XVII IOSTE Symposium
Science and Technology Education for a Peaceful and Equitable World

Programme

Braga, Portugal
11 – 16 July 2016
Welcome Address

Dear Colleagues

Welcome to the XVII IOSTE Symposium in Braga, Portugal.

The Research Centre on Child Studies of the University of Minho (CIEC-UMinho) is proud to host the IOSTE Symposium 2016, and the Local Organizing Committee welcomes you in Braga and, more generally, in Portugal.

As you may be aware, IOSTE (International Organization for Science and Technology Education) is a unique organization in the sense that it was born during the cold war as a meeting place for dialog across different cultures and ideologies, and for the peaceful use of Science and Technology to foster democracy, equity and sustainable development. Today, IOSTE has members from about eighty countries, and is officially recognized by UNESCO as a non-governmental organization. In the present disturbed world, this 2016 IOSTE Symposium has formulated an appropriate theme: “Science and Technology Education for a Peaceful and Equitable World”.

A total of 272 proposals of 39 countries of all continents have been submitted to this XVII IOSTE Symposium. We regret, however, that several colleagues from South America, Middle East and North Africa could not get financial support to join us in this event. This is easily understandable in the present world of high socioeconomic inequalities. Nevertheless, we wish all participants take the opportunity to interact with all present colleagues in a fruitful way so that participants can take home new ideas and share them with their local colleagues that could not come. We also wish the event runs in a way consistent with the IOSTE mission to encourage the peaceful and ethical use of science and technology in the service of humankind.

In brief, the XVII IOSTE Symposium Local Organizing Committee wishes you an interesting and productive meeting and a very pleasant stay in Braga.

On the behalf of the XVII IOSTE Symposium Local Organizing Committee

[Signature]

- IOSTE Symposium Chair -
Rooms Layout

Level 1:

Level 2:
General Information

Internet access:
To access to the Internet, you must select ‘eduroam’ from the available network list. Activate the option ‘Connect Automatically’ and click on the ‘Connect’ button and login with:
- Username: ioste@guest
- Password: ioste2016

For any difficulty, you can get help from the IOSTE Secretariat. A Manual is available at the IOSTE Symposium Secretariat.

Lunches and Coffee breaks:
Lunches and Refreshments during coffee breaks are included in the registration fee. Lunch is delivered at the UMinho canteen (see map in this book), where you have to give the staff your specific day ticket. Coffee breaks are delivered at the building (01), where the IOSTE Symposium is held.

Welcome reception:
On Monday, the Welcome reception “Verde de honra” will start by 18:00h at the Panoramic Restaurant of UMinho (see map in this book). From 18:30h to 20:30h there will be a performance of traditional Portuguese Fado by Paula Barroso. The Welcome reception is included in the registration fee.

Gala dinner:
On Thursday, a bus will be available at 19:00h at the main entrance of the 01 building. Those that have their tickets for the Gala Dinner will take this bus to go to the Bom Jesus Restaurant, Sala Arcada.

Excursions:
On Wednesday, two buses will be available at 10:00h at the main entrance of the 01 building. One bus will take those who will visit Braga, the other bus will take those who will visit Ponte de Lima. You are required to show your specific ticket at bus entrance.

TUB – Braga Buses:
Participants will receive free bus tickets to be used during the IOSTE Symposium period.

112 – Emergency telephone number
The emergency telephone number 112 can be dialled free of charge from mobile telephones and fixed telephones in order to reach emergency services: ambulance, fire and rescue, police.
Keynote Speakers

Heidi B. Carlone is a professor of science education at The University of North Carolina at Greensboro. In her research, Carlone searches for explanations for the equity problem in science education that move beyond deficit- or difference-based lenses. She draws on anthropology of education, sociocultural theory, and cultural studies to understand the local and global productions of "science" and "science person" in K-16 in-school and out-of-school settings and implications of those meanings for those historically shut out of science and for science education reform. Her studies of equity, identity, and culture in science education have earned her over $3.5 million dollars in funding from United States' National Science Foundation and other non-profit organizations. She has received a number of awards in her academic career including: The UNCG Alumni Teaching Excellence Award; the Early Career Research Award from the National Association for Research in Science Teaching; and the Early Career Development Award (CAREER) from the National Science Foundation.

CONFERENCE:

A vision and tools for an equitable and just science education: Challenging common myths and shifting lenses

Internationally, we have a substantial equity problem in science and technology education. In many parts of the world, we have persistent gaps in achievement, participation, and affiliation between men and women, economically wealthier and poorer students, and, especially in the United States, White students and students of color. Addressing the equity problem within science and technology helps us forward the agenda of this conference—science and technology for a peaceful and equitable world. In this talk, I argue that creating a more equitable science education demands that we challenge taken-for-granted notions of science, smartness, and learning. Myths about equity and achievement pervade our common-sense ideas about reforming science education and, unfortunately, draw us to solutions of reform that limit possibilities and make too likely the perpetuation of the status quo. In this talk, I outline myths about the equity problem in science, outline a vision for what a science education for a peaceful and equitable world might look like, and provide theoretical and pedagogical tools to forward the vision.

Nélvio Bizzo is a biologist and educator, Full Professor of Science Education at the Faculty of Education, São Paulo University, Brazil. His work is related to biological education, with a special focus on the learning and teaching of biological evolution in Brazil and other countries. He is scientific coordinator of the research nucleus on Education, Epistemology of Evolution and Outreach (EDEVO-Darwin/USP), and his research group has developed methods on sociocultural grounds, combining qualitative and, more recently, quantitative methods. History of Biology is one of his major research subjects, with a special focus on the development of Charles Darwin's works, having developed some research with access of primary sources at Cambridge University Library (Manuscripts Room). Nélvio is a Senior Researcher of the National Council of Research (CNPq) in Brazil, and Fellow of the Royal Society of Biology (England), has spent some time as Visiting Professor in Italy (Verona and Padova Univ.), and is currently member of the Intergovernmental Panel on Biodiversity and Ecosystems Services (www.ipbes.net).
Evolution in Five Dimensions

Biological evolution will be discussed from five different points of view: historians discuss the architecture of scientific myths, philosophers discuss questions related to teleology, scientists are about to propose an "extended synthesis", some religions demand equal time for teaching sacred texts, and educators research students' beliefs and attitudes towards biological evolution. A panoramic view of the first four areas will allow a deeper consideration of the last one, presenting results of collaborative research recently carried out in three different countries: Brazil, Italy and the Galapagos Islands (Ecuador).

Nelson Lima obtained a BSc degree in Teaching Geology and Biology and a PhD in Biotechnology at the University of Minho, Braga, Portugal. Currently he is Full Professor in the Institute of Education and is a Researcher at the Biological Engineering Centre at the University of Minho. He is a Visiting Professor at the federal universities of Lavras and Pernambuco in Brazil. In 2015 he received from the latter university the honorary title of Professor Honoris Causa. His primarily research is related with fungal identification and applications, including description of new species for science, and fungal ex situ preservation and data management. He is also involved in the educational research field, mainly in science and environmental education with focus on biological diversity preservation. Since 1996 he has been the head of the fungal culture collection Micoteca da Universidade do Minho (MUM). Since 2003 that has served on the executive board of the European Culture Collections' Organisation, first as Collection Officer and currently as President. He was member of the executive board of the World Federation of Culture Collections. In Chile, Brazil, Belgian, and UK he has been the evaluator or consultant of different funding agencies. Similar positions are held with the European Commission. He has supervised 21 PhD and 30 Masters theses and has published more than 300 papers and proceedings.

