

ICSE Newsletter

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In Brief: Successful Inauguration of ICSE and the ICSE Consortium

What a great start into the New Year: On **18 January, 2018**, the **festive opening ceremony of the International Centre for STEM Education and the ICSE Consortium** took place in the auditorium of the Freiburg University of Education.



Festive: Participants of the ICSE inauguration at the auditorium of the University of Education. Photo: ICSE

The well attended event brought together educational policy makers, researchers, teachers and industry representatives from all over Europe and was enthusiastically received by the participants.

In addition to **short plenaries and a panel discussion**, there were many opportunities for networking with coffee, finger food and drinks during the celebration.

The event was accompanied by festive and lively sounds of the great PHunky-MHonkey Big Band.

In short, inspiring lectures the meaning of ICSE from the university's point of view was outlined by Prof. Dr. med. Druwe, Rector of the University of Education Freiburg, and by em. Prof. Dr. Michèle Artigue, Université Paris Diderot. Then, Prof. Dr. Katja Maass, Director of ICSE, explained, based on concrete examples from everyday teaching, the rationale for founding of ICSE as well as its aims: She emphasized that STEM teaching should prepare all students for a life in an ever-changing, increasingly technical world and raise their interest in STEM subjects. To achieve this, cooperation with all key players in the field of STEM education would be essential.

It was precisely these key players, with representatives from industry, politics, research and teaching practice, who came together in the subsequent panel discussion. The experts agreed on many points: In the future, assessment should not only be limited to recalling factual knowledge, but must be adapted to innovative forms of STEM teaching. Teacher education and training should focus on that.



Inspired: Experts for STEM education at the ICSE panel discussion. Photo: ICSE

Achieving this would not be an easy task, Prof. Michiel Doorman, ICSE consortium member of the University of Utrecht, noted at the panel discussion. Marc Durando, executive director at European Schoolnet, emphasized the importance of an initiative like ICSE and expressed its full support to the Center.

Dr. Peter Balyta, President of Education Technology at the US-based company Texas Instruments, highlighted optimistically: It is an important first step that all representatives of this panel recognize the problem as such because only with joint forces the parties involved can tackle the challenges in STEM education. Katja Maaß emphasized that ICSE wants to further promote the cooperation of various key players in the future.

Following the successful panel discussion, there was a market of innovation that presented current education and training materials from the research on STEM education of ICSE and its partners. More than 100 guests from around 20 countries enriched the opening event and had lively discussions about the possibilities and trends of MINT education and research in Europe.

At the end of the event, Volker Schebesta, State Secretary of the Ministry of Culture, Youth and Sports, emphasized the urgency of promoting STEM subjects.



Congratulates: Volker Schebesta, State Secretary of the Ministry of Culture, Youth and Sports. Photo: ICSE



Photo: ICSE

The ICSE team would like to thank all participants for the great speeches, discussions and contributions. It was in every way an outstanding event that created many new networks and ideas.

Now officially founded: the International Consortium for STEM Education

Coinciding with the inauguration celebration of the International Centre for STEM Education (ICSE) on 18th January 2018, the **International Consortium for STEM Education** celebrated the fact that the contractual basis of the International Consortium for STEM education became effective by signature.



The ICSE Consortium and ICSE Team. Photo: ICSE

The **ICSE Consortium comprises leading higher education and research institutes from across Europe** that all have a unique focus in their research in STEM education: one that takes aspects of transfer into day-to-day teaching into account from the very beginning of the research and development process.

All of the **13 founding member institutions** of the ICSE Consortium were present at the celebration:

- Austria, University of Innsbruck
- Bulgaria, Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences
- Cyprus, University of Nicosia
- Czech Republic, Charles University
- Germany, International STEM Centre, University of Education Freiburg
- Greece, National and Kapodistrian University of Athens
- Lithuania, Vilnius University
- Malta, University of Malta
- Netherlands, Utrecht University
- Norway, Norwegian University of Science and Technology
- Slovak Republic, Constantine the Philosopher University in Nitra
- Spain, University of Jaén
- Turkey, Hacettepe University

The **ICSE Consortium strives to lead the European field of transfer-oriented research and development in relation to STEM education**, and to set standards for a **high-impact international collaboration of higher education and research institutes**.

