



LUMAT Symposium June 5-7, 2019 in Jyväskylä

PROGRAMME

WEDNESDAY JUNE 5, SEMINAARINMÄKI CAMPUS

13.15 - 13.30 Opening words, S212 (Seminarium building)

13.30 - 14.30 LUMAT opening session S212

Rethinking creativity for mathematics teaching: introducing multi- and trans-disciplinary approaches for schools

14.30 - 15.00 Coffee & tea break

15.00 – 17.00 LUMAT parallel sessions 1 & 2

Research Session 1-STEM Rules!, S203

Capacity Building for STEM Teaching: Responses of schools to a professional learning program

Achieving authentic STEM education - through industry and community partnerships

The role of NGOs in supporting education systems: ICDA as a model

Increasing physics teacher-students' understanding of the falling motion of objects by investigating the motion of a bungee jumper

STEM in education

Research Session 2 - From teachers to teachers, S205

How Artificial Intelligence can support creativity in learning process?

Quebec Elementary Pre-service Teachers' Conceptions on the Newtonian Mechanics: The Case of the Study of Free Fall Bodies

About Methodological Foundation of Interdisciplinary and Transdisciplinary Research

Moving past authoritative and dialogic discourse: Teacher roles of questioning to support student argumentation

The effectiveness of STEM based instruction on pre-service science teachers' problem solving skills

International LUMA StarT nominees presentations, S305

19.00 - Welcome reception of the city of Jyväskylä, City Hall at Vapaudenkatu 32 (Capacity 150 persons)

THURSDAY JUNE 6, SEMINAARINMÄKI CAMPUS

Non-stop programme

Conference exhibit area, C building lobby

Experience Workshop's STEAM Oasis (Nóra Somlyódy, Matias Kaukolinna & Kristóf Fenyvesi), C building lobby

10.15 - 10.30 Welcoming words, C1 & C2

10.45 - 11.45 LUMAT Invited Session, S212

Teachers Eliciting Students' Mathematical Arguments: Insights from an After-School Program

11.30 - 13.00 Lunch break

13.00 – 14.30 LUMAT parallel sessions 3, 4 and 5



Research session 3 - STEM & Tech, S203

Sensory integration in mathematics. Use of sensory analyzers at mathematics lessons for training of fractions.

How the STEM teachers can use the Golab portal

~~Modeling to foster Computational Thinking and 21st Century Skills~~

Simulation course – A little bit something for everybody?

Research session 4 - Math through education, S303

“One of the most beneficial classes I have completed during pursuit of my degree”: A case study of effective instructional practices to improve pedagogical mathematics content knowledge for pre-service teachers.

Utilizing mathematical research reading as a methodological tool for research education

Development of one class in dialogic argumentation in mathematics during one year

A theoretical framework for a holistic model of early mathematical skills

Research session 5 - Environment and culture, S305

Special needs and cinema - STEM creative challenge

Smartphones as didactic tools for approaching Chemistry and Geosciences

Teaching of science through ethnomathematics and tourism

Investigating Pre-service Science Teachers' cognitive structures about earth science concepts

14.30 – 17.00 StarT Gala, C1 & C2

14.30 – 15.00 Coffee and tea

15.00 – 17.00 StarT gala and Statistical olympics reward ceremony

THURSDAY JUNE 6, SEMINAARINMÄKI CAMPUS (FINNISH PROGRAMME)

10.30-11.00 Opening lecture: LUMA subjects and the Working Life (FI), C1 & C2

11.00 - 12.00 Panel discussion: Opportunities for working life collaboration in LUMA subjects through the educational system (FI), C1 & C2

13.00 - 14.30 Parallel Programme (FI)

13.00 – 14.30 Visits A

The Arts Museum as a STEAM learning environment, Jyväskylä Art Museum HOLVI (FI)

Checkpoint Leonardo: Just an illusion. Art and Science exhibition, University of Jyväskylä Science museum Harju (FI)

Visit to the Finnish Air Force Academy (FI)

13.00 – 14.30 Pedagogical cafés A1, C5

13.00 – 13.45 LUMA-subjects in the nearby companies (FI)

13.45 – 14.30 Sciences in the Society. Sustainable development and circular economy project meeting. (FI)

13.00 – 14.30 Pedagogical cafés A2, C4

13.00 – 13.45 E Avenue and electronics learning environment (FI)

13.45 – 14.30 Renewal of Upper Secondary education and collaboration with Tertiary education: best practises and development ideas (FI)

13.00 – 14.30 Pedagogical cafés A3, F106

13.00 – 14.30 “Climate education from a solution mindset” project meeting (FI)

13.00 – 14.30 Pedagogical cafés A4, F205

13.00 – 14.30 Using GeoGebra in mathematics education (FI)

FRIDAY JUNE 7, YLISTÖNRINNE CAMPUS (FINNISH PROGRAMME)

9.15 - 10.15 Selection of lectures (FI)



- 9.15 – 10.15 Lecture: Assessment (FI), YAA303
9.15 – 10.15 Lecture: Circular Economy (FI), FYS1

10.30-12.00 Parallel programme (FI)

- 10.30 – 12.00 Workshops A
- 10.30 – 12.00 Evolution in action - workshop for preschool and class teachers: How to teach biological interactions through science and art education (FI), YAB320
 - 10.30 – 12.00 Collaborative learning in STEM subjects (FI), YAB312
 - 10.30 – 12.00 Escape – escape games supporting learning (FI), YNC121
 - 10.30 – 12.00 Simulations in Physics Teaching (FI), FL349
 - 10.30 – 12.00 ActionTrack –workshop (FI), FYS5
- 10.30 – 12.00 Visits B
- The Mathematical Exhibit at the department of Mathematics and Statistics (FI)
 - Nuclear Physics at the most Northern Accelerator Laboratory in the World (FI).
 - A visit to the Research Laboratories of the Nanoscience Center (FI)
- 10.30 – 12.00 Pedagogical cafés B1, YAA305
- 10.30 – 12.00 StarT café: National Best Practises, part 1 (FI)
- 10.30 – 12.00 Pedagogical cafés B2, FL140
- 10.30 – 11.15 "Research and Practise for teachers" project start up meeting (FI)
 - 11.15 – 12.00 Working life knowledge for STEM teaching (FI)
- 10.30 – 12.00 Pedagogical cafés B3, FYS3
- 10.30 – 11.15 What moves our children? Cornerstones of learning (FI)
 - 11.15 – 12.00 Dancing Mathematics (FI)
- 10.30 – 12.00 Pedagogical cafés B4, YAB310
- 10.30 – 11.15 The phenomenon-based education and research at the Air Force Academy (FI)
 - 11.15 – 12.00 Emphazing argumentation in science education (FI)

13.00 – 14.30 Parallel programme (FI)