A world in which microbial diversity is preserved and accessed with fair and equitable sharing of benefits

The variability among living organisms is biological diversity. This include terrestrial, marine and other aquatic ecosystems. An important aspect is the number of species on Earth which ranges from 5 to 30 million with only 1.7–2.0 million species being formally described. In the microbial world, it is estimated that 5 million fungal species exist but only 0.1 million are known with a low rate of less than 800 being described annually. For bacteria sensu lato, less than 0.1% are known. We know that the abundance and diversity of microbes is huge and, for example, the total number of bacterial cells on Earth (4-6 x 1030) surpass the estimated number of stars in the universe (1021) by several orders of magnitude: The number of microbial cells associated with the human body is a factor of 10 more than the human cells.

Some microbes are crucial to our existence, while others cause grave threats. For example, microbes are involved in recycling of plant material, or are in close association with plants that provide us the oxygen we breathe. Some provide antibiotics, other pharmaceuticals, industrial enzymes and valuable organic acids. Many cause devastating diseases of humans, animals, and crops. Microbial diversity is a treasure that must be understood, preserved and exploited.
Public service culture collections globally preserve more than 2.5 million of microorganisms. However, only a small fraction of the true environmental microbial diversity is currently preserved. Culture collections have recently expanded to become more wide-ranging biological resource centres (BRCs) providing innovative products and services in compliance with legal frameworks. The Nagoya protocol, on access to genetic resources and the fair and equitable sharing of benefits, is an international agreement which aims to share the benefits arising from the utilization of genetic resources, including microbes, and traditional-related knowledge enhancing opportunities available for nature-based research and development activities. This presentation will provide sound information about the importance of microbial diversity and state-of-the-art details on preservation and exploitation under the new legal framework on access and benefit sharing.

**Svein Sjøberg** is professor emeritus in science education at Oslo University and honorary professor at several other universities. He has received international prices for his research and science communication. He has also been involved in expert committees on science education for national institutions and research councils in several countries as well for the EU, UNESCO, OECD, The European Commission, ICSU (International Council of Science) etc. Svein has been organizer of two large comparative projects on pupils' interests, attitudes, perceptions etc. of importance to science teaching and learning. The main study is ROES (the Relevance of Science Education), with participation from more than 50 countries. His main perspective is on science and science education in a social and ethical perspective and science education policy. He has been active in IOSTE since 1980, also as board member and president.

**CONFERENCE:**

*Science education: from international cooperation, inspiration and cultural understanding -- to global competition, commercialization and standardization?*

IOSTE was born in the 1979, during the cold war, to promote dialog, cooperation and understanding across cultural and political borders. Educators in science and technology from all continents and widely different cultures met to share ideas and research and to inspire each other. The underlying value commitments are manifested in IOSTE’s mission statement.

The cold war is over, but the need to live up to the heritage of IOSTE and its mission statement is equally important today. We are facing global challenges: climate change, loss of biodiversity and other threats to a common future and sustainable development. These concerns are, however, under stress from other current tendencies: Nations’ fear of losing out in a global competitive race in a high-tech world economy. Such concerns may overrule our tasks as educators to promote human values, democratic citizenship and empowerment.

Competition replaces Cooperation. Globalization replaces Internationalization. Self-interest replaces Solidarity.

This development is fueled by the panic created world-wide by rankings of countries on standardized tests like PISA. Moreover, standards that are created by and for the highly industrialized OECD countries are used to judge the quality and influence educational priorities and polices also in less developed countries.

The presentation will provide a review and critical outlook on our challenges as S&T educators, based on nearly four decades of experiences in and for IOSTE.
### Program Overview

<table>
<thead>
<tr>
<th>Time</th>
<th>Monday July 11</th>
<th>Tuesday July 12</th>
<th>Wednesday July 13</th>
<th>Thursday July 14</th>
<th>Friday July 15</th>
<th>Saturday July 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00-10.00</td>
<td>Opening Session <em>(Tribute to M. Gago)</em></td>
<td>Keynote 1</td>
<td>Keynote 2</td>
<td>Keynote 3</td>
<td>Keynote 4</td>
<td></td>
</tr>
<tr>
<td>10.00-10.30</td>
<td>Coffee break</td>
<td>Coffee break</td>
<td>Coffee break</td>
<td>Coffee break</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.30-12.00</td>
<td>Parallel Session 1</td>
<td>Parallel Session 4</td>
<td>Parallel Session 6</td>
<td>IOSTE Assembly Board meeting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.00-14.00</td>
<td>Lunch</td>
<td>Lunch</td>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.00-15.30</td>
<td>Registration opens</td>
<td>Parallel Session 2</td>
<td>Parallel Session 5</td>
<td>Parallel Session 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.30-16.00</td>
<td>Coffee break</td>
<td>Coffee break</td>
<td>Coffee break</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.00-17.30</td>
<td>Parallel Session 3</td>
<td>Poster Session 1</td>
<td>Poster Session 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.30-...</td>
<td>Welcome Meeting</td>
<td>Regional Meetings</td>
<td>Board Meeting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.30-23.00</td>
<td>Board Meeting</td>
<td>Gala Dinner</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Monday: July 11

#### Registration open (14:00 - 19:30)

**IOSTE Board Meeting (16:00 - 19:30)**  
Room 220

#### Welcome reception (18:00 – 21:00)

*Verde de honra* with a *Fado* performance  
Panoramic restaurant, University of Minho
Tuesday: July 12

**Opening Session (09:00 - 10:15)**
Auditorium A1

*Welcome and Introductory Notes*
- Ministry of Science, Technology and Higher Education
- Rector of the University of Minho
- President of the Institute of Education of the University of Minho
- President of IOSTE
- President of the XVII IOSTE Symposium

*A tribute to José Mariano Gago*
Auditorium A1

**Chairperson:** Graça S. Carvalho

- Rosália Vargas, President of “Ciência Viva”
- Svein Sjøberg, University of Oslo, Norway

- **Coffee break** -

**Parallel Session 1 (10:30 - 12:00)**
Room 208

**Strand 1 - Student Understanding and Learning in STE- Curriculum, Contents and Contexts in a Real World**

**Chairperson:** Martin Braund, South Africa

- **008:** STEAMing Ahead! Why and How Science and Science Education Need the Arts
  *Martin Braund, South Africa.*

- **009:** Critical Episodes and Impacts of Physical Role-Plays in Science Teaching
  *Martin Braund, Christelle Ekron, Zalboenisha Ahmed and Trevor Moodley, South Africa.*

- **023:** Moral Judgment of High School Students in the Context of an Evaluation Process
  *Anderson Rabello, Fatima Gomes, Paula Birchal, Ronaldo Nagem and Mariana Vieira, Brazil.*

- **030:** Elementary Students’ Cognitive Process and Load in Visual Images about the Heights of Triangles - Based on Analysis of Eye Movement Data
  *Kwangho Lee and Mijin Lee, Korea.*

- **042:** Solving the Relevance Problem with Socioscientific Issues and Students’ Perceived Authenticity
  *Daniel Åkerblom, Sweden.*
### Strand 2 - Teaching STE for Quality Learning- Effective Teaching Models, Innovative Teaching, ICT, & Others

**Chairperson:** Jacolyn Weller, Australia  
**Room 209**

007: The Power of Primary Science Pre-Service Teacher Online Publishing  
*Jacolyn Weller, Australia.*

014: Modeling as a Strategy for Science Teaching: An Experience in Microbiology  
*Mariana Vieira, Fátima C. liveira Gomes, Ronaldo Luiz Nagem, Anderson Arthur Rabello and Alexandre Ferry, Brazil.*

016: Structural Analysis of Analogies and Counter Analogies in a Chemistry Class about Stereoisomery  
*Alexandre da Silva Ferry and Mariana de Lourdes Almeida Vieira, Brazil.*

021: International Comparative Studies as a Bases of Instructional Policy for Science Teaching - Well-Structured Classroom Management and Student-Centred Approaches  
*Imbi Henno and Pritt Reiska, Estonia.*

