

ARTiST

ACTION RESEARCH TO INNOVATE SCIENCE TEACHING





Conference Venue

Batumi Shota Rustaveli State University

Registration of the participants – First Building, Ninoshvili Str. 35, Foyer of Rustaveli Hall

All plenary talks will be held in the First Building, Ninoshvili Str. 35, Rustaveli Hall

All workshops will be held in the Second Building, Rustaveli Str. 32,
Rooms NN 303, 306, 307, 314, 328



CONFERENCE PROGRAM

30 July, 2019

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|------------------------------------|---|--|
| 08:30 – 09:30 | Registration | |
| 09:30 – 10:00 Rustaveli Hall | Opening Ceremony | <p>Maia Khajishvili Minister of Education, Culture and Sport of Adjara</p> <p>Merab Khalvashi Rector of Batumi State University</p> <p>Marina Koridze Project ARTIST, Batumi State University</p> |
| 10:00-10:45 Rustaveli Hall | Plenary talk The philosophy of action research and the ARTIST project | Ingo Eilks, Coordinator of the ARTIST project University of Bremen, Germany |
| 10:45 – 11:15 | Coffee break | |
| 11:15 - 12:30 | Parallel workshops | |
| 1 N 314 | Action research in teacher education programs | Franz Rauch Alpen-Adria University of Klagenfurt, Austria |
| 2 N 328 | Motivating industry to stimulate STEM education | John Loftus British Telecom, Ireland |



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| 3 N 307 | Service Learning: The University as a Resource of Church and Nation | Minie Rose Lapinid De La Salle University, Manila, Philippines |
| 4 N 306 | Cases of action research from the Philippines at DLSU | Lydia Roleda De La Salle University, Manila, Philippines |
| 5 N 303 | Applying the self-study methodology for science teacher development | Fatih Taşar, Ayçin Ünal, Manolya Yücel Dağ, İsmail Dönmez Gazi University, Ankara, Turkey |
| 12:30 – 13:30 | Lunch break | |
| 13:30 – 14:45 | Parallel workshops | |
| 6 N 314 | Curriculum development based on science in the media | Nadja Frerichs, Johanna Dittmar University of Bremen, Germany |
| 7 N 306 | Inquiry Based Learning in the extra-curricular learning location NAWIMix | Bernhard Schmölzer & Diana Radmann Alpen-Adria University of Klagenfurt, Austria |
| 8 N 328 | Industry networks: implications for practice in schools and universities | Sarah Hayes SSPC, University of Limerick, Ireland |



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| 9 N 303 | Action research: a significant way for professional development | Michal Nachshon & Amira Rom Oranim Academic College of education, Haifa, Israel |
| 10 N 307 | Introducing spectroscopy in the early grades | Ivan B. Culaba Ateneo de Manila University, Manila, Philippines |
| 14:45 – 15:15 | Coffee Break | |
| 15:15 – 16:00 Rustaveli Hall | Plenary talk Action Research – a view from different perspectives | Silvija Markic University of Ludwigsburg, Germany |



31 July, 2019

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| <p>9:30-10:00 Rustaveli Hall</p> | <p>Plenary talk The role of the ARTIST project for Georgia</p> | <p>Marika Kapanadze Co-coordinator of the ARTIST project Ilia State University, Tbilisi, Georgia</p> |
| <p>10:00 – 11:15</p> | <p>Parallel workshops</p> | |
| <p>11 N 303</p> | <p>Developing student laboratories for non-formal learning using action research</p> | <p>Antje Siol & Ingo Eilks University of Bremen, Germany</p> |
| <p>12 N 314</p> | <p>Using Action Research for enhancing students motivation in science</p> | <p>Eka Slovinsky, Mzia Varazashvili, Marika Kapanadze Ilia State University, Tbilisi, Georgia</p> |
| <p>13 N 307</p> | <p>Colorimeter from a discarded LCD projector</p> | <p>Armando Guidote M. Guidote Ateneo de Manila University, Manila, Philippines</p> |
| <p>14 N 306</p> | <p>Action Research as a reflective practice of evaluating educational innovations for the fourth industrial revolution (FIRE)</p> | <p>Socorro Aguja De La Salle University, Manila, Philippines</p> |
| <p>11:15 – 11:45</p> | <p>Coffee Break</p> | |
| <p>11:45 – 13:00</p> | <p>Parallel workshops</p> | |