- 13.00 – 14.30 Workshops B
- 13.00 – 14.30 Evolution in Action – workshop: How to teach biological interactions through science and art education (FI), YAB320
 - 13.00 – 14.30 Tools for Inquiry – how to get from phenomenon to concept? (FI), YAB312
 - 13.00 – 14.30 Multidisciplinary Mathematics Learning with the Polyuniverse Visual Experience Toolkit, FYS5
 - 13.00 – 14.30 Innokas! Micro:bit –programming workshop (FI), YNC121
- 13.00 – 14.30 Visits C
- The Mathematical Exhibit at the department of Mathematics and Statistics (FI)
 - Nuclear Physics at the most Northern Accelerator Laboratory in the World (FI).
 - A visit to the Research Laboratories of the Nanoscience Center (FI)
- 13.00 – 14.30 Pedagogical cafés C1, YAB310
- 13.00 – 14.30 "Preparing for the future of AI as part of science and mathematics teaching" project meeting
- 13.00 – 14.30 Pedagogical cafés C2, YAA305
- 13.00 – 14.30 StarT café: National Best Practises, part 2 (FI)
- 13.00 – 14.30 Pedagogical cafés C3, FL140
- 13.00 – 13.45 Information and communication technology (ICT) and social media supporting the development of your teaching (FI)
- 13.00 – 14.30 Pedagogical cafés C4, FYS3
- 13.00 – 13.45 Laughter in the Laboratory (FI)

14.30 - 15.00 Final Words (FI), YAA303





Wednesday June 5, Seminaarinmäki campus

LUMAT symposium

13.15 - 13.30 Opening words, S212 (Seminarium building)

Chair of the Board Jan Lundell & Director of the Center Maija Aksela

13.30 - 14.30 LUMAT opening session S212

LUMAT symposium invited session. Prof Zsolt Lavicza, Linz School of Education, Johannes Kepler University, Austria & Geogebra Director of Research.

Rethinking creativity for mathematics teaching: introducing multi- and trans-disciplinary approaches for schools

There is a growing emphasis for encouraging creative thinking in mathematics education and needs to develop connections of mathematics with other subjects. Activities focusing on the creative process, rather than concentrating on achieving only results for posed problems, are being designed and trialled by innovative groups around the world. Often involving Arts, in a broader sense of design and creation, can be good a starting point for students to find their own interests and follow their own way of learning (Burnard et al., 2016).

Such creative activities often involve the development of collaborative problem-solving skills utilising students' strengths in different areas that adds up at the group level (English et al., 2008).

Furthermore, such activity designs and the opportunities offered by the availability of digital technologies inevitably afford new multi- and trans-disciplinary approaches for education.

In my talk, I will introduce ideas and examples for mathematics teaching involving STEM to STE-A-M (by the inclusion of Arts) transitions (Fenyvesi, 2016). Examples will include STEAM research with the Experience Workshop Movement; studies related to GeoGebra and its new developments such as Augmented Reality, 3D Printing and mobile experiments; developing mathematical skills through robotics and connecting digital and physical worlds with 4D Frame; and possibilities to detect and nurture creative thinking processes from Big Data. An overview of such studies could offer new insights into developments of mathematical creativity, novel teaching approaches, and opportunities for further collaboration in these areas.

References

Burnard, P., Ross, V., Dragovic, T., Powell, K., Minors, H., Mackinlay, E. (Eds) (2017) '*Building Interdisciplinary and Intercultural Bridges: Where Practice Meets Research and Theory*'.

English, L., Lesh, R. A., & Fennewald, T. (2008). Future Directions and Perspectives for Problem Solving Research and Curriculum Development. Presented at the 11th International Congress on Mathematical Education.

Fenyvesi, K. (2016) Bridges: a World Community for Mathematical Art. *Mathematical Intelligencer*.

14.30 - 15.00 Coffee & tea break

Coffee served in lobbies



15.00 – 17.00 LUMAT parallel sessions 1 & 2

Research Session 1-STEM Rules!, S203

Capacity Building for STEM Teaching: Responses of schools to a professional learning program

Timothy Teague and Stanley Grazotis, Bell Park North Primary School, Australia

Gary Hindle, Rollins Primary School, Australia

With the recent endorsement of STEM education as part of the *National Innovation and Science Agenda* by the Australian Government, the challenge facing educators is how to meaningfully embed STEM-related knowledge, skills and dispositions across all levels of schooling. In this presentation, teachers from primary schools in Victoria will reflect on their participation in a professional learning program specifically designed to build teacher capacities for STEM teaching: STEM and Entrepreneurship in Primary Schools (SEPS) program. This presentation will discuss changes occurred in schools as a result of teachers' participation in the SEPS program in relation to:

- teacher capacity building
- curriculum development and implementation
- students learning and engagement

This presentation will help to generate insights into the diverse responses of schools to the professional learning program and the importance of school contexts in enabling changes in teacher practice and student learning in STEM-related areas.

Achieving authentic STEM education - through industry and community partnerships

Ben Jenkinson, Casey Tech School, Australia

Robbie Phillpott, Bendigo Tech School, Australia

This presentation will provide an overview of the new Victorian Tech Schools initiative (in Australia), by focusing on how the Casey and Bendigo Tech Schools deliver authentic, integrated STEM learning to secondary students through close partnerships with local schools, universities, industry and community groups. Delegates participating in this session will gain samples of curriculum programs, statistical evidence of impact to date (2018-19), and case studies of successful Tech School-industry partnerships for consideration. With many parallels to the Finnish LUMA Centres, including PBL pedagogies and extensive teacher professional learning, the Victorian Tech Schools initiative is ultimately about connecting young people to the future world of work and the STEM skills predicted to underpin our economic future.

The role of NGOs in supporting education systems: ICDA as a model

(more information coming)

Increasing physics teacher-students' understanding of the falling motion of objects by investigating the motion of a bungee jumper

Mikko Kesonen, Risto Leinonen and Mervi A. Asikainen, Department of Physics and Mathematics, LUMA Centre of University of Eastern Finland, University of Eastern Finland, Finland.

The falling motion of a bungee jumper is somewhat exceptional, since a jumper's acceleration may exceed $g=9,81 \text{ m/s}^2$. As acknowledged by the various physics educators, this provides a good opportunity to widen students' understanding of the falling motion of objects. The present study introduces a simple model that can be used to formulate a qualitative explanation for the acceleration of a bungee jumper. Besides this, the use of the model is described in a form of 90-minute teaching intervention that was held to physics teacher-students (N=15). The students'



learning was assessed with the aid of notes they made during the intervention and paper-and-pecil test-questions that were used at the beginning and end of the intervention. The results show that the most of the students were able to obtain solid understanding of the model since they managed to apply it into a novel situation after the intervention was held. This indicates that the model and the activities included in the intervention help students to increase their understanding of the subject matter of physics that underlies the falling motion of a bungee jumper.

STEM in education

Zhyvotova Oksana, Gumnasium #32, Ukraine

Recently, STEM education is becoming more widespread and debating. What is it and why it will be interesting to the child? To begin, I will decipher: STEM - the abbreviation of English words Science, Technology, Engineering, Mathematics. That is, "science, technology, design, mathematics". This is a direction in education, in which in the curricula the natural science component + innovative technologies is intensified.