### Strand 3 - Teacher Professionalism in STE-Teacher Training and Professional Development, PCK, & Others

**Chairperson:** Pernilla Granfelt Enochson, Sweden  
**Room 210**

012: Exploring Outdoor Science in Teacher Education from a Comparative Scandinavian Perspective  
*Oleg Popov and Jan Höper, Sweden & Norway.*

032: Teachers’ Use of Hybrid Contexts as Means for Facilitating the Negotiation of the Science Content  
*Pernilla Granfelt Enochson and Eva Davidsson, Sweden.*

### Strand 4 - Education of Environment and Sustainable Development, Health Education, Sex Education

**Chairperson:** Ana Maria Caldeira, Brazil  
**Room 211**

181: Understanding the Complexity of Biodiversity Concept: A Case Study with High School Students  
*Rafael Castro and Marcelo Motokane, Brazil.*

061: Decision-Making and Biodiversity Conservation: Some Contributions for the Initial Education of Biologists  
*Camila S. Miani, Fernanda R. Brando and Ana Maria A. Caldeira, Brazil.*

236: The Influence of Scientific Discourse on Student’s Understanding of Biodiversity Complexity  
*Rafael Castro and Marcelo Motokane, Brazil.*

064: Environmental Education and Biodiversity in the Media  
*Marcia Cristina Bacic and Rosana L. F. Silva, Brazil.*
### Strand 5 - Other Cultural and Societal Issues in STE- Gender, Diversity of Cultures, Indigenous Knowledge System

**Chairperson:** John Oversby, UK  
**Room 213**

**015:** Are There Interesting Cultural Interconnections Between the Sciences, Technologies and Traditional Societies?  
*Geilsa Costa Santos Baptista and Jorge Arnaldo Troche-Escobar*, Brazil.

**088:** Action Research: Organising a Virtual Conference on Science Education Justice and Inclusion  
*John Oversby*, UK.

**098:** Understanding the Choice for a Study in STEM. Motives and STEM-Profiles among Students  
*Haydée De Loof, Annemie Struyf, Jelle Boeve-De Pauw and Peter Van Petegem*, Belgium.

**117:** Students’ Perceptions about the Social and Societal Orientation of Hard STEM Careers  
*Annemie Struyf, Haydée De Loof, Jelle Boeve-De Pauw and Peter Van Petegem*, Belgium.

### Strand 8 - Epistemology and History of Science in STE-Science and Religions in Schools

**Chairperson:** Olivier Perru, France  
**Room 212**

**011:** Teaching Sciences During the 18th Century: An Education in Experiment and Reasoning  
*Olivier Perru*, France.

**013:** The School Culture and the Implementation of the Historical-Philosophical Approach in the Teaching Physics  
*Abigail Vital and Andreia Guerra*, Brazil.

**029:** Scientists Discuss the Need for Openness in Science and Society  
*Pamela Mulhall, Dorothy Smith, Richard Gunstone and Christina Hart*, Australia

**054:** The Platypus: An Extraordinary Story for Teaching  
*Perru Olivier, Bruguière Catherine and Charles Frédéric*, France.

- Lunch -
Parallel Session 2 (14:00 - 15:30)

**Strand 1 - Student Understanding and Learning in STE- Curriculum, Contents and Contexts in a Real World**

**Chairperson:** Susanne Engström, Sweden  
**Room 208**

044: A Project about Materials as Subject Content within Technology Education  
*Susanne Engström, Eva Björkholm and Per Norström, Sweden*

051: Opinions of Teachers about New Third Grade Science Curriculum  
*Naim Demirkol and Şule Bayraktar, Turkey.*

058: Brazilian Testing Culture and Science Education: Principals’ Perspective  
*Paulo Garcia, Leandro Prearo, Maria do Carmo Romeiro and Marcos Bassi, Brazil.*

073: Enhancing Botanical Contents Teaching and Learning with Problem/Project-Based Learning (PBL) Approaches: A Report of Brazilian Experiences at a Federal Institution in São Paulo State  
*Fernando Santiago dos Santos, Brazil.*

184: Application Effects of PBL (Project-Based Learning) for Development of Life and Career Skills  
*Juneuy Hong and Kiljae Lee, Korea.*

**Strand 2 - Teaching STE for Quality Learning- Effective Teaching Models, Innovative Teaching, ICT, & Others**

**Chairperson:** James Mackay, New Zealand  
**Room 209**

047: The Steam Generator Project – The Development of Key Competencies in First Year Engineering Physics Students in Guangxi, China  
*James Mackay, New Zealand.*

056: Didactic Value of a Concept Maps Knowledge Model for the Study of Matter in the 4th Grade of Primary School  
*Mª Milagros Mateos Núñez, Guadalupe Martinez Borreguero and Francisco Luis Naranjo Correa, Spain.*

*Noelia Molina Rubio, Guadalupe Martinez Borreguero and Francisco Luis Naranjo Correa, Spain.*
**Strand 3 - Teacher Professionalism in STE-Teacher Training and Professional Development, PCK, & Others**

**Chairperson:** Gillian Kidman, *Australia*  
**Room 210**

- **043:** Acknowledging Students’ Voices in the Context of a Socio-Scientific Issue  
  *Ulrika Bossér*, Sweden

- **059:** Exploring the Nature of Science Teachers’ Pedagogical Equilibrium  
  *Jennifer Mansfield and Gillian Kidman*, Australia.

- **068:** Meaning-Making from CPD – Developing Practice in own Classroom and as a Peer in the Local Science PLC  
  *Birgitte Lund Nielsen*, Denmark.

- **125:** In Technology Training of Science Teachers: Discussions of the Teaching Qualification  
  *Taitiany Bonzanini*, Brazil.

**Strand 5 - Other Cultural and Societal Issues in STE- Gender, Diversity of Cultures, Indigenous Knowledge System**

**Chairperson:** Pierre Clement, *France*  
**Room 213**

- **133:** Profile of Students, Future Teachers of Science and Biology, of a Public University in The State of São Paulo – Brazil  
  *Maria De Lourdes Spazziani, Sheila Zambelo De Pinho, José Brás Barreto De Oliveira, Valéria Nobre Leal Oliva and Laurence Duarte Colvara*, Brazil.

- **063:** Teachers’ Conceptions of Gender Equality in 33 Countries  
  *Pierre Clement*, France.

- **152:** Gender Awareness in Teacher Education: Towards an Embodied and Inclusive Approach to Elementary Science Education  
  *Maria João Silva, Eduarda Ferreira and Ana Ferreira*, Portugal.

- **191:** Sociocultural Factors: Do they Affect the Teaching of Human Reproduction in South African Primary Schools  
  *Megan Doidge*, South Africa.

**Strand 8 - Epistemology and History of Science in STE-Science and Religions in Schools**

**Chairperson:** Hesley Silva, *Brazil*  
**Room 212**

- **084:** Views of Vocational High School Students and Teachers about the Nature of Science  

- **101:** Guided Group Research in the Classroom: Can HPS be used by Students as a Means to Understand Contemporary Scientific Themes?  
  *Andreia Guerra, José Claudio Reis and Julliana Bomfim*, Brazil.

- **104:** An Alternative Conceptualisation of the Nature of Science for Science & Technology Education  
  *Angel Vazquez Alonso and Maria-Antonia Manassero-Mas*, Spain.