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| 15 N 303 | Producing TY science modules with student teachers – action research for PSSTs | Peter Childs, Sarah Hayes University of Limerick, Ireland |
| 16 N 314 | Improving aspects of action research pedagogy in teacher training: discussion and a case study example | Tahel Weiss-Izhaki & Rachel Cohen Oranim Academic College of education, Haifa, Israel |
| 17 N 307 | Teaching projectile motion using pins and ballpens | Ramon M. de los Santos Ateneo de Manila University, Manila, Philippines |
| 18 N 306 | The ARAL journey | Maricar Prudente Alpen-Adria University of Klagenfurt, Austria |
| 13:00 – 14:00 | Lunch break | |
| 14.00 – 14.45 Rustaveli Hall | Plenary talk Cases and experiences of AR | Franz Rauch Alpen-Adria University of Klagenfurt, Austria |
| 14:45 - 17:00 | Poster Session | |



1 August, 2019

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| 9:30-10:00 Rustaveli Hall | Plenary talk The outcomes of the ARTIST project | Rachel Mamlok-Naaman Weizmann Institute of Science, Israel |
| 10:00 - 11:15 | Parallel workshops | |
| 19 N 303 | Low cost science teaching | Peter Childs, Martin McHugh University of Limerick, Ireland |
| 20 N 307 | Teaching sinking and floating using POE strategy | Fadeel Joubran & Ahmad Basheer Arab Academic College of Education, Haifa, Israel |
| 21 N 306 | Action research to face heterogeneity in the science classroom | Silvija Markic University of Ludwigsburg, Germany |
| 22 N 314 | Action Research as a tool for promoting teaching and learning of science | Rachel Mamlok-Naaman Evaluator of ARTIST project Weizmann Institute of Science, Israel |
| 11:15 – 11:45 | Coffee break | |
| 11:45 – 13:00 | Parallel workshops | |
| 23 N 303 | Action Research with science teachers: Collaboration is key | Elizabeth Smith JCT, Ireland |



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| 24 N 306 | Teaching optics using plastic bottles and cardboard tubes | Joel T. Maquiling Ateneo de Manila University, Manila, Philippines |
| 25 N 307 | Introducing color mixing in science classes | Johanna Mae M. Indias Ateneo de Manila University, Manila, Philippines |
| 26 N 314 | Reflections on continuous professional development networks for educators | Doris Arzmann Aplen-Adria University of Klagenfurt, Austria |
| 13:00-13:15 Rustaveli Hall | Closing remarks and farewell | Ingo Eilks, Marika Kapanadze |



PARALLEL WORKSHOPS

ABSTRACTS

30 July, 2019

1. Action research in teacher education programs

Franz Rauch

Aplen-Adria University of Klagenfurt, Austria

In the workshop university based In-service teacher education courses in Science Education and Environmental Education/Education for Sustainable Development will be presented. The courses are offered by the University of Klagenfurt in cooperation with a range of Universities of Teacher Education in Austria and consist of a series of seminars plus regional mentoring meetings. The participating teachers complete an action research study based on their own teaching and work at school. Experiences and empirical findings regarding the learning of the participating teachers as well as the programme's results and impact are provided and discussed.

2. Motivating industry to stimulate STEM education

John Loftus

British Telecom, Ireland

John is a key member of BT's operational team for the BT Young Scientist & Technology Exhibition. John has also been responsible for designing and cofacilitating the highly successful BT YS Business Bootcamp which takes place annually in Dublin and Abu Dhabi. During this 90 minute interactive workshop he will explore the many reasons why corporations should be involved in stimulating STEM education and what's in it for them.