Why is STEM-education so relevant? The rapid evolution of technology leads to the fact that soon the most popular and promising on the planet experts will be programmers, IT professionals, engineers, professionals in the field of high technology.

In STEM-education, the creative direction of creative and artistic disciplines (industrial design, architecture and industrial aesthetics, etc.) is actively developing.

I will try to reveal the distinction of the STEM approach from traditional education. Consequently, the traditional approach: a teacher's presentation of the theory, then (at best) demonstration of the scope of application. STEM-approach: the teacher creates a problematic practical situation (research, practical task), during preparation for which the essence of the problem is studied, and during execution - tells how this problem can be solved. Moreover, the main attention is paid to the independent work of children.

It should be noted that in this approach, students learn to immediately approach the problem globally: to study its essence, relevance, independently find ways to solve it and learn to interact with other members of the group and with other groups (for the STEM approach there is no concept of "plagiarism" - there is use of the experience of others). Also, there is no suppressive authority of the teacher ("I have said so and that's why it's true"), on the contrary - students immediately see the truth or the falsity of theoretical statements.

Research Session 2 - From teachers to teachers, S205

How Artificial Intelligence can support creativity in learning process?

Kalle Saastamoinen, National Defence University of Finland, Finland

Being bored has traditionally been a fruitful source of creativity. Before digital age with mobile phones, tablets, computers and Internet people had to grab a pen and draw and write or read some book. This was essential to the development of linguistic as well as concentration and logical thinking skills. All of this can be threatened by nowadays fast-food culture for brains offered by our new gadgets which are more often used by their users for easy relaxation than for development of their skills. One challenge is to create interactive learning systems that supports creativity. Other challenge is to make people actually use them instead of using social media, playing addictive online games, watching streaming videos etc.



Nowadays learning systems are demanded good usability, social aspect, ability to adapt learners needs and skill levels and time-effectiveness. Artificial intelligence offers many solutions. Chatbots are more or less clumsily able to chat with people and they could be programmed to have intellectual discussions adapted to the people own needs, intellectual level and stage of development. Virtual classrooms free us from physical phase, people can play with different roles and test things that are not possible in a real world. It can detect people strengths and weaknesses, support peer learning and bring automatically tailored materials supporting deep-learning.

In this paper we study how these abilities of Artificial Intelligence support a method called evolutionary creative that is a process with four phases

- 1) Collect: learn from previous works stored in libraries, the Web, etc.;
- 2) Relate: consult with peers and mentors at early, middle, and late stages;
- 3) Create: explore, compose, evaluate possible solutions; and
- 4) Donate: disseminate the results and contribute to the libraries.

Quebec Elementary Pre-service Teachers' Conceptions on the Newtonian Mechanics: The Case of the Study of Free Fall Bodies

Abdeljalil Métioui, Université du Québec à Montréal, Canada
Trudel Louis, Université d'Ottawa, Canada

Research that deals with student conceptions, particularly in the field of physics, are relatively numerous. Recent publications indicate that, in general, students prior to any formal teaching, built knowledge of the phenomena with which they interact daily. However, insofar as this knowledge is based on epistemological premises different to scientific knowledge, they constitute obstacles to their learning. In this communication, we will present the results of qualitative research conducted with 80 elementary pre-service teachers on their conceptions after studying the free fall bodies. First, we will present the multiple-choice questionnaire with justification built for this purpose. Then we will present the analysis of the experimental data. The results show that, even though there is a continuing education related to this subject, many misconceptions persist despite the teaching provided.

About Methodological Foundation of Interdisciplinary and Transdisciplinary Research
Arto Mutanen, Finnish Naval Academy & Finnish National Defence University, Finland

In the philosophy of science there has been discussion about interdisciplinary research and transdisciplinary research which both are of central importance. (See, for example, Frodeman 2010; Koskinen & Mäki 2016.) The first refers to research which includes cooperation between different fields of science and the latter refers to research which includes cooperation between science and non-science. In the paper we focus the attention to cases in which technology have a central role. In the history of natural sciences (and, more generally, experimental sciences) mathematics has played a central methodological role such that mathematics is central methodological core. The idea is not mere mathematization: as Suvi Tala (2015) says mere mathematics does not give understanding that is needed to information that an experiment gives; one need also philosophical and historical knowledge to get good understanding.



Mathematics does not offer Nagelian “view from nowhere” but a systematic methodology for interdisciplinary and transdisciplinary research which is closely connected to natural sciences and engineering sciences. Mathematical methods allow us to unify different points of views given different disciplines (and different expertise). How much and what kind of mathematical knowledge is needed in interdisciplinary and transdisciplinary research? Obviously, technical mathematical skills are not necessary (except of specialists of natural sciences and technology). The general understanding of mathematical reasoning which is needed in experimentation and in planning (Hughes, Kroes & Zwart 2007). Technical mathematical skills are not good enough (and no necessary for all the participants). The understanding needed is basically of philosophical character which can be concretized by historical examples. So, the intention is to increase conceptual understanding of mathematical reasoning, not so much mathematical skills in formal or technical sense. We will discuss more precisely about the needed philosophico-mathematical knowledge that is needed.

Moving past authoritative and dialogic discourse: Teacher roles of questioning to support student argumentation

Jonathan Kilpelä, Sami Lehesvuori and Jouni Viiri, University of Jyväskylä, Department of Teacher Education, Finland

Dialogic classroom discourse can be seen as a prerequisite to supporting students’ argumentation skills, but simply achieving a balance of authoritative and dialogic talk may be insufficient for a teacher to foster high-level student argumentation. Mortimer and Scott (2003) identify four classes of communicative approach that a teacher can employ, but the framework falls short of describing specific actions and roles that teachers can play within each communicative approach. Discourse within each communicative approach ranges along a third dimension, which is identified by Chen et al. (2017) in the teacher roles of questioning framework. In addition to identifying whether students or teachers retain ownership of ideas present in discourse, this framework includes a dimension which identifies how ownership of activities can be exchanged between teachers and students.

This study utilizes the teacher roles of questioning framework and draws a distinction between dialogic/interactive talk that is teacher-driven and dialogic/interactive talk that is student-driven, thus offering an in-depth look at dialogic discourse in science classrooms. In this study, analysis of video data from lower secondary physics lessons in Finland focuses on how classroom discourse ranges within two frameworks. Instances of student argumentation are also explored and assessed on the basis of their complexity. This multi-level analysis reveals observations about the relationship between communicative approaches and teacher questioning roles, as well as assesses what patterns of discourse are effective in supporting student argumentation. Portions of lessons are presented along with turn-by-turn microanalysis, and findings about how science teachers can support student argumentation are discussed.