- **122:** The Perception of Biology Teachers from Argentina, Brazil and Uruguay on the Purpose of Evolution and the Emergence of the Human Species  
  *Hesley Silva, Ivanna Tomasco, Martin Diaz and Graça Carvalho*, Brazil & Portugal.
Parallel Session 3 (16:00 - 17:30)

Strand 1 - Student Understanding and Learning in STE-Curriculum, Contents and Contexts in a Real World

Chairperson: Juneuy Hong, Korea

174: The Analysis on the Relation of Scientific Interest and Eye Movement for a Photo Associated with Biological Phenomena
Jang-Hwan Kim and Dong-Hoon Shin, Korea.

175: The Analysis of the Nature and Process of Students' Attention in the Real Elementary Science Class
Won-Sub Shin and Dong-Hoon Shin, Korea.

190: Elementary Students’ Authentic Science Activities using Rapid-Cycling Brassica Rapa through a Brain-Based Evolutionary Approach
Chae-Seong Lim, So-Young Kim, Sung-Ha Kim and Juneuy Hong, Korea.

198: A Study on the Effectiveness of Virtual Experiments
Sooah Lee and Youngseok Jhun, Korea.

Strand 4 - Education of Environment and Sustainable Development, Health Education, Sex Education

Chairperson: Zélia Anastácio, Portugal

229: Sustainable Development in Terms of Health Education as a Part of Students-Future Teachers Training
Katarzyna Potyrala, Karolina Czerwiec and Beata Jancarz-Lanczkowska, Poland.

242: The Contribution of Natural Sciences Teachers for Sexuality Education
Zélia Anastácio, Portugal.

024: Health Promotion and Education in Portuguese Schools: Links Between the Health and the Education Sectors
Leonel Lusquinhos and Graça Carvalho, Portugal.

227: Assessing the Effectiveness of an Educational Intervention in Improving the Quality of Food and Snacks that Children Bring to School
Maria José Henriques, José Precioso, Mariana de Senzi Zancul, Catarina Samorinha and Regina Alves, Portugal.

244: Media Literacy Empowering Health Teachers in the Republic of Mozambique
Agnaldo Arroio, Clara Mauaie and Lucy Ito, Brazil & Mozambique.
Thematic Session:

**Theory Based Development in Science Education through the Use of Managing Education Model of Science Instruction**

**Chairperson:** Mohammadreza Behrangi, *Iran*  
**Room 209**

251: Models of Teaching Comparison for Glorifying Management Education Model (MEM)  
*Mohammadreza Behrangi and Sayedeh Zohreh Hosseini*, Iran.

085: Improving Learners’ Learning through Managing Science Education Theory, Cybernetic, and Picture-Word-Inductive Mixed Models  
*Mohammadreza Behrangi and Morvarid Khanjarkhani*, Iran.

210: The Impact of Implementing the Education Management Ten Steps on Remembering Improvement at Primary English Language  
*Mahdieh Rahimzadeh Shandiz and Mohammadreza Behrangi*, Iran.

226: Study Effect of Performing Education Management in English Learning with Sustainability of Students  
*Marjan Jenabi and Mohammad Reza Behrangi*, Iran.

253: The Effectiveness of Attending to the Institutional and Cognitive Learning on Students’ Success, Self-Efficacy, Teachers’ Burnout, and Job Satisfaction  
*Neda Rangi and Mohammadreza Behrangi*, Iran.

Round Table:

**262: Initiating a Process. Time for a Revised and Updated Version of the ROSE Study?**

**Chairperson:** Svein Sjøberg, *Norway*  
**Room 212**

- The ROSE-Project after 10+ Years: Overview and Impact  
  *Svein Sjøberg*, Norway.

- Experiences from the Relevance of Science Education (ROSE) Research Studies in Sweden  
  *Anders Jidesjö and Magnus Oskarsson*, Sweden.

- Changes in Estonian Grade Nine Students’ Interest and Motivation Towards Learning Science at School During the Period 2003-2015  
  *Moonika Teppo, Miia Rannikmäe*, Estonia.

- Performed Actions and Lessons Learnt from Brazil, Italy and Ecuador (Galapagos)  
  *Nelio Bizzo and Giuseppe Pellegrini*, Brazil & Italy.

- Methodological Issues and Socio-cultural Perspectives  
  *Suan Yoong*, Malaysia.

Open Meeting (17:30 - 19:30)

**A Second ROSE Project? Informal, Open Planning Meeting**

**Room 212**

Wednesday: July 13

Keynote 1 (09:00 - 10:00)
Chairperson: Magnus Oskarsson, Sweden

Science education: from international cooperation, inspiration and cultural understanding -- to global competition, commercialization and standardization?

Svein Sjøberg, University of Oslo, Norway.

Excursions (10:00 - 19:00):
- Braga
- Ponte de Lima

IOSTE Board Meeting and diner (19:30 - 22:00) Hotel Meliã
Thursday: July 14

Keynote 2 (09:00 - 10:00)
Chairperson: Giuseppe Pellegrini, Italy
Auditorium A5

Evolution in Five Dimensions

Nélio Bizzo, University of São Paulo, Brazil.

- Coffee break -

Parallel Session 4 (10:30 - 12:00)
Strand 1 - Student Understanding and Learning in STE- Curriculum, Contents and Contexts in a Real World
Chairperson: Fernanda Franzolin, Brazil
Room 208

089: Creative Drama as a Communicative Practice in the Chemistry Classroom
Kerstin Danckwardt-Lillieström, Maria Andrée and Margareta Enghag, Sweden.

090: Facing Religious Conflict: Common Descent and Science Practice
Viviane Vieira, Alessandra Santos and Eliane Falcão, Brazil.

092: Exploring and Developing Aspects of Students’ Critical Evaluation of Health Related Online Resources in Science Education
Jonna Wiblom, Carl-Johan Rundgren and Maria Andrée, Sweden

096: Human Genetics and Didactic Transposition: The Expression of Skin Color, Eye Color, and Height in Brazilian and Portuguese Textbooks
Fernanda Franzolin, Ana Paula Zampieri Silva, Luana de Souza Prochazka, Cláudia Ferreira and Graça S. Carvalho, Brazil & Portugal.

120: Youth Perceptions of Science, Technology, and Engineering in Workshops at a Community Organization
### Strand 2 - Teaching STE for Quality Learning: Effective Teaching Models, Innovative Teaching, ICT, & Others

**Chairperson:** Pernille Maj Svendsen, Denmark  
**Room:** 209

**066:** Continuing Training of Teachers: Interdisciplinary Practices as a Contribution to the Teaching of Sciences and Mathematics  
*Ophelio Walkyrio de Castro Walvy,* Brazil.

**069:** The Impact of a "Testing Culture" on Elementary Science. An Examination from Jurisdictions in Brazil and Canada  
*Paulo Sergio Garcia and Xavier Fazio,* Brazil & Canada.

**076:** Integrating Philosophy for Children with Science in Primary Schools  
*Yalcin Yalaki and Nihan Akkocaoglu,* Turkey.

**078:** Teacher Roles and Pedagogies Whilst Undertaking Inquiry-Based Teaching  
*Gillian Kidman,* Australia.

**110:** An Innovative Research-Focused Intervention for Upper Secondary School Students  
*Pernille Maj Svendsen,* Denmark.

### Strand 3 - Teacher Professionalism in STE-Teacher Training and Professional Development, PCK, & Others

**Chairperson:** Siv Flæsen Almendingen, Norway  
**Room:** 210

**077:** Analysis of Educational Products in Professional Master’s Degree Course: Educational Supplies for Science Education  
*Maria Cristina Moreira, Giselle Rôças, Maylta dos Anjos and Marcus Vinicius Pereira,* Brazil.

**080:** Science Teacher Education and International Cooperation towards Development: Researching the Contributions of Portuguese Public Universities  
*Betina Lopes, Patrícia Almeida, Nilza Costa and Pedro Callapez,* Portugal.

**081:** How Confident Are Primary School Teachers to teach Science? A Comparative European Study  
*Tom Klepaker and Siv Flæsen Almendingen,* Norway.

