of participants was lower than expected, to achieve "balance zero", expenses for several items had to be drastically reduced.

Table 7: ATEE Conference finance issues

Items	Amount (Euro)
Income	+16 620,00
ATEE Fee*	-1 540,00
Conference Costs	-15 080,00
Balance	0,00

* 20 euros per ATEE paying participant (excluding students)

7 - Conference proceedings

Full papers (regarding papers or posters presented) should be submitted by 20 July, through the Conference e-mail address. Full paper proposals will be peer reviewed, and afterwards the accepted ones will be published in the Digital Conference proceedings. Proceedings should be ready by the end of November 2019. Due to the conference zero balance, the Organizing Committee will find ways of producing them at zero cost.

8 - Concluding remarks

The ATEE Winter Conference 2019, held at the University of Minho, looked at science and mathematics teaching and learning in the 21st century. It enabled enlightening discussions on issues that encompass strong challenges for teachers, for students, for the school and for the society as a whole. Similar dilemmas (like student's motivation, teacher's teaching practices) and even contradictions (like opposition between conceptions and practices) in countries all over the world were reported.

Science and mathematics education need a reform, starting with a deep reform on in-service teacher education that values those that take in service training relevant for the discipline they teach. Science and mathematics education is a complex process whose development may include resistance and turbulence because changes may be troublesome for many reasons. However, despite the differences, the dilemmas, and even the contradictions between teachers' conceptions and practices we believe that science and mathematics teacher education can make a difference as the successful experiences that were described in the Conference suggest.

Acknowledgements

Acknowledgements are due to the UMinho, to ATEE and the RDC on science and mathematics Education, to the Conference Academic Council and to the Conference sponsors.

Conference sponsors

University of Minho, Institute of Education - UMinho, Departamento de Estudos Integrados de Literacia, Didática e Supervisão - UMinho, Centro de Investigação em Educação - UMinho, FCT, Câmara Municipal of Braga, TUB, Delta Cafés, LEYA Educação, Porto Editora.

Annexe 1 – Conference Overall Programme

Monday 15 April (Pre-Conference)

14.30-18.00	Visit to I3B's - Institute of Biomaterials, Biodegradables and Biomimetics
19.00-20.00	Welcome to Conference Delegates; Greetings to ATEE first time attendants
20.00-21.30	Welcome Reception

Tuesday 16 April

08.30-9.30	Participants' registration
9.30-10.00	Opening ceremony
10.00-11.00	Keynote address 'Mathematics crossing borders: integrating mathematics with other disciplines in teacher education', by Merrilyn Goos
11.00-11.30	Coffee break
11.30-13.00	Parallel sessions
13.00-14.30	Lunch
14.30-16.00	Parallel sessions
16.00-16.30	Coffee break
16.30-18.00	Parallel sessions
18.30-18.45	Departure to Social dinner

Wednesday 17 April

09.30-10.30	Keynote address "The challenges of teaching science in the 21st century: the benefits of context-based interdisciplinary approaches" by Ilka Parchmann
10.30-11.00	Posters Presentation
11.00-11.30	Coffee break
11.00-13.00	Parallel sessions
13.0 0-14.30	Lunch
14.30-16.00	Panel "The challenges of 21st century science and mathematics education: ways forward", with António Cachapuz, Doris Elster, João Pedro Ponte and Maria Alessandra Mariotti
16.00-16.30	Coffee break
16.30-17.30	Presentations on 'European and Portuguese policies for science and mathematics education', with Vladimir Garkov and Rosalia Vargas
17.30-18.00	Closing ceremony

Notes: - I3B's is located in AvePark - Park of Science and Technology, Caldas da Taipas, Guimarães.
- Plenary sessions: Auditorium B1 - ground floor of building number 2, Campus of Gualtar.
- Parallel sessions: rooms 1 - 5, located in the ground floor, nearby the Auditorium.
- Coffe breack: main hall of building number 2, Campus of Gualtar.
- Lunch takes: Canteen, Campus of Gualtar.
- Welcome Reception: Museum D. Diogo de Sousa, at the City centre.
- Social Diner: Hotel Vila Galé, at the City centre.

Annexe 2 - Form for Abstract Evaluation

ATEE WINTER CONFERENCE 2019

Science and Mathematics Education in the 21st century

(15-17 April, 2019)

Evaluation of papers and poster proposals

For the Organizing Committee

Abstract Code: Oral presentation #: _____ Poster #: _____
Abstract Title:_____
Reviewer: _____
Conference Sub-theme: _____
Empirical research: _____ *(use checklist 1)* Theoretical issue: _____ *(use checklist 2)*

1 - Abstract evaluation (please, choose the appropriate checklist)

1.1 - Checklist 1 – Empirical research abstract evaluation

Items	Fair	Sufficient	Good	Very Good		Missing		To be improved
1 – Relevance with regard to the conference theme								
2 – Originality of the research								
3 – Context of the research								
4 – Research questions / objectives								
5 – Theoretical framework								
6 – Research methodology								
7 – Results /findings								
8 – Implications for science/mathematics education								
9 – Language accuracy								
10 – Consistency with the guidelines for authors								

Checklist 2 – Theoretical issue abstract evaluation

Items	Fair	Sufficient	Good	Very Good		Missing		To be improved
1 – Relevance with regard to the conference theme								
2 – Originality of the research								
3 – Introduction of the topic /theme								
4 – Objective								
5 – Theoretical framework								
6 – Quality of argument								
7 – Conclusions								
8 – Implications for science/mathematics education								
9 – Language accuracy								
10 – Consistency with the guidelines for authors								

2 – Acceptance: Accept ____ Accept after minor revisions ____ Reject ____

3 – Recommendations for revision (for each item marked for improvement, if applicable)

Can be enlarged