The effectiveness of STEM based instruction on pre-service science teachers’ problem solving skills

Merve Özkızılçık and Umran Betül Cebesoy, Usak University, Turkey

21st century education consist of three main themes as skills, content knowledge and character. The skills theme consist of creativity, communication, collaboration, critical thinking and problem solving. These skills are crucial for 21st century citizens. These skills have been placed in many countries curricula as well as in Turkey’s science curriculum. The recent revisions in science curriculum (2013 and 2018) stress the 21th century skills. Moreover, the latest revisions in



curriculum introduce engineering and design skills along with the innovative thinking skills. Thus, integration of disciplines has become necessity. STEM (Science, Technology, Engineering and Mathematics) is an approach that focuses on the integration of different disciplines for learning and teaching. The key skills that STEM approach focuses overlap with the 21st century skills. Thus, for raising 21st century citizens, STEM based instruction will provide facilities. At that point, teachers who raise next generations need to be aware of STEM based instruction. Therefore, this study investigated development of pre-service science teachers' problem solving skills after a semester long design based STEM instruction. For this purpose, a one-semester Science Laboratory Applications Course was designed. 24 third grade pre-service science teachers (6 male and 18 female) enrolling in a public university participated in the study. The data was collected through Problem solving Skills Test for Adults developed by Yaman and Dede (2008) as pre-test before the design based instruction and post-test after the instruction. The scale comprised of five subdimensions as thinking of effects of problem solving, modelling of problem solving, research for problem solving alternatives, insistence of determined problem solving steps and analysis of problem. The Cronbach alpha coefficient for this study was calculated as 0.88. The results revealed that design based STEM instruction improved pre-service science teachers' problem solving skills.

International LUMA StarT nominees presentations, S305

Anette Markula, international StarT coordinator hosts the international LUMA StarT nominees presentations of the best StarT Science and Technology projects and best Educational Practises.

Internationally awarded examples for interdisciplinary project-based learning from teachers and students: The international LUMA StarT award winners will present their innovative projects and best practices. Join the session to learn from the awarded projects and the young people and teachers behind them. You are also welcome to share your own experiences of project-based learning.

19.00 - Welcome reception of the city of Jyväskylä, City Hall at Vapaudenkatu 32 (Capacity 150 persons)

Thursday June 6, Seminaarinmäki campus

LUMAT Symposium:

Non-stop programme

Conference exhibit area, C building lobby

Conference exhibit stalls are present throughout the day.

Experience Workshop's STEAM Oasis (Nóra Somlyódy, Matias Kaukolinna & Kristóf Fenyvesi), C building lobby

STEAM Oasis is offering you a full sandbox of innovative learning tools to create or recreate in the flow of the LUMA-days. More information: www.experienceworkshop.org

10.15 - 10.30 Welcoming words, C1 & C2

Rector Keijo Hämäläinen, University of Jyväskylä.



10.45 - 11.45 LUMAT Invited Session, S212

LUMAT symposium invited session. Associate Professor John M. Francisco, University of Massachusetts, Amherst, USA.

Teachers Eliciting Students' Mathematical Arguments: Insights from an After-School Program
There is a documented need for more studies on how mathematics teachers can promote students' mathematical thinking. This study reports on the experiences of six middle school mathematics teachers in an after-school research project where they had the opportunity to lead research sessions on students' development of mathematical ideas. The study examines the teachers' attempts to elicit convincing mathematical arguments from students. The results show that teachers can engage in effective practices, but also face some challenges in trying to promote thoughtful mathematical activity in mathematical classrooms.

11.30 - 13.00 Lunch break

Lunch can be purchased from the cafeterias Lozzi and Tilia or the café Belvedere.

13.00 – 14.30 LUMAT parallel sessions 3, 4 and 5

Research session 3 - STEM & Tech, S203

Sensory integration in mathematics. Use of sensory analyzers at mathematics lessons for training of fractions.

Olena Kovalova, Secondary School №8, Kramatorsk, Ukraine

Learning about fractions in mathematics is one of the most difficult tasks for middle school children, especially for children with autism and intellectual disabilities. The process of teaching requires additional efforts, the search for effective methodological techniques and tools.

The purpose of the project is to create and use SensoryMath-Lapbook, when studying the topic "Fractions". We can also use the sensory- room in training "Fractions". Sensory stimulation help the child stay focused and attentive longer. Child better notice the connection between the number of equal parts and the name of each part. The visual and tactile support helps children with autism. They expand and perfect the idea of the whole and parts.

SensoryMath-Lapbook to help children develop both a quantitative understanding of, and skill in operating with fractions. The use of manipulatives is crucial in developing students understanding of fraction ideas.

The result of the successful use of SensoryMath-Lapbook is that students with special needs, are better aware of, mastering the theme "Fractions". Sensory support is of great importance for inclusive education for children with disabilities.

How the STEM teachers can use the Golab portal

Oubella Mohammed, Le Mans University, France

The Golab portal provides online labs and learning apps for classes, combining them with lesson scenarios and sharing investigative spaces with students.

Using the Golab portal, students have the opportunity to perform personalized scientific experiments with online labs in a structured learning environment.

The structure of the lessons follows the investigation process. The platform offers complete applications for creating simple custom lessons or reusing and adapting spaces created before by other teachers.



The overall goal of the Go-Lab project is to provide students with the opportunity to gain hands-on science experience by conducting online experiments using modern laboratory equipment, deepen their knowledge of the basic sciences and encourage them to move towards the scientific disciplines.

Go-Lab has created an infrastructure, the Go-Lab Portal, to provide access to a collection of online labs from world-renowned research organizations, such as the European Space Agency (ESA, The Netherlands), European Organization for Nuclear Research (CERN) as well as multiple universities and institutions.

These online labs can be used by universities, schools, students and lifelong learners to extend regular learning activities with scientific experiments.

Modeling to foster Computational Thinking and 21st Century Skills

Barbara Sabitzer, Johannes Kepler University Linz, Austria

Kristof Fenyvesi, University of Jyväskylä, Finland

Modeling from the field of computer science is a powerful tool, strategy and skill set for teachers and learners that can develop and enhance computational thinking as well as other 21st century skills such as problem solving or creativity. The Erasmus+ project “Modeling at School” aims at strengthening these innovative potentials in to school practice. The project focuses on two relevant pillars: creating tools and materials for the application of modeling as learning strategy and for developing competences of computational thinking. Therefore, target-group-specific materials and ready-to-use-guidelines will be developed cooperatively with teachers, students, scientists and other stakeholders of the educational system. The second pillar is focusing on the challenge spreading this knowledge on a sustainable way within the school system. To achieve this goal, an innovative concept - the Educational Pyramid Scheme - has been developed. According to this scheme, multipliers are qualified with the involvement of scientists.

Simulation course – A little bit something for everybody?