**086:** Naught, Sought and Fraught: Tensions in Professional Development for Science, IT and Maths Teachers Operating Out-Of-Field in Small Rural Schools in NSW, Australia.  
*Frances Quinn, Lee Ann Hally, Linda Hobbs, Christopher Speldewinde and Colleen Vale,* Australia.

**087:** The Role of a CPD Program in Promoting Teacher Self-Confidence in using 3-Stage "Education Through Science" Teaching Modules  
*Ana Valdmann, Miia Rannikmäe and Jack Holbrook,* Estonia.
**Strand 4 - Education of Environment and Sustainable Development, Health Education, Sex Education**

**Chairperson:** Rosa Branca Tracana, Portugal  

**Room 211**

- **252:** Teachers’ Conceptions of Nature and Environment in Togo  

- **070:** Teachers’ Conception of Environment in Russia  
  Charles Frédéric and Clément Pierre, France.

- **075:** Biodiversity in Environmental Movies: Analysis for Critical Environmental Education  
  Rosana Louro Ferreira Silva, Ana Cláudia Thinen and Maria Angélica Barrios, Brazil.

- **097:** Prevention of Unhealthy Body Postures in Children from 7 to 12 Years – A Case Study  
  Rosa Branca Tracana, Amália Ferreira and Graça S. Carvalho, Portugal.

**Strand 5 - Other Cultural and Societal Issues in STE- Gender, Diversity of Cultures, Indigenous Knowledge System**

**Chairperson:** Katherine Wade, USA  

**Room 213**

- **209:** African American Females’ Discourse Use and Identity Development in After School and School Science  
  Katherine Wade, USA.

- **219:** Empowering Students’ Activism on Socioscientific Issues: Decisions on Forms of Actions  
  Majd Zouda, Tomo Nishizawa and John Lawrence Bencze, Canada.

- **230:** My Home Too: Place-Based Education and Dadirri in Science for Remote Australian Indigenous Students  
  Lee Ann Hally and Frances Quinn, Australia.

- **235:** Introducing Thought Listing Technique to Measure Affective Factor of Attitude toward Science,  
  Eunjeong Yun and Yunebae Park, Korea.
**Strand 7 - Informal Education of S&T-Museums, Science Centers, Natural Parks, Media, Etc.**

**Chairperson:** Deborah Corrigan, Australia

018: Drama for Inclusion in Science  
*John Oversby, UK.*

046: The Importance of Fifth Grade Students’ (10-11 Years Old) Sociocultural Experiences at a State Park  
*Patricia Patrick and Kandace Haigler, USA.*

071: Stand of Science: Mobile Communication Science Inquiring about Culture and Society in Schools  
*Luis Paulo de Carvalho Piassi, Rui Manoel de Bastos Vieira and Emerson Izidoro dos Santos, Brazil.*

*Yui Tanaka, Etsuji Yamaguchi, Shigenori Inagaki, Ryohei Egusa, Fusako Kusunoki, Hideto Okuyama and Tomoyuki Nogami, Japan.*

134: Innovation and Entrepreneurship as Economic Change Agents: The Role of STEM Education in Australia  
*Debra Panizzon and Deborah Corrigan, Australia.*

---

**Parallel Session 5 (14:00 - 15:30)**

**Strand 1 - Student Understanding and Learning in STE- Curriculum, Contents and Contexts in a Real World**

**Chairperson:** Yoon Fah Lay, Malaysia

150: The Predictive Effects of Attitudes Toward Science and Mathematics on Southeast Asian Grade 8 Students’ Science and Mathematics Achievement in TIMSS  
*Yoon Fah Lay, Malaysia.*

156: Transformations of Materials: Teaching the Water Cycle in Primary Science Education  
*Kathrin Ottrel-Cass and Bronwen Cowie, Denmark & New Zealand.*

157: Design-Based Science Learning: Understanding Students’ Scientific Reasoning in Complex Problem Solving  
*Katrin Vaino, Toomas Vaino and Madelen Bodin, Sweden & Estonia.*

196: Influence of Augmented Reality Technology on Seventh Grade Students’ Achievement about Astronomy  
*Tuba Demircioglu Demirel, Memet Karakus and Sedat Ucar, Turkey.*
### Strand 2 - Teaching STE for Quality Learning: Effective Teaching Models, Innovative Teaching, ICT, & Others

**Chairperson:** Etsuji Yamaguchi, Japan

**Room 209**

*Betina Lopes, Patrícia Albergaria-Almeida, Margarida Lucas and Mariana Martinho*, Portugal.

082: The Educational Video and its Spectator: A Meeting at the Medical School
*Américo de Araújo Pastor Junior, Luiz Augusto Coimbra Rezende Filho, Marcus Vinicius Pereira and Wagner Gonçalves Bastos*, Brazil.

091: Epistemic Artifacts for Supporting Students’ Constructing Arguments on Socio-Scientific Issues
*Etsuji Yamaguchi*, Japan.

116: Online Research as a Strategy for Data Collection and Planning a Model of b-Learning Teacher Education
*Arilson Sartorelli Ribas and João Filipe Matos*, Brazil & Portugal.

*Hassanreza Zeinabadi and Maryam Faeli*, Iran.

### Strand 3 - Teacher Professionalism in STE: Teacher Training and Professional Development, PCK, & Others

**Chairperson:** Fernando Guimarães, Portugal

**Room 210**

094: IBSE and the Training of In-Service Science Teachers in the Czech Republic
*Hana Ctnactova, Milada Tepla and Lenka Ctnactova*, Czech Republic.

127: The Effect of Real Life Oriented Teaching Practices on Learning about Light and Sound
*Sema Altun YalÇin, Paşa YalÇin, Said Akar and Meryem Ozturan SaĞirli*, Turkey.

132: Academic Performance of Students in Technological Area in a Brazilian Social Inclusion Program
*José Brás Barreto Oliveria, Maria de Lourdes Spazziani, Valeria Nobre Leal Oliva, Sheila Zambelo Pinho and Laurence Duarte Colvara*, Brazil.

140: Botany Classes’ Contextualization: A Research Work Inside Three Brazilian Universities and a Portuguese One
*João Rodrigo Silva, Fernando Guimarães and Paulo Takeo Sano*, Brazil & Portugal.
**Strand 4 - Education of Environment and Sustainable Development, Health Education, Sex Education**

**Chairperson:** Maria Teresa Vilaça, Portugal  
**Room:** 211

111: Teachers’ Conception of Environment in Sarawak, Malaysia  
*Margaret Kit Yok Chan, Pierre Clément and Kim Leong Lai*, Malaysia & France.

112: Environmental Perceptions about Marine and Coastal Ecosystems: Propose of a Research Instrument based on Bogner and Wiseman’s Model of Ecological Values  
*Suzana Ursi and Naomi Towata*, Brazil.

119: Achieving Scientific Literacy Through Media Literacy  
*José Azevedo, Margarida Morais Marques, Luísa Aires and Rita Santos*, Portugal.

137: Identifying Influential Youths for Effective Peer Education on HIV/AIDS Prevention with the use of Information and Communication Technologies  
*Maria Teresa Machado Vilaça and Catarina Certal*, Portugal.

147: Validation and Production of Investigative Didactics Sequences of Biology  
*Marcelo Tadeu Motokane and Marcelo Pereira*, Brazil.

**Strand 7 - Informal Education of S&T-Museums, Science Centers, Natural Parks, Media, Etc.**

**Chairperson:** Alessandra Bizerra, Brazil  
**Room:** 212

115: Serendipitous Encounters with Science: Guerrilla Marketing in Contexts of Informal Education of S&T  
*Paulo J. Fontes and José Azevedo*, Portugal.