3. Service Learning: The University as a Resource of Church and Nation

Minie Rose Lapinid

De La Salle University, Manila, Philippines

Service learning is a pedagogy that has the potential to address some of the contemporary challenges facing higher education - how to enhance education's relevance and connectedness to the issues and problems faced by the broader society and the pressure to develop future leaders and for entry into employment positions. Discussions include theoretical underpinnings and key ideas that underscore service learning from the traditional models of experiential learning, the benefits it has to the educational stakeholders and risks to its viability.



Based on these, participants can brainstorm suggestions and tips on how to integrate service learning into the science education curriculum and for their own successful implementation in their respective institutions.

4. Cases of action research from the Philippines at DLSU

Lydia Roleda

De La Salle University, Manila, Philippines

Dr. Lydia Roleda will share her department's journey as Action Research becomes a recognized area of research for student theses not only in the undergraduate programs but in the graduate programs as well. She will attempt to identify crucial turning points of transition. Institutional support and challenges will also be presented. Dr. Roleda is the former chair of the Science Education Department of De La Salle University, Philippines.

5. Applying the self study methodology for science teacher development

Fatih Taşar, Ayçin Ünal, Manolya Yücel Dağ, İsmail Dönmez Gazi University, Ankara, Turkey

In this workshop, we will explore the meaning, significance, and prospects of the self-study methodology for science teacher training and development. Accounts of how self-study helps teachers develop will be given. Advantages and disadvantages of conducting a self-study will be discussed.

6. Curriculum development based on science in the media

Nadja Frerichs, Johanna Dittmar University of Bremen, Germany

In our everyday lives, we are surrounded by different media messages which often contain factual information. Often this information is derived from science and technology. Understanding the science in and behind communication in the media is necessary to become a critical consumer and a scientifically literate citizen. In the workshop, we will show how to use science-based advertising as well as Internet forums as a basis for curriculum development. The participants will try out material on several science-related topics and reflect their own attitude towards scientific arguments in the media as well as the potential of the issue for the science classroom.

7. Inquiry Based Learning in the extra-curricular learning location NAWIMix

Bernhard Schmölzer & Diana Radmann Aplen-Adria University of Klagenfurt, Austria

The extracurricular learning location called NAWImix was built within the University of Teacher Education Carinthia to promote science education. After a short presentation of NAWImix the concept and method of Inquiry Based Learning will be explained. The participants will have the opportunity to take actively part in an experiment with sound tubes. A "concert" with all participants forms the conclusion of the workshop.



8. Industry networks: implications for practice in schools and universities

Sarah Hayes

SSPC, University of Limerick, Ireland

This workshop will offer opportunities to see a case study of an industry-academic-school partnership and associated activity in practice. The workshop will also offer practical guidelines for how to engage with industry to develop networks that can enhance the pupil experience in the classroom.

9. Action research: a significant way for professional development

Michal Nachshon & Amira Rom

Oranim Academic College of Education, Haifa, Israel

Our workshop will present 44-action research study's data. Together with the participants, we will analyze the research data, focusing on some various categories. In addition, we will present our action research model, in purpose to validate it, as well as trying to identify the stages of professional development of teachers who have been experienced the action research process.

10. Introducing spectroscopy in the early grades

Ivan B. Culaba

Ateneo de Manila University, Manila, Philippines

Science in the early grades can be made exciting to the students through spectroscopy, by allowing the students experience the interaction between light and matter. In this workshop a simple spectroscope is used to observe the spectrum of different sources of light and the absorption spectrum of different substances, like, chlorophyll and cellophane filters. Using a cheap 3-color laser pointer, glow-in-the dark materials, highlighter pen and other materials, fluorescence and phosphorescence can be demonstrated.



31 July, 2019

11. Developing student laboratories for non-formal learning using action research

Antje Siol & Ingo Eilks

University of Bremen, Germany

The workshop provides insights into non-formal chemistry learning for secondary school students in a university laboratory. Different materials will be presented and design elements can be discussed, e.g. laboratory instructions by comics and social media designs. Part of the material is also available in Georgian language, corresponding offers are available in Tbilisi.