To read more about the ICSE Consortium, please visit our new homepage: icse.eu

Summer School on Intercultural Learning in Science: Discover different approaches to science education from all over Europe



*Learning in an intercultural environment.
Photo: IncluSMe*

The missing link: Why teachers should combine science education with intercultural learning

Intercultural learning combines the acquisition of knowledge (on other cultures, cultural differences, and differing perspectives) with the development of personal competences that affect attitudes, values and opinions. While being an integral part of initial teacher education (ITE) in the humanities, intercultural learning is not included in most maths and science curricula of ITE in Europe. Yet, prospective maths and science teachers need to learn how to cope with language barriers, culturally different conditions and highly varying proficiencies of (immigrant) pupils. Prospective science teachers need to be aware of the cultural realities of many science tasks as well as of culturally different algorithms. They should be able to perceive culturally different perspectives and develop intercultural sensitivity.

For prospective science teachers: Join a unique intercultural experience preparing you for the future classroom!

For intercultural learning, **first-hand experiences** are indispensable and in particularly relevant for the future classroom. Therefore, **IncluSMe** offers a summer school in Prague, June, 20th - 29th 2018, with the focus on intercultural learning in natural sciences. Participating students will be prepared for their stay abroad with the help of a module on raising students' intercultural awareness. The module will also equip students with **methods for reflecting own intercultural experiences** they will make during the summer school and connect them to their learning processes linked to natural sciences. During their stay, students will have numerous opportunities for intercultural exchange, both within the international student group and outside when meeting local students, teacher and pupils. This will enable them to gain rich intercultural experience connected to their own future profession.

First insights into the programme

During the summer school, **lectures and workshops** with a particular emphasis on those topics will be given:

- Accompanying prospective teachers in making intercultural experience (preparation module)
- Different perspectives on current ecological problems
- Scientific problems involving moral, ethical or cultural aspects
- Intercultural science learning outside of school
- Relevance of language in science education
- Assessment in mathematics and science in multicultural contexts



Prague Cathedral.
Photo: Martin Bilek

In addition, IncluSMe will offer a cultural learning programme: for example, visits of the Czech National Museum, the Technical Museum and the expositions of the Faculty of Natural Sciences of the Charles University. Also, excursions to schools and other relevant institutions will be organised to give prospective teachers an insight into the life in school and society in another country.

Further activities are planned, the detailed program is currently being set up and we will be published on the IncluSMe website in March.

More information about IncluSMe: <http://inclusme-project.eu>

Key information: IncluSMe International Summer School

Date: 20 June – 29 June, 2018

Venue: Charles University, Faculty of Education, Prague, Czech Republic

Main target group: Natural science students in teacher education programmes – also interested university teachers welcome!

Application deadline: 15 April, 2018

Award: 3 ETCS credits, certificate of participation

Language: English

Costs for students of IncluSMe partner universities: Attendance fee 25, - EUR. Participants can apply for funds for travel, accommodation and subsistence up to 910, - EUR

Fee for students of other universities: Attendance fee 100, - EUR. Travel, accommodation and subsistence costs on own expenses

Organizer: IncluSMe Project - University of Hradec Kralove in cooperation with the Faculty of Education at Charles University

Contact for information: martin.bilek@uhk.cz or martin.bilek@pedf.cuni.cz

Web: <http://inclusme-project.eu>

Also join the IncluSMe summer school focussing on intercultural learning in mathematics
- Summer 2019 in Vilnius, Lithuania!

Innovative STEM professional development courses implemented in six European countries:

Rediscover inquiry-based learning (IBL) in science and mathematics!

Using IBL to address different achievement levels – using it to promote students’ learning of fundamental values – using it to deal with diversity in class/multicultural classrooms

➔ The innovative professional development courses will start in spring 2018 in *Germany, Cyprus, Malta, the Netherlands, Spain and Turkey.*

Rationale and aims

In Europe, 17% of 15-year-olds underachieve in science and 22% in mathematics - and alarmingly, students of low socio-economic status (SES) and migrant backgrounds are particularly at risk. The situation requires urgent action, as:

- Science and mathematics are vital prerequisites for employability and active participation in society.
- Underachievement is one cause of early school leaving. Millions of young people are not in employment or education, and thus less involved in social and political life and at risk of exclusion.
- Increasing numbers of immigrant students will exacerbate this situation.