Kalle Saastamoinen and Antti Rissanen, National Defence University of Finland, Finland

Modeling from the field of computer science is a powerful tool, strategy and skill set for teachers and learners that can develop and enhance computational thinking as well as other 21st century skills such as problem solving or creativity. The Erasmus+ project “Modeling at School” aims at strengthening these innovative potentials in to school practice. The project focuses on two relevant pillars: creating tools and materials for the application of modeling as learning strategy and for developing competences of computational thinking. Therefore, target-group-specific materials and ready-to-use-guidelines will be developed cooperatively with teachers, students, scientists and other stakeholders of the educational system. The second pillar is focusing on the challenge spreading this knowledge on a sustainable way within the school system. To achieve this goal, an innovative concept - the Educational Pyramid Scheme - has been developed. According to this scheme, multipliers are qualified with the involvement of scientists.

Research session 4 - Math through education, S303

“One of the most beneficial classes I have completed during pursuit of my degree”: A case study of effective instructional practices to improve pedagogical mathematics content knowledge for pre-service teachers.

Taik Kim, New Mexico Highlands University, U.S.A

The purpose of this case study is to recognize effective instructional practices that improve pre-service teachers’ pedagogical content knowledge and to provide a model for how we can train future teachers to be highly-qualified educators of mathematics. There were 21 students who were



majoring in elementary education during the last three years. Literatures have identified pre-service teachers lacking in knowledge of crucial mathematics concepts (Hurrell, 2013; Livy, Vale & Herbert, 2016) and do not have the confidence to teach mathematics (Swars, Smith, S., Smith, M., & Hart, 2009). Participants in this research had a poor attitude toward mathematics and had to pass the National Evaluation Series (NES), which is the state-required license exam to be a certified teacher. Key features in the classroom are:

- 1) actively participating in the learning process instead of just sitting in a traditional lecture;
- 2) make students explain how to solve a problem on the board to the entire class;
- 3) understand the reasoning behind what students were learning;
- 4) allow partners to work in conjunction with review of assignments as a whole class.

The data collected were test scores for midterms and final exams, NES test scores, and writings about their learning experiences.

Implementing effective instructional practices in this research produced very positive outcomes: a 98% NES passing rate compared to 42% in other classes, confidence to teach mathematics, and an improved attitude toward mathematics.

Utilizing mathematical research reading as a methodological tool for research education

Antti Rissanen and Arto Mutanen, National Defence university, Finland

Academic education should give to students sophisticated understanding of scientific research. A central factor in this is deep methodological knowledge. In this case study we are looking at how the annual Mathematical day workshop can help students to understand mathematical reasoning better. The intention is to show how mathematical reasoning could be understood as methodological foundation for different kinds of research projects. Articles which our students read were selected so that each of them opens both methodological and substantial questions of the relevant fields of research.

In the introduction lecture a sample case was presented and the schedule for half day long exercise session was explained. The theme was practiced in small groups. Two lectures were available to reframe questions or discussion. Each group read their article and answered to set of questions based on the given research paper. After immediate preparation each group presented their study to the class for further discussion.

In the end of the session most of the 40 students gave student evaluation of teaching (SET) through NDU's standard questionnaire. Later on instructors had additional discussions with few students to form a feedback to students as well to clarify conclusions from the study.

Even though few arrangement problems modified the initial plan, students were both motivated and pleased to participate to the experiment. Observations on changes in opinions were seen, but how these students dear to utilize concepts presented in this experiments, will be seen in the future when the group will give out their master thesis.

Development of one class in dialogic argumentation in mathematics during one year

Markus Hähkiöniemi, Jenna Hiltunen, Kaisa Jokiranta, Jonathan Kilpelä, Sami Lehesvuori & Pasi Nieminen, University of Jyväskylä

Previous studies have emphasized the importance of dialogic argumentation in whole class discussion. Yet, longitudinal studies investigating students' development in argumentation are



needed. The aim of this study is to examine how dialogic argumentation changes when a class participates in a program on dialogic argumentation. The teacher of the class participated in a professional development program and taught eight argumentation lessons in mathematics during the 7th grade. In this presentation, we focus on the whole class discussion after a small group assignment. The lessons were video recorded and coded for students' dialogical and argumentative moves. According to the results, the number of dialogical moves had a tendency to increase but depended also on the type of the task, lesson structure and the teacher's guidance.

Acknowledgment: This work has been funded by the Academy of Finland (project number 286576).

A theoretical framework for a holistic model of early mathematical skills

Piia Parviainen, University of Jyväskylä

In the presentation, I will present a comprehensive theoretical model of early mathematical skills as an opening discussion for considering mathematical aspects holistically in early mathematical learning and teaching. The model bases on international research literature analysis and curricular perspectives regarding early mathematical skills. I will explain how I collected peer-reviewed articles written in English by using electronic searches focusing mainly on educational database (ERIC). I will also explain the content analysis method that I used to carefully analyse the articles in order to find conceptual similarities first, wider clusters second and finally wider themes.

Through my presentation the participant will come to know the three main skill areas of the holistic model of early mathematical skills: numerical skills, spatial thinking skills and mathematical thinking and reasoning skills. The participant will also come to know how I have built up the framework. I will also discuss about the importance of promoting versatile early mathematical skills in early childhood education as children's skills start to develop gradually at early age.

Although several studies show that, the strong foundation of mathematic skills gained in early childhood influence in later mathematical achievement, more research regarding early mathematics education is urgently needed. This is because the amount of studies related to early mathematics education is rather narrow and does not cover early mathematical skills wide enough.

Research session 5 - Environment and culture, S305

Special needs and cinema - STEM creative challenge

Sandra Leite and Paula Matos, Escola Básica Integrada da Praia da Vitória, Portugal

Anabela Santos, Escola Básica e Secundária Tomás de Borba – Azores, Portugal

Education for all is closely linked to working for equal rights of persons with disabilities and against their social exclusion and is the most effective tool for developing the skills needed for this group of children with special needs, aged 11 and to 16 years of age. The main objective of the project is to provide these children with a better understanding of the environment in which they live, since they live on a small island in the Azores archipelago and help them to ensure a role, an active and responsible participation in the society in which they are inserted.

In this way and continuing the European Year of Cultural Heritage and 2019 being the National (Portuguese) Year of Collaboration, the idea will be for the students to create through STEM concept a small cinematographic and audiovisual work with the different traditions that the island offers, involving parents, school, municipality, government, companies and local television, as an instrument of expression of cultural diversity, affirmation of national identity and promotion of STEM. It is intended to create creative and scientific talents, promoting the connection between society and these children, having as an integrated solution that is adaptable, flexible and profitable,



that is designed to help these children observe, discover, prove, verify and measure the results of different experiments and simulations, based on real-life situations.

A virtual laboratory will be created with the help of a local television / municipality so that they can carry out experiments, video clips, animations thus stimulating their natural curiosity and engaging them in a pleasant learning experience, providing guidance and permanent feedback. With this, it is intended to awaken and value cinema as an art with the educational community and be a way of working and entrepreneurship on the island, for these children, through STEM.