12. Using Action Research for enhancing students' motivation in science

Eka Slovinsky, Mzia Varazashvili, Marika Kapanadze

Ilia State University, Tbilisi, Georgia

Recently, a lot of countries have been affected by decreasing student motivation with respect to science. As a result, the main question of the most teachers' Action Research is the following: how to raise motivation among students? The workshop will feature a lesson delivered by inexperienced teacher. Other participants of the workshop will play the roles of teacher's critical friends. Apart from this, they will have an opportunity to provide teacher with recommendations and offer consistent stages Action Research.

13. Visible Colorimeter Demonstration from Waste LCD Projectors

Armando Guidote M. Guidote

Ateneo de Manila University, Manila, Philippines

A prototype low-cost RGB colorimeter that utilizes recycled LCD projectors was constructed. Additional materials used were an LED flashlight (light source), foam board (sample holder and casing), and a RGBC Color sensor (detector). It features the use of open-source programs Arduino and Processing, for data acquisition and for creation of a simple user interface program. The system was evaluated using three analytes—erionoglucine, potassium permanganate, tartrazine—absorbing at the red, green, and blue regions, respectively.



14. Action Research as a reflective practice of evaluating educational innovations for the fourth industrial revolution (FIRE)

Socorro Aguja

De La Salle University, Manila, Philippines

The use of Action Research to evaluate the efficacy of technological innovations used in the Teaching Science will be explicated. The effectiveness of certain technologies such as simulations, learning management systems, online games and gamification in promoting greater students' engagement and performance in Science classes will also be discussed. Specifically, the PDSA (Plan-Do-Study-Act) model will be presented as a framework for evaluating changes in the practices of the teacher-researcher.

15. Producing TY science modules with student teachers – action research for PSSTs

Peter Childs, Sarah Hayes

University of Limerick, Ireland

Since 2003 we have been using a curriculum development model using action research to produce teaching materials for the Transition Year Option in Irish schools. This has involved working with pre-service science teachers (PSSTs) in their final year teaching practice, to develop 8 week teaching modules in science. The topics were interdisciplinary and relevant to everyday life, building on the junior cycle science course. The modules were implemented by the module author and by other PSSTs and in-service teachers and evaluated through questionnaires, before revision and dissemination. Topics included Science of Sport, Forensic Science and Science and Medicine.

16. Improving aspects of action research pedagogy in teacher training: discussion and a case study example

Tahel Weiss-Izhaki & Rachel Cohen

Oranim Academic College of Education, Haifa, Israel

We will discuss an example of central action research practice relating to academic content that the presenters carried out in teacher training. Presenters will discuss what should teachers know or be able to do to perform it in the classroom practice. For example, where in the program are teachers working on obtaining this practice? We will ask participants to bring an example of central action research to the workshop and to add an artifact related to this practice.



17. Teaching projectile motion using pins and ballpens

Ramon M. de los Santos

Ateneo de Manila University, Manila, Philippines

This workshop on projectile motion will help students visualize the trajectory of projectile as a combination of horizontal and vertical motions using graphing paper, pins and corkboard. Furthermore, a retractable ballpen (i.e. HBW Matrix pen) will be used as a launcher to approximate the initial horizontal velocity of a metal ball using the height and range data and the calculated time of flight. This activity highlights the use of low-cost, readily accessible materials, instead of the sophisticated ones, to demonstrate projectile motion in class.

18. The ARAL journey

Maricar Prudente

De La Salle University, Manila, Philippines

The session will present the 5-year journey of ARAL (Action Research, Action Learning) Program at De La Salle University, Manila. ARAL provides a platform for teachers in the Philippines to present their action research works and collaborate with each other to continue with their transformative practices. Such endeavor aims to improve the quality of education in the country. A model for training teachers on the principles, characteristics and processes in conducting Educational Action Research will also be discussed.