Because our schools’ mathematics and science classes include more and more students with varying achievement levels, ethnic backgrounds and value systems, mathematics and science education must address diversity and contribute its share to enabling all students to actively and autonomously participate in society and democracy and respect diversity. These are all fundamental values of our society.

Teachers are key enablers to delivering such science education; however, they need help to do so. Particularly, lower secondary teachers have expressed urgent need to learn how to teach students of different achievement levels and different cultures. The **project MaSDiV will therefore deliver professional development courses that fulfill these requirements and supports teachers in delivering mathematics and science education that meets the needs of all students** (regardless of their achievement levels, socio-economic and cultural background) and supports them in developing mathematics and science literacy and in developing fundamental values.

Our approach draws on inquiry-based learning (IBL), as we can innovatively expand it to tackle the above-named challenges. In **IBL lessons**, students work at their level of competence ‘to do inquiry’ on unstructured problems. Teachers facilitate students’ learning processes.

Our approach: (1) introduces IBL as a means for addressing achievement-related diversity; (2) expands IBL to realistic, relevant contexts and (3) embeds IBL in multicultural settings. It will produce effective results because:

- (1) IBL has proven efficiency in reaching students of all competence levels (thus addresses underachievement and early-school leaving.)
- (2) Learning in realistic, relevant contexts makes science more meaningful for all students, leads to better science understanding and scientific literacy, tackles diverse students' underachievement and increases their societal participation.
- (3) Taking up multicultural differences in science education supports students with migrant backgrounds, raises their motivation for science and addresses underachievement. In intercultural learning, all students experience tolerance, non-discrimination and our society's fundamental values.

Key information on the courses

- The professional courses consist of three flexible modules:
 - IBL as an approach for addressing achievement-related diversity
 - IBL in realistic, relevant contexts and
 - IBL in multicultural settings
- **Target group:** lower secondary school teachers in general education
- Free of charge
- Short face-to-face sessions, longer-term support through teacher trainers
- Classroom materials included
- Support course leaders to bring a new approach to schools which is now tested across the European Union
- The professional development courses will start in spring 2018 in **Germany, Cyprus, Malta, the Netherlands, Spain and Turkey.**
- If you are interested in **participating in the courses in one of the countries**, please contact icse@ph-freiburg.de for more information on the related course.
- The piloted and optimized professional development materials will be available online by the end of 2019 and are free of charge. Please contact [icse@ph-freiburg](mailto:icse@ph-freiburg.de), if you are interested in preliminary versions for piloting.
- If you are interested in implementing the courses in a country beyond the above mentioned countries or you want to have more information on the courses in general, please also contact icse@ph-freiburg.de



Teachers at a professional development course
Photo: P. Bronner, PH Freiburg

Policy Briefing: Introducing STEM PD Net to Policy Makers

We live in a society where school is one of the most important building blocks. From research we know that teachers and their competencies are one of the most prominent factors determining students' educational results. It is important that today's young people develop problem-solving skills so that they are able to think analytically about cases and eventually become the researchers, creative innovators and imaginative individuals we need for a future sustainable society.

STEM education can contribute to this!

STEM is the acronym for Science, Technology, Engineering and Mathematics. The valued outcomes of STEM Education are: developing science literacy for all students; preparing them for advanced degrees and technical careers; and raising the future workforce to support a nation's prosperity and economic competitiveness. And this within a sense of active citizenship fostering equity, diversity and preventing radicalization.

STEM education integrates concepts that are usually taught as separate subjects in different classes and emphasizes the application of knowledge to real-life situations. A lesson or unit in a STEM class is typically based around finding a solution to a real-world problem and tends to em-



Students having fun at a STEM class. Photo: David Wisniewski

phasise project and inquiry-based learning.