254: Mutual Engagement as a Formative Element of Mediators in Non-Formal Education Spaces  
*Luana Biasutti and Alessandra Bizerra*, Brazil.

**Strand 8 - Epistemology and History of Science in STE-Science and Religions in Schools**

**Chairperson:** Gultekin Cakmakci, Turkey  
**Room:** 213

143: The Distorted Views of Brazilian Teachers on the Nature of Science: From the Point of View of Social Representation Theory  
*Daniele da Silva Maia Gouveia, Andreia Guerra de Moraes and Alcina Maria Testa Braz da Silva*, Brazil.

232: Explanations as Cultural Tools: Bridging Philosophical Studies of Scientific Explanations with Science Teaching  
*Alexsandro P. Pereira*, Brazil.

260: Using Video Vignette of Historical Episodes as a Mediating Artefact for Promoting Pre-Service Science Teachers’ Ideas about Nature of Science  
*Gultekin Cakmakci*, Turkey.

- Coffee break -
Poster Session 1 (16:00 - 17:30)

025: Analyzing Mediated Activity of Primary School Science: A Monograph  
Nathalie Baqué

027: Experimentation in Physics Education: Future Teachers Considerations  
José Claudio Reis and Andreia Guerra

033: Primary and Secondary School Teachers’ Conception of Environmental Education in the English and French Speaking Subsystems of Education in Cameroon  
Lawrence Ntam Nchia, Pierre Clément, George Nditalfon, George Epah Fonkeng and Joseph Tamesse

035: Integrating Socio-Scientific Issues in School Health Education  
Dâlía Melissa Conrado, Nei Nunes-Neto, Liziane Martins, Graça S. Carvalho and Arantza Etxeberria

036: Secondary Students’ Notions Concerning the Simple Pendulum in a Modelling Perspective: A Clinical Study  
Juliana Machado and Marco Braga

037: Exploring the PCK Development: A Case Study on Electric Fields Teaching  
Lina Viviana Melo Niño, Florentina Cañada Cañada and Guadalupe Martínez Borreguero

038: Pedagogical Content Knowledge of a Mexican Secondary School Teacher on Kinetic Molecular Model  
Esther Marín Resendiz, Guadalupe Martínez Borreguero, Florentina Cañada Cañada and Lina Viviana Melo Niño

045: Informal Science Educators and the Nine Dimensions of Reflective Practice  
Patricia Patrick and Martin Braund

050: Augmentation of Museum Science Education Using Human-Interaction Technology  
Haruya Tamaki, Tsugunosuke Sakai, Ryuichi Yoshida, Yosuke Ota, Ryoei Egusa, Shigenori Inagaki, Etsuji Yamaguchi, Fusako Kusunoki, Miki Namatame, Masanori Sugimoto and Hiroshi Mizoguchi

053: Exploring How to Communicate with Zoo Visitors: The Impact of an Elephant Story on Zoo Visitors’ Awareness Toward Environmental Issue  
Shiho Miyake

072: Model of Learning in the Cloud – Research on Information Highway  
Katarzyna Potryala, Beata Jancarz-Lanczkowska and Karolina Czerwiec

074: The Curriculum and the Textbook of Basic Education: Contributions for Training in Degree in Biological Sciences  
Rúbia Emmel and Maria Cristina Pansera-De-Araújo

083: “Projeto Novos Talentos”: The Science Education as a Way to Empower Brazilian Students  
Maylta Brandão Dos Anjos, Giselle Rôças and Marcus Vinicius Pereira

093: A Scientometric Analysis of the Impact of OECD/PISA on Non-Educational Areas  
Daniel Morin Ocampo and Luiz Caldeira Brant Tolentino-Neto
099: Audiovisual Reception in Science Education: Science Teachers’ Use and Adaptation of Videos
Luiz Augusto Coimbra Rezende Filho, Wagner Gonçalves Bastos, Américo De Araujo Pastor Junior and Marcus Vinicius Pereira

Emerson I. Santos, Rui Manoel B. Vieira and Luis Paulo Piassi

105: L.Y.R.A. – Laboratory of Inquiring in Robotics and Astronautics
Rui Manoel De Bastos Vieira, Emerson Izidoro Santos and Luis Paulo de Carvalho Piassi

106: The Reflective Teacher: Analysis of Donald Schön Concepts in Teacher Training
Alexandre José Krul and Rúbia Emmel

107: Environmental Education in a Brazilian Public University: Disciplinary Diagnosis
Rosana Louro Ferreira Silva and Denise De La Corte Bacci

118: Practices and Relevance of ICT in the Algerian Physics Programs
Brahim Mazouze and Rabah Ladj

124: Teaching Tools and the Quality of Science Education: Some Reflections
Taitiâny Bonzanini

131: Science Education and the Academic Research: How Brazilian and International Journals Has Approached the Subject
Naomi Towata, Péricia P. Barbosa, Luís Carlos Saito and Suzana Ursi

135: Sustainability and Learning Spaces at a Public School
Maria De Lourdes Spazziani and Raisa Donatelli Veríssimo De Mello

136: Professional Development and Supervision in Science, Health and Sustainability Education: An Exploratory Study with Portuguese and Brazilian Natural Science Teachers
Maria Teresa Machado Vilaça and Célia Regina Rossi

138: Social Representation of Marine and Coastal Environments: A Perspective of Teachers from Southeast Coast of Brazil
Suzana Ursi, Geisly Katon, Naomi Towata and Flávio Berchez

171: Motivating Mathematics Learning and Building Human Values
Patrícia Moura and Taitiâny Bonzanini K.

178: Perception and Connectedness with Marine and Coastal Environments: The Perspective of Basic Education and Undergraduate Students from Two Brazilian Cities
Naomi Towata and Suzana Ursi

212: Neo-Nardo Da Vinci's Thinking: New Convergence Thinking of the Students Appearing in the Creative Invention
Seung-Hyuk Kwon, Young-Ji Lee, Jeung-Tae Eom, Jae-Young Oh, Ahn Heum Eom and Yong-Ju Kwon

240: Convergence Thinking Brain: Brain Connectivity of Convergence Thinking during Problem Solving using Bio-Mimics
Seung-Hyuk Kwon, Jae-Young Oh, Young-Ji Lee, Ahn Heum Eom and Yong-Ju Kwon
<table>
<thead>
<tr>
<th>Event</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOSTE Regional Meetings</td>
<td>17:30 - 19:00</td>
<td>Rooms 208 / 209 / 210 / 211 / 213 / 212</td>
</tr>
<tr>
<td>Gala Dinner</td>
<td>19:00 - 23:00</td>
<td></td>
</tr>
</tbody>
</table>
Friday: July 15

Keynote 3 (09:00 - 10:00)

Chairperson: Maria Andrée, Sweden

A vision and tools for an equitable and just science education: Challenging common myths and shifting lenses

Heidi Carlone, University of North Carolina, USA.

-Coffee break-

Parallel Session 6 (10:30 - 12:00)

Strand 1 - Student Understanding and Learning in STE- Curriculum, Contents and Contexts in a Real World

Chairperson: Esme Hacieminoğlu, Turkey

159: Investigating How Undergraduate Biological Sciences Students Understand Tree-Thinking: Results from Two Brazilian Institutions
Marcela D'Ambrosio, André Victor Lucci Freitas and Fernando Santiago dos Santos, Brazil.

189: Analysis of the Higher Education Student’s Point of View in the Taking of Decision about SSI Approached in the Discipline of STS
Wanna Santos de Araújo, Anderson Jésus da Silva and Wildson Luiz Pereira dos Santos, Brazil.

166: First Year Students’ Perceptions on their Transition from Secondary to Tertiary Education: A Case of Latvia
Rita Birzina and Dagnija Cedere, Latvia.