19. Low cost science teaching

Peter Childs, Martin McHugh

University of Limerick, Ireland

In many countries the cost of equipment and chemicals is a hindrance to the implementation of practical work in schools, particularly hands-on student experiments. Using low-cost equipment and chemicals not only reduces costs and makes practical work more feasible, it also reduces hazards and improves laboratory safety. The workshop will look at how to use everyday materials and chemicals in teaching science and how to adapt existing experiments to a low-cost approach e.g. by using microchemistry techniques.



1 August, 2019

20. Applying a POE teaching strategy sequences in teaching floating and sinking with regard to students' alternative conceptions

Fadeel Joubran, Muhamad Hugerat and Ahmad Basheer
Arab Academic College of Education, Haifa, Israel

Students come to the school with their prior knowledge or conceptions about the world, based on their daily life observations and experiences. These conceptions are commonly referred to as misconceptions. Sinking and floating is a common daily life phenomenon, although Yin, Tomita & Shavelson (2008) reported ten misconceptions in this topic as diagnostic questionnaire. We applied the POE (predict, observe and explain) teaching strategy sequence in teaching sinking and floating, based on the reported ten misconceptions. Every sequence has three stages; first the stage of writing down the PREDICTION what will happen, second the stage of the OBSERVATION of what happened and the third stage is to write down the EXPLANATION of the phenomenon. In our workshop, we apply the POE strategy with 8-10 sequences based on the questionnaire.

21. Action research to face heterogeneity in the science classroom

Silvija Markic
University of Ludwigsburg, Germany

Heterogeneity is noticeable in almost all of the classrooms all over the world. For the teachers, one of the major difficulties in the heterogeneous classrooms is next to the diversity in students' content knowledge differences in students' linguistic skills both in the official language of the country and scientific language. However, most of the science teachers are not prepared to teach language sensitive and use methods for supporting students with language difficulties. In an Action Research Project, science education researchers in cooperation with science teachers as well as second language teachers developed tools and materials which can be used for language-sensitive teaching. In a workshop, the model for the development will be presented as well as developed methods and tools.

22. Action Research as a tool for promoting teaching and learning of science

Rachel Mamlok-Naaman
Weizmann Institute of Science, Israel

In this workshop, the teachers will experience several stages of the Action Research procedure, and learn how they can research their own practice of teaching. The rationale of the workshop is based on findings which show that involving teachers in an intensive and comprehensive workshop dealing both with various aspects of teaching, and their investigation of their own work,



provide them with an environment of support, collegiality, and the opportunity to collaborate with professional researchers and teachers who teach related subjects.

23. Action Research with science teachers: Collaboration is key

Elizabeth Smith

JCT, Ireland

This workshop draws on learning from research conducted with a number of Science teachers across Ireland in realising the power of collaborative practices amongst teachers and the implications for action research.

24. To Converge or Not to Converge

Joel T. Maquiling

Ateneo de Manila University, Manila, Philippines

This is a workshop on geometric optics focusing on the concept of refraction of light by lenses. The main objective of the workshop is to help participants determine the parameters, conditions, and characteristics of materials that converge or diverge parallel light rays. Materials to be used are low-cost discarded PET bottles of varied shapes, different fluids, flashlight and acetate paper.

25. Introducing color mixing in science classes

Johanna Mae M. Indias

Ateneo de Manila University, Manila, Philippines

Most visual display technology, like flat screen liquid crystal displays and billboards, use the red (R), green (G) and blue (B) color mixing. Color mixing is therefore an important topic to discussing contextual science. This workshop involves understanding color mixing using a simple spectroscope and a demonstration of color mixing using low-cost RGB light emitting diodes.

26. Reflections on continuous professional development networks for educators

Doris Arztmann

Aplen-Adria University of Klagenfurt, Austria

Mediating structures like networks/alliances/partnerships connect various stakeholders within and between different levels of the educational system. They are means for actors engaging in education issues- such as policy makers, school education leaders, researchers, continuous professional development providers as well as a wider range of stakeholders. Based on the experience of the IMST initiative and the LINKS project, his workshops deals with the issue on how best to harness the potential of educational networks.