Smartphones as didactic tools for approaching Chemistry and Geosciences

Angela Colli, ANISN (National Association Science Teachers), Italy

Marina Porta, Liceo Scientifico "Antonio Banfi" Via Adda 6, 20871 Vimercate, Italy

How to link Chemistry and Earth Sciences in high schools? Chemistry is considered difficult by teenagers because of its language and themes, far away from reality. Geosciences are often left in the corners and in particular the teaching/learning of minerals and rocks is particularly boring! It is important to find new ways to ensure that students fall in love with these disciplines and acquire their fundamental concepts starting from their interests and linking teaching to everyday life.

In our project we adopt an inquiry based methodology: students pose and answer questions in different steps, for example "How many chemical elements can we find in a mobile phone? Is the mobile phone like a mine for elements? Where these elements are coming from in nature? You bought a new phone: what do you do with your old one?". Starting from students' answers different activities were carried out in groups to discover the properties and the role of the elements contained in the mobile phone. The questions / answers methodology open the possibility to introduce the concepts of environmental sustainability, 3Rs (Reduce Reuse Recycle) and Circular Economy. Subsequently we organized a treasure hunt: students have to find clues to complete tabs related to the different elements and place them in a point of a geographic chart where they think there is a mine of that element. We have especially looked for mines in our territory and decided to visit a still active one. Very interesting is the possibility to interview inhabitants of the mining sites, to find the presence of old mines now no longer used and to reconstruct the lives of the communities around them. Finally the project will be open to the problem of land georesources as a cause of world conflicts.

Teaching of science through ethnomathematics and tourism

Ageleo Justiniano Tucto and Heidy Milagros Justiniano Moya, FUNDACIÓN EDUCACIÓN VIRTUAL ABIERTA, Peru

The teaching of science requires real situations of the local context linked to ethnomathematics and tourism, so that the students by inquiry and fun construct the mathematical and astronomical knowledge. This research was conducted with fifth grade students of the National College of Women (Peru), in the Archaeological Complex of Guanuco Pampa. The objective was to represent the structure of the "Chinchaysuyo Solar Calendar" and to explain the possible uses by the inhabitants of ancient Peru, based on the basic knowledge of mathematics and astronomy. Taking as reference the structure built by the settlers of ancient Peru, in the Archaeological Complex of Guanuco Pampa, the students had to represent this structure to scale on graph paper and explain the possible uses that were given; for which they had to make geometric measurements, astronomical observations, establish relationships; Applying inquiry as a learning strategy for scientific knowledge. In the work process of the students, the teacher had the role of accompanist, facilitator and motivator; the students in work teams of five members organized their plan of inquiry, carried out the established



activities, systematized their results and socialized the conclusions of their work with their study colleagues.

The results show that the students learned the scientific knowledge in an enthusiastic, collaborative way, with great interest, attention and diligence; because their activities were carried out outside the classroom, through tourism in an archaeological center that most visited for the first time and ethnomathematics that takes advantage of the social, cultural and political context of their locality, bequeathed by their ancestors. Therefore, it is suggested to link tourism and ethnomathematics for the meaningful learning of science by students.

Investigating Pre-service Science Teachers' cognitive structures about earth science concepts
Umran Betül Cebesoy and Cansu Fotbolcu, Usak University, Turkey

Science teachers in middle schools teach life science and earth science concepts including earth structure, fossils, earthquakes, volcanos, minerals and rocks to their students in addition to other science concepts in biological sciences, physics and chemistry. Middle school science curriculum in Turkey also include these concepts in grade 4-8. So, science teachers need to be ready to teacher these concepts when they are graduated from university. In order to increase pre-service science teachers' understanding of earth science concept, a one-semester Earth Science course was designed. The aim of this study was to investigate third grade pre-service science teachers' cognitive structures about earth science concepts. In order to elicit and represent participants' cognitive structures, word association test (WAT) was used as pre-test before instruction and post-test after instruction. WAT is generally used for eliciting structural knowledge by recalling information. For this purpose, stimulus words representing the content is presented to participants and participants are asked to generate related words in determine time interval. Then the participants' responses are counted and then, cut-off points and relatedness coefficients techniques were used to analyze the data. The cognitive network and map were structured by using the values and frequencies gathered from the two techniques. WAT, in this study, included a total of 10 basic concepts including earth science, earth structure, fossil, geologic time, plate tectonics, earthquakes, volcanos, minerals, rocks and rock cycle. A total of 45 pre-service science teachers enrolling earth science course in a mid-size public university participated in the study. The results showed that the instruction enhanced pre-service teachers' cognitive structures about earth science concepts.

14.30 – 17.00 StarT Gala, C1 & C2

14.30 – 15.00 Coffee and tea

15.00 – 17.00 StarT gala and Statistical olympics reward ceremony

The StarT gala celebrates the international and Finnish national best: awards are given to the best projects, the best practices in teaching, as well as to the most active StarT participating countries and (Finnish) municipalities.

Come and celebrate project-based learning with us!



LUMA Days (Finnish programme)

The LUMA Days programme is offered in Finnish. Short descriptions of the programme contents are shown here for your information.

Thursday June 6, Seminaarinmäki campus (FINNISH PROGRAMME)

LUMA days Finnish programme:

10.30-11.00 Opening lecture: LUMA subjects and the Working Life (FI), C1 & C2
Prof. Tuula Keinonen, University of Eastern Finland

(description forthcoming)

11.00 - 12.00 Panel discussion: Opportunities for working life collaboration in LUMA subjects through the educational system (FI), C1 & C2

The Panel discussion is hosted by prof. Jan Lundell, University of Jyväskylä. Discussants are Tuula Keinonen (University of Eastern Finland), Leena Pöntynen (Technology Industries of Finland), Piia Parviainen (University of Jyväskylä, Early Childhood education) and Tuomo Lahtinen (Ylä-Savo Vocational College).

13.00 - 14.30 Parallel Programme (FI)

13.00 – 14.30 Visits A

The Arts Museum as a STEAM learning environment, Jyväskylä Art Museum HOLVI (FI)

Sirpa Turpeinen, Jyväskylä Art Museum

PRE-REGISTRATION REQUIRED

Scientific equipment and content has snuck into the Art Museum. How does a museum become a learning environment, and how do mathematics and science have a dialogue with the arts? The novel learning space has been co-developed with researchers, educators and citizens.

Checkpoint Leonardo: Just an illusion. Art and Science exhibition, University of Jyväskylä Science museum Harju (FI)

Anssi Lindell, University of Jyväskylä

PRE-REGISTRATION REQUIRED

The Just an illusion –exhibit portrays the surprising interpretations of sensory input. Try out equipment and ponder how designing a science exhibit helps teacher students learn about science education. How would a teacher use the exhibit in her teaching?

Visit to the Finnish Air Force Academy (FI)

Mika Nieminen, Air Force Academy

PRE-REGISTRATION REQUIRED



NB! Registration to the visit by Wed 15 May at the latest! Citizens of countries other than Finland must provide passport number upon registration.