153: Use of Coupled Inquiry Based Method Course Environment as a Source of Development of College Students’ Science Teaching Efficacy Belief, Attitude and Constructivist Approaches to Teaching Science
Esme Hacieminoğlu, Turkey.
Strand 2 - Teaching STE for Quality Learning- Effective Teaching Models, Innovative Teaching, ICT, & Others

Chairperson: Kalle Saastamoinen, Finland

Room 209

162: Design Principles for a Didactic Sequence on Cell Biology Contextualized by Social and Ethical Issues
Ayane de Souza Paiva, Ana Paula Miranda Guimarães, Nei de Freitas Nunes Neto and Rosiléia Oliveira de Almeida, Brazil.

177: Collaborative Work in the Development of Educational Innovations Guided by Socioscientific Questions in the Context of Primary Education
Ana Paula Miranda Guimarães, Anna Cássia de Holanda Sarmento, Nei Nunes-Neto and Charbel N. El-Hani, Brazil.

167: Using the Internet as a Tool for Teaching – Experiments and Experiences
Kalle Saastamoinen, Finland.

Strand 3 - Teacher Professionalism in STE-Teacher Training and Professional Development, PCK, & Others

Chairperson: Stephen Keast, Australia

Room 210

180: Does Developed Mean More Advanced: STEM Teacher Training in Uruguay. A Case Study?
Jude Sanders and John Oversby, Ireland & UK

188: Teacher Educators’ Strategies for using Pre-Service Teacher-Authored Cases
Lucy Rutherford, Gillian Kidman and Stephen Keast, Australia.

186: The Use of Technologies in the Teaching and Learning Process of Science Subjects under the Teachers Perspective
Alcina Maria Testa Braz da Silva, Vitor Luiz Bastos de Jesus and Alexandre Lopes de Oliveira, Brazil.

Strand 3 - Teacher Professionalism in STE-Teacher Training and Professional Development, PCK, & Others

Chairperson: Zeynel Abidin Yilmaz, Turkey

Room 213

206: Continuing Education of Teachers in STES Approach: Small Projects and Great Discussions about Sustainability
Sidnei Quezada Meireles Leite, Antônio Donizetti Sgarbi, Maria das Graças Ferreira Lobino and Vilma Reis Terra, Brazil.

213: To Communicate the Theory of Evolution to All, from Babies to Adults
Jan-Eric Mattsson, Mikael Lönn and Ann Mutvei, Sweden.

220: The Difference Between “Laboratory Activity”, “Experimental Activity” and “Practical Activity” in Teacher Vision
Francine Pinhão and Maria Cristina Moreira, Brazil.

207: Instructors’ Opinions about PowerPoint, their Usage Frequency, Use and Intended Purposes
Erol Kaya, Sema Altun Yalçıın, Sinan Yalçıın, Sakip Kahraman and Zeynél Abidin Yilmaz, Turkey.
<table>
<thead>
<tr>
<th>Strand 4 - Education of Environment and Sustainable Development, Health Education, Sex Education</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chairperson:</strong> Majken Korsager, Norway</td>
</tr>
<tr>
<td><strong>Room 211</strong></td>
</tr>
<tr>
<td>158: Moving the Classroom for Sustainable Development Outdoor – Can it be Justified?</td>
</tr>
<tr>
<td><em>Anja Gabrielsen and Majken Korsager, Norway.</em></td>
</tr>
<tr>
<td>161: Interdisciplinary Teaching for Students' Understanding of Sustainable Development – Does it Matter?</td>
</tr>
<tr>
<td><em>Majken Korsager and Eldri Scheie, Norway.</em></td>
</tr>
<tr>
<td>257: Environmental Justice Issues in Natural Sciences Textbooks</td>
</tr>
<tr>
<td><em>Zaiboenisha Ahmed, South Africa.</em></td>
</tr>
<tr>
<td>268: Competences to act sustainably in favour of the environment. A study on the knowledge, attitudes and behaviours towards a sustainable environment with Portuguese students of the 1st cycle of primary education</td>
</tr>
<tr>
<td><em>Marcia Moreno, Pedro Vega and Graça S. Carvalho, Portugal &amp; Spain.</em></td>
</tr>
<tr>
<td>187: The Effects of Blogging on Pre-Service Science Teachers’ Internet Self-Efficacy and Understanding of Atmosphere-Related Environmental Issues</td>
</tr>
<tr>
<td><em>Sakip Kahraman, Turkey.</em></td>
</tr>
</tbody>
</table>

**- Lunch -**

<table>
<thead>
<tr>
<th>Parallel Session 7 (14:00 - 15:30)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strand 1 - Student Understanding and Learning in STE- Curriculum, Contents and Contexts in a Real World</strong></td>
</tr>
<tr>
<td><strong>Chairperson:</strong> Bulent Cavas, Turkey</td>
</tr>
<tr>
<td><strong>Room 208</strong></td>
</tr>
<tr>
<td>173: Integration of Robotics into School Science Curriculum: 4 Best Practices</td>
</tr>
<tr>
<td><em>Bulent Cavas, Ilhan Silay, Sercan Senel and Kadir Demir, Turkey &amp; USA.</em></td>
</tr>
<tr>
<td>192: Interests, Class Experiences and Opinions in Science. How Adolescents Perceive Scientific Careers</td>
</tr>
<tr>
<td><em>Giuseppe Pellegrini, Italy.</em></td>
</tr>
<tr>
<td>211: The Uses of Evidences and their Evaluation in Written Arguments about a Codominance Case</td>
</tr>
<tr>
<td><em>Marcelo Tadeu Motokane, Israel Silli Palandre, Giovanna Paola Moretto Bergamini, Gabriel Henrique Camargo, Beatriz Azevedo Cezila, Tiago do Amaral Moraes, Kimberly Mazagão Ferreira and Uriel Assan, Brazil.</em></td>
</tr>
</tbody>
</table>
**Strand 1 - Student Understanding and Learning in STE- Curriculum, Contents and Contexts in a Real World**

**Chairperson:** Ilona Iłowiecka-Tańska, Poland  
**Room 212**

223: Botany in Basic Education Textbooks: Conceptual Issues Regarding Simplifications and Complexifications in Brazil and Portugal  
*Fernando Santiago dos Santos and Fernando Manuel Seixas Guimarães*, Brazil & Portugal.

225: Learning Science in a STS Perspective: A Didactic Experience with 5th Grade Students  
*Vicente Garcia, Joana Oliveira and Luisa Neves*, Portugal.

261: Science Capital and Students Aspirations  
*Ilona Iłowiecka-Tańska*, Poland.

270: How can a Garden to be used to Learn Science? Student's Point of View in a Garden's Collaborative Project  
*Vânia Galindo Massabni*, Brazil.

**Strand 2 - Teaching STE for Quality Learning- Effective Teaching Models, Innovative Teaching, ICT, & Others**

**Chairperson:** Margaret Chan, Malaysia  
**Room 209**

224: Constructing Arguments: Data and Evidence Worked in a Didactic Sequence in Ecology  
*Sofia Valeriano Silva Ratz and Marcelo Tadeu Motokane*, Brazil.

237: A Karl Popper Inspired Inquiry Based Laboratory Experiment with Interesting Results for Learning and Motivation in Primary Students  
*Lars Björklund*, Sweden.

**Strand 3 - Teacher Professionalism in STE-Teacher Training and Professional Development, PCK, & Others**

**Chairperson:** Daisy B. Rezende, Brazil  
**Room 210**

222: Viewpoints of Pedagogical Formation Students on Technology  
*Cansu Özbek, Sema Altun Yalçın, Sinan Yalçın, Zeynel Abidin Yılmaz and Sakip Kahraman*, Turkey.