POSTERS

1. Practical Work, Cooperative Learning and Internet Forums – An example on Teaching about the Chemistry of Water

Johanna Dittmar & Ingo Eilks

2. Evaluating Sustainability in Chemistry Teaching – Glyphosate and Orange Oil

Christian Zowada, Nadja Frerichs, Vania G. Zuin & Ingo Eilks

3. LSC:digital: Teacher Education, Teaching Practice, Curriculum Development – an interlinked approach on digital media in the science classroom

Moritz Krause

4. “Footprint calculator for Schools – an interdisciplinary tool to support local climate protection“

Guenther Pfaffenwimmer, Christine Lechner, Franz Rauch

5. Improving the understanding of the topics: elements, compounds and mixtures in micro and macroscopic scales among eighth graders

Ahmad Basheer and Ayshi Sindiani

6. The Effect of Teaching Methods on Students Understanding of Basic Concepts in Chemistry

Najami Naim, Hugerat Muhamad and Abo-salih Hekmat

7. The Effect of Explicit Instruction on Improving Students Understanding of the Female Reproductive System

Naji Kortam and Muhamad Hugerat

8. Awareness of green chemistry, sustainability and environmental education among preservice students of science education

Ahmad Basheer, Muhamad Hugerat and Ayshi Sindiani

9. An Alternative Teaching Method Seeks to Activate Students: Student’s Perception of the Cell Structure and Function

Riam Abo-Muck and Mohamad Hugerat

10. The “Acheret” Center and the “Archimedes Fulcrum” Academy

Amos Cohn and Ricardo Trumper



11. Gamification: Enhancing Students' Motivation and Performance in Grade 10 Physics

Kristina dela Cruz and Lydia Roleda

12. Student Engagement and Motivation in a Gamified College Physics Course

Coleen Amado and Lydia Roleda

13. Zero-Waste and Industry-Oriented Instructional Materials for Science Teaching

Rodney Cajimat and Maricar Prudente

14. Engaging the Public High Schools in Marikina City, Philippines through ARTIST

Ivan B. Culaba, Ramon delos Santos, Johanna Mae Indias, Joel T. Maquiling, Vienne Mae Chuavon

15. Low-Cost Chemical Instrumentation: RGB Colorimeter from Recycled LCD Projectors

Sofia P. Surtida , Danielle B. Lapinig, Carlos M. Oppus, Ivan B. Culaba, Armando M. Guidote

16. Self-study research for teachers

Fatih Tasar

17. Reproduction education - motivation for teaching and occupation perspectives

Zhana Chitanava, Darejan Rusia, Ketevan Adamia

18. Action Research in teaching biodiversity

Lali Zhgenti, Nana Papunaishvili, Ketevan Kharabadze

19. My successful future enterprise

Marina Nagervadze, Naira Jakeli, Irine Tsintsadze

20. "Is there sun in wine?"

Nino Saakashvili

21. From the school laboratory to the cheese factory

Natia Bagatrishvili

22. Motivation - at first!

Darejan Margalitashvili

23. The way to success!

Ala Sanamiani



24. **"Dried Marmalade"**

Neli Naochashvili

25. **The way to be gone to physicist**

Inga Chinchaladze

26. **"Phages are our friends"**

Nino Shubladze

27. **"The bread of our being"**

Nana Garjikauli

28. **Physics - for the healthy life**

Lali Nadiradze

29. **How to improve students' entrepreneurial skills with the help of science**

Tamar Beridze

30. **Science is FUN**

Marina Bagalishvili

31. **The way from the school to science**

Inga Paksashvili

32. **"Augmented Reality Teaching and Learning: Correlation Between Students' Academic Achievement and Their Attitude Towards Biology"**

Lyka D. Lamoste, John Oliver P. Distor and Catherine Genevieve B. Lagunzad

33. **"Entrepreneurship-based Biology Teaching and Learning: Students' Academic Achievement and Motivation"**

John Oliver P. Distor, Lyka D. Lamoste and Catherine Genevieve B. Lagunzad



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