Welcome to visit Air Force Academy. Technical and science education in Air Force focuses on air plane engineering and ICT issues. Among with these education includes leadership, pedagogy and naturally art of war, tactics and strategy.

13.00 – 14.30 Pedagogical cafés A1, C5

13.00 – 13.45 LUMA-subjects in the nearby companies (FI)

Päivi Koussa, University of Helsinki

Company visits are popular, but seldom organized. Utilizing smaller companies near schools saves teachers' time and resources and gives students a first-hand look at various professions, products and services. In the café we will search for resources and ways to make school-company-collaborations more functional.

13.45 – 14.30 Sciences in the Society. Sustainable development and circular economy project meeting. (FI)

Oona Kiviluoto, University of Helsinki

In the café we discuss school and society collaborations as part of sustainability and circular economy education. Come listen and share experiences or ideas about school-company-partnerships.

13.00 – 14.30 Pedagogical cafés A2, C4

13.00 – 13.45 E Avenue and electronics learning environment (FI)

Tuomo Lahtinen, Ylä-Savon Ammattiopisto

Students' coaching in the business environment for individual goals for the on-the-job learning cycle. For more information visit <https://www.ysao.fi/Suomeksi/Hae-opiskelemaan/Ammatilliset-perustutkinnot/E-Avenuen-ja-sahkoalan-yritysten-oppimisymparisto>

13.45 – 14.30 Renewal of Upper Secondary education and collaboration with Tertiary education: best practises and development ideas (FI)

Tiina Silander, Ministry of Education and Culture

Upper secondary and Tertiary educational collaboration has a goal of strengthening the choices of secondary school students by making it possible to learn about different paths in education and working life. We will discuss the good practises and development of models of realizing this collaboration in the café.

13.00 – 14.30 Pedagogical cafés A3, F106

13.00 – 14.30 "Climate education from a solution mindset" project meeting (FI)

Maija Aksela, University of Helsinki

(description forthcoming)

13.00 – 14.30 Pedagogical cafés A4, F205

13.00 – 14.30 Using GeoGebra in mathematics education (FI)

Milla Lohikainen, Tampere University



This cafe includes a presentation of a GeoGebra learning module for studying polygons in secondary school. We will open the discussion for GeoGebra and other modeling programmes in Maths education through school levels.

Friday June 7, Ylistörinne campus (FINNISH PROGRAMME)

LUMA days programme (FI)

9.15 - 10.15 Selection of lectures (FI)

9.15 – 10.15 Lecture: Assessment (FI), YAA303

Najat Ouakrim-Soivio, Ministry of Education and culture

(description forthcoming)

9.15 – 10.15 Lecture: Circular Economy (FI), FYS1

Ari Väisänen, University of Jyväskylä

Recently, the circular economy has risen strongly to headlines both in Finland and all over the world. In Europe, there is a particular concern about the critical raw materials (CRMs), such as; the availability and sufficiency of precious metals and rare earth metals for the needs of companies manufacturing high-tech products. The growth in demand for metals poses risks not only for price development but also for availability. For this reason, it is necessary to develop the recovery of metals from different waste materials. At the University of Jyväskylä, a hydrometallurgical method has been developed, which can be applied for the selective recovery of metals from electronic waste like printed circuit boards.

10.30-12.00 Parallel programme (FI)

10.30 – 12.00 Workshops A

10.30 – 12.00 Evolution in action - workshop for preschool and class teachers: How to teach biological interactions through science and art education (FI), YAB320

Carita Lindstedt-Kareksela, Aigi Margus, Tiina Hirvonen, University of Jyväskylä

PRE-REGISTRATION REQUIRED (max. 20 person)

Our aim is to promote children's understanding of the evolution, its timescales and how humans impact ecological and evolutionary processes. This will guarantee that people understand how biological interactions shape and maintain biodiversity and how human actions currently threaten it. Our workshops are based around practical activities where students can experience science through games and art methods. Workshops will promote critical thinking skills and inquiry-based learning.

10.30 – 12.00 Collaborative learning in STEM subjects (FI), YAB312

Irma Aroluoma

PRE-REGISTRATION REQUIRED (max 20 person)

When equipment are few, lab spaces inexistent, and group sizes large – come to this workshop suited for all school levels.

10.30 – 12.00 Escape – escape games supporting learning (FI), YNC121

Juha-Pekka Lehtonen ja Sari Halavaara, Olari High school, Espoo



PRE-REGISTRATION REQUIRED (max 20 person)

Workshop explores gamification in strengthening students' problem solving skills and collaborative learning. We will work on a sample pedagogical escape game and get concrete ideas for making your own escape game through traditional or digital equipment.

10.30 – 12.00 Simulations in Physics Teaching (FI), FL349

Jan Sarén, University of Jyväskylä

PRE-REGISTRATION REQUIRED (max 20 person)

Workshop on simulations in physics teaching introduces you to a few simple computer simulations related to common physics phenomena. We will use Python3 as a language. You can come to the workshop even if you are not familiar with programming. The main motivation is to encourage one to build his or her own simulations and to show that with the help of numerics the well known physics laws really describe the observations of everyday life.

10.30 – 12.00 ActionTrack –workshop (FI), FYS5

Tero Hirvi, Jyväskylän yliopisto

PRE-REGISTRATION REQUIRED (max. 25 person)

ActionTrack is location-based platform which allows you to create customized self-run tracks for learning. It can be used in all levels of education. In a functional workshop you get to know how to use the platform and you also have a chance to test it from the perspective of the pupil. Your own mobile device (Android or iOS) is advisable.

10.30 – 12.00 Visits B

The Mathematical Exhibit at the department of Mathematics and Statistics (FI)

Contact: Tuomo Äkkinen, department of Mathematics and Statistics

PRE-REGISTRATION REQUIRED

Dynamical systems are used in mathematical modeling of real world phenomena. We will explore the behavior of dynamical systems through physical devices and illustrate the mathematical and statistical facts related to these dynamical systems.

Nuclear Physics at the most Northern Accelerator Laboratory in the World (FI).

Contact: Jan Saren

PRE-REGISTRATION REQUIRED

Come and see how atomic nuclei are studied at the Accelerator Laboratory of the University of Jyväskylä! After the tour you will recognize at least the following concepts: fusion, fission, gamma radiation and Albert Einstein. You will also get an introduction to how energy is produced in the Sun and nuclear power plants. You will hear also something about applications even though the tour will focus on basic research.

A visit to the Research Laboratories of the Nanoscience Center (FI)

Contact: Kimmo Kinnunen

PRE-REGISTRATION REQUIRED



You will learn about the interdisciplinary research done at the Nanoscience Center and get an idea about what “nano” is.

The topics include: ultrafast lasers and what kind of research is done with them. DNA, nanoparticles, carbon nanotubes, graphene and their applications. Cleanroom and sample fabrication methods. What is an atomic force microscope and how does it work? A peek into research of quantum phenomena at low temperatures, and demonstration of a levitating superconductor.