234: How to Further the Role of the Students in their Own Educational Process by having them Produce Audiovisual Materials Concerning Chemical or Physical Transformations  
*Luiz G. B. Novais, Agnaldo Arroio and Daisy B. Rezende*, Brazil.

239: Why to be a Chemistry Teacher? Social Representation of Science Teaching in the East Timorense Context  
*Marcia B. R. Aguilar and Daisy B. Rezende*, Brazil.

248: Exploring Routes into Student Engagement: An Aspect of the Pedagogical Reasoning of Expert Teachers  
**Strand 3 - Teacher Professionalism in STE-Teacher Training and Professional Development, PCK, & Others**

**Chairperson:** Alexandra Gomes, Portugal

**Room 213**

- **255:** Development of SEARS-ST for Teacher Professionalism in STE: Lessons Learnt and the Way Forward  
  Khar Thoe Ng, Yoon Fah Lay, Soo Boon Ng and Robert Peter Devadason, Malaysia.

- **266:** Portuguese Elementary Teachers’ Knowledge and Skills Assessment Test (Specific Component Mathematics Level 1): What Was Really Assessed?  
  Catarina Vasconcelos Gonçalves and Alexandra Gomes, Portugal.

- **259:** Professional Learning of Beginner Science Teachers  
  Melanie Sadeck, South Africa.

- **231:** Integrated Chemistry and Biology Teaching of Digestion  
  Ann Mutvei and Jan-Eric Mattsson, Sweden.

**Strand 4 - Education of Environment and Sustainable Development, Health Education, Sex Education**

**Chairperson:** Nelson Lima, Portugal.

**Room 211**

- **208:** Assessing the Effectiveness of a Tobacco Use Prevention Programme Based on the School Curriculum, in the Prevention of Tobacco Consumption  
  Maria Isabel Sousa, José Precioso, José Machado, Maria de Fátima Reis, Carla Joana Sousa, Catarina Samorinha and Henedina Antunes, Portugal.

- **267:** Children Conceptions on the Structure of a Bird, Mammal and their Relation in the Biosphere  
  Rosa Branca Tracana, Marisa Lopes and Maria Eduarda Ferreira, Portugal.

- **269:** Planning Experimental Activities for Primary School Learning about Microbes and Hand Hygiene  
  Paulo Mafra, Nelson Lima and Graça S. Carvalho, Portugal.

**- Coffee break -**

**Poster Session 2 (16:00 - 17:30)**

- **114:** Effects of the Concept Change Teaching Model on Evolution Teaching  
  Jaeho Sim and Hae-Ae Seo

- **139:** Pedagogic Practice Skills for the Science, Technology and Society (STS) Approach  
  Thomas Fejolo, Thiago B. Melo, Chrispino Alvaro and Silva Alcina Maria T. B. Da

- **141:** Basic Problem Learning for a Peaceful and Equitable World  
  Amine Said and Ahmed Chabchoub

- **144:** A Case Study of the Novice and Expert Teachers’ Eye Movement in Elementary Science Classes  
  Ilho Yang, Sungha Kim, Eunjin Kim and Sukyoung Kim
145: Supporting Self-Directed Investigation Planning of the Gifted in Science at Secondary Level  
Hwoegwan Yang, Jongwon Park and Hanghwa Hong

163: Students’ Views on Biological Evolution in Brazil, Italy and Ecuador (Galapagos)  
Nelio Bizzo, Giuseppe Pellegrini, Nicolás Cuvi, Graciela Oliveira, Ana Santos-Gouw, Helen Mota, Adrian Soria, Luiz Tolentino Neto and Jaqueline Pinao

165: Teaching the Evolution Theory, but not Creationism, for the Explanation of the Origin of Species and Biological Evolution Analysed in a Brazilian Local Community  
Heslley Silva, Isabela Leão and Graça S. Carvalho

168: Comparison of Grade 6 and 9 Students’ Interest and Motivation towards Learning Science and Mathematics at School  
Moonika Teppo, Merlin Saulep, Terje Hõim and Miia Rannikmäe

169: Socioscientific Issues and Moral Reasoning of Students in Relation to Genetically Modified Organisms  
Shirley Margareth Buffon Da Silva and Wildson Luiz Pereira Dos Santos

170: Artistic Activities Applied to Children in Oncological Treatment: Comparative Study Between Portugal and Brazil  
Denise Rocha and Graça S. Carvalho

176: Critical Environmental Education in School Curriculum: The Brazilian Issue  
Jorge Sobral Maia, Marília Marília Freitas de Campos Tozoni-Reis, Lucas André Teixeira and Marcela De Moraes Agudo

179: A Problematizing STS Education Proposal: The Case of Monte Carmelo’s Ceramics  
Maria Stela Costa Gondim, Emanuel Lopes Dornelas and Tiara Da Costa Silva

182: Prospective Science Teachers’ Misconceptions about Geometrical Optics  
Zeynel Abidin Yılmaz, Önder Şimşek and Zeynep Gurel

183: From Words to Quanta: Analogies on Quantum Physics Class  
Roberto Cruz-Hastenreiter and Ivá Gurgel

193: Scientific Research Activity of Students Pre-Service Teachers of Sciences at University: The Aspects of Understanding, Situation and Improvement  
Vincentas Lamanauskas and Dalia Augiene

194: Homebrew Mathematical Exercise Creation Environments – Experiments and Experiences  
Kalle Saastamoinen and Antti Rissanen

195: “Visiting Monuments” or “Questioning the World” in Natural History Museums  
Fernanda Vidal, Martha Marandino and Marianne Achiam

200: The Development and Application of Noise STEAM Program for Elementary School Students  
Taerin Kang, Youngjoon Shin and Youngseok Jhon

204: The Construction of Teacher Knowledge in a Biology Pre-Service Program  
Mariana Tambellini Faustino and Rosana Louro Ferreira Silva

214: Making a Case for Outdoor Engagement in Environmental Studies at Indian Schools  
Shubhangi K. Bhide and Sugra Chunawala
216: Modes of Address of a Health Education Video Produced for Deaf Students
   Maria Inês Barbosa Ramos, Luiz Rezende and Wagner Gonçalves Bastos

221: Multimodality of Explanation in Physics Class for Literacy Engineering Students
   Naykiavick Rangel, Marina Castells and Jose Castello

238: From Macroscopic to Microscopic Vision for the Acquisition of the Concept of Living Being with
   Children in the 1st Cycle of Basic Education
   Sandra Teixeira, Maria João Silva and Isabel Garcia-Rodeja Gayoso

241: Equine Assisted Activities Therapies: A Non-Formal Education Space
   Carla Batista, Zélia Anastácio and Tobba Sudmann

263: History of Science as Context in Teaching Sequences. Levels, Illustrations and Framework
   Marina Castells and Angela Garcia

264: The Effect of Tomatis Method Therapy on Cognitive Functions in Children With Speech
   Problems: Preliminary study.
   Ewa Mojs, Włodzimierz Samborski, Anna Sudoł, Bartosz Piasecki and Katarzyna Wiechec

265: Determination of Normal Hydrocarbons C5 – C18 using Silanized Algerian Bentonite (B1100)
   as Support in Gas Chromatographic Analysis: Implications for Science Teaching
   Lahmek M’Hammed

ISTOE Board Meeting (17:30 - 19:30) Room 208
Saturday: July 16

Keynote 4 (09:00 - 10:00)  
Chairperson: Hae-Ae Seo, Korea  
Auditorium A5

* A world in which microbial diversity is preserved and accessed with fair and equitable sharing of benefits  

_Nelson Lima_, University of Minho, Braga, Portugal.

- Coffee break -

IOSTE Assembly & Closing session (10:15 - 11:30)  
Auditorium A5

IOSTE Board Meeting (11:30 - 12:30)  
Room 208