10.30 – 12.00 Pedagogical cafés B1, YAA305

10.30 – 12.00 StarT café: National Best Practises, part 1 (FI)

Outi Haatainen, University of Helsinki

The best teaching practises from Finland present.

10.30 – 12.00 Pedagogical cafés B2, FL140

10.30 – 11.15 “Research and Practise for teachers” project start up meeting (FI)

Maija Aksela, University of Helsinki

(description forthcoming)

11.15 – 12.00 Working life knowledge for STEM teaching (FI)

Jenny Kolström, University of Eastern Finland

(Description forthcoming)

10.30 – 12.00 Pedagogical cafés B3, FYS3

10.30 – 11.15 What moves our children? Cornerstones of learning (FI)

Jukka Sinnemäki, Jyväskylä

How does knowledge change into action so that the learning process can begin? Learning motivation, concentration, social relationships and their impact on learning outcomes. At the heart of everything is to seek a state of well-being where the child can see his / her own abilities and cope with life's challenges and work with members of different communities. The child learns to lead his / her well-being and learning with the help of objective and subjective measurement, but the focus is on learning processes and the pedagogical model."

11.15 – 12.00 Dancing Mathematics (FI)

Saara Lehto, University of Helsinki

We know from medical research that we need our bodies to think. That is why movement and acknowledging your body and senses are important also in education. Internationally, there are several good examples of teaching mathematics through dance. Also research supports these new teaching methods. The LUMATIKKA course “Kehollinen ja liikkuva matematiikka (Embodied and moving mathematics)” has gathered teaching ideas for dancing mathematics from early childhood education to lower secondary education. Come and gather the best ideas and share experiences of teaching moving mathematics.

10.30 – 12.00 Pedagogical cafés B4, YAB310

10.30 – 11.15 The phenomenon-based education and research at the Air Force Academy (FI)

Mika Nieminen, Air Force Academy

Some principles of modelling of Air Force Fighting from the points of view of Maths and Physics.



11.15 – 12.00 *Emphazing argumentation in science education (FI)*

Mikko Kesonen (PhD), LUMA CENTRE of University of Eastern Finland.

This cafe focuses on ways to support students' justification skills and learning by emphasizing argumentation in science education. In the course of the cafe, the basics of argumentation are presented, and instructional activities and methods designed to guide students to construct and assess arguments are discussed. The activities and methods covered during the workshop are the most suitable for science lessons held in lower and upper secondary schools. For more information: mikko.kesonen@uef.fi.

13.00 – 14.30 Parallel programme (FI)

13.00 – 14.30 Workshops B

13.00 – 14.30 Evolution in Action – workshop: How to teach biological interactions through science and art education (FI), YAB320

Carita Lindstedt-Kareksela, Aigi Margus, Tiina Hirvonen, University of Jyväskylä

PRE-REGISTRATION REQUIRED (max. 20 person)

Our aim is to promote children's understanding of the evolution, its timescales and how humans impact ecological and evolutionary processes. This will guarantee that people understand how biological interactions shape and maintain biodiversity and how human actions currently threaten it. Our workshops are based around practical activities where students can experience science through games and art methods. Workshops will promote critical thinking skills and inquiry-based learning.

13.00 – 14.30 Tools for Inquiry – how to get from phenomenon to concept? (FI), YAB312

Mari Nuutinen, Pirkko Kärnä and Heidi Sillanpää. Finnish Science Learning Foundation & MAOL.

PRE-REGISTRATION REQUIRED (max 20 person)

Workshop is aimed at teachers from early childhood education to secondary school. Inquiry learning is suited for all age groups. We are examining them on the basis of educational research. The workshop explores natural curiosity, keeping the joy in inquiry, and practises of researcher skills: making observations, classifying concepts, and concluding. Researcher skills are a requirement of the future.

13.00 – 14.30 Multidisciplinary Mathematics Learning with the Polyuniverse Visual Experience Toolkit, FYS5

Merja Sinnemäki, Leena Kuorikoski, Matias Kaukolinna & Kristóf Fenyvesi,

www.experienceworkshop.org

PRE-REGISTRATION REQUIRED (max. 25 person)

All participants get a free set from the newly developed Polyuniverse Mathematics Education Toolkit (<http://poly-universe.com/>) and a full collection of creative problems covering K12 geometry, combinatorics and probability, sets and logic, graphs and algorithms, and more. The next generation of "Hungarian mathematics" is here: if you liked Varga-Neményi's logical set, you will like this too. The complexity emerging from Polyuniverse's simplicity makes it more than a game. Play, art, and creative problem-solving are all coming together in a new synergy for mathematics education. The program is supported by the "Polyuniverse in School Education" Erasmus+ project.



13.00 – 14.30 *Innokas! Micro:bit –programming workshop (FI), YNC121*

Janne Fagerlund, Innokas!-network

PRE-REGISTRATION REQUIRED (max. 20 person)

In this active workshop you will get to know the basics of using the mini-computer Micro:bit in teaching programming and robotics (no need for earlier Micro:bit programming experience). You will additionally hear examples of how Micro:bit can be used in different school subjects. Please bring your own computer that has a USB port for programming.

13.00 – 14.30 Visits C

The Mathematical Exhibit at the department of Mathematics and Statistics (FI)

Contact: Tuomo Äkkinen, department of Mathematics and Statistics

PRE-REGISTRATION REQUIRED

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Contact: Jan Saren

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Contact: Kimmo Kinnunen

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13.00 – 14.30 Pedagogical cafés C1, YAB310

13.00 – 14.30 “Preparing for the future of AI as part of science and mathematics teaching” project meeting

Maija Aksela, University of Helsinki

(description forthcoming)

13.00 – 14.30 Pedagogical cafés C2, YAA305

13.00 – 14.30 StarT café: National Best Practises, part 2 (FI)

Outi Haatainen, University of Helsinki



The best teaching practises from Finland present.

13.00 – 14.30 Pedagogical cafés C3, FL140

13.00 – 13.45 Information and communication technology (ICT) and social media supporting the development of your teaching (FI)

Ari Myllyviita, Viikki Teacher Training School

The development of teaching and working community is based on Design based research, you are analyzing and reflecting your own teaching, you are sharing your results and experiences and you are challenging our knowledge. Projects have a vital role in deployment of ICT and social media, they bring new elements to your teaching. You can divide ICT-tools to pedagogical, cognitive and metacognitive tools.

13.00 – 14.30 Pedagogical cafés C4, FYS3

13.00 – 13.45 Laughter in the Laboratory (FI)

Veli-Matti Vesterinen & Jaakko Lamminpää, University of Turku

Why is science seen as a serious business? What is the role of humour in inquiry learning? Why students laugh more when the teacher is absent? Come and hear some serious - and not so serious - science about humour.

14.30 - 15.00 Final Words (FI), YAA303

Maija Aksela, Jan Lundell