Preparing Teachers for STEM Education

STEM teachers are expected to develop the mathematical, scientific, technological expertise that students need to be competitive in the 21st century workforce. But STEM goes far

beyond preparing students for specific jobs. It develops a set of thinking, reasoning, team-working, investigative and creative skills that students can use in all areas of their lives. For such an important responsibility teachers need access to professional development.

What is STEM PD Net?

The objective of STEM PD-Net is to strengthen the position, relevance, quality and knowledge base for STEM PD on a large scale. To provide as many teachers as possible with relevant and high-quality professional development (PD) courses, many countries have, in recent years, set up national professional development centres. The European STEM Professional Development Centre Network grew out of the idea that these national centres should be connected internationally since they have similar aims and agendas, namely: investing in teacher professional development to substantially improve STEM education as it happens day-to-day in schools. Despite different national circumstances, foci and structures, the national PD Centres across Europe encounter similar concerns and challenges. International collaboration therefore is an essential element of sharing good practice.

STEM PD Net was formed in 2014 and received Erasmus+ funding from 2016 to bring together teachers, universities, ministries, unions, PD centres, namely all stakeholders who take active role in professional development of teachers. The network consists of STEM PD centres from countries across Europe.

Active cooperation between STEM PD providers and policy makers is vital

To meet these objectives and ambitions it is necessary that policy makers, STEM PD Centres and STEM PD providers find common ground. This introductory paper is intended to draw policy makers' attention to our work. This includes research outcomes and evidence describing effective professional development in different contexts, from kindergarten level, via pre-school and primary school to upper secondary school.



Image: U.S. Department of Energy

The innovative linking of research, practice, international exchange and opportunities for mutual benefit are key to STEM PD-Net. Our consortium addresses the need for cooperation between policy makers and STEM PD providers on regional, national and European levels.

The network promotes knowledge exchange in order to improve local practices in STEM professional development and strengthens the voice of practice when it comes to shaping STEM education in Europe.

Policy support on regional, national and European level

The importance of policy support for STEM PD cannot be overestimated and so our network deliberately addresses policy makers at various levels and within various sectors. Supporting policy makers to connect, communicate, agree and cooperate with STEM PD providers is therefore one of the main aims for the STEM PD Net.

Policy Making in Three Arenas

What policy makers do we want to reach? Research shows that the governance of an educational system can be seen as three arenas mutually affecting each other. Policy makers in the different arenas can play important roles for STEM PD in this interplay. STEM PD-Net will facilitate awareness and connections between the actors in the three arenas in order to develop innovative solutions to PD issues.

1. The Formulation Arena

This arena includes most of the formal policy makers. National and regional decisions are made regarding curricula, budgets, professional development, teacher education, and regulations concerning STEM education and STEM PD. The actors are, for example, national Ministries of Education, Inspectorates, regional or national Agencies of Education, Curriculum Development Centres, Universities, Teacher Education providers, and local community School Boards.

2. The Transformation Arena

This arena consists mainly of the informal policy makers, such as textbook publishers, industry and industry organizations, media, NGO's, political parties, teacher unions, STEM PD Centres, foundations and other funds supporting STEM PD etc. National and regional political activities and decisions are interpreted and transformed into different projects, publications and campaigns.

3. The Realisation Arena

In this arena STEM PD activities take place. The main actors are teachers and teacher students together with PD providers. Other actors include principals, parents and parent's unions - and their viewpoints may differ from the messages from actors in the Formulation Arena.

Governance

Governing an educational system is concerned with how the funding, provision, ownership and regulation of education and training systems is coordinated. Taking into account these three arenas can offer a new perspective on how different actors can engage themselves in the STEM PD landscape.



Meeting of the STEM PD Net, Gothenburg 2017. Photo: STEM PD Net

For example, in the long term, activities in the Realisation arena impact on activity in the Transformation arena. Actors in the Transformation arena can have impact on curriculum change in the Formulation arena. The results of collaborative projects between actors in the Formulation and Transformation arenas will be of interest and can influence projects at regional, national and European level.

What can STEM PD Net offer?

- (1) Setting up research-based criteria for high-quality PD and enriching these with good-practice examples
- (2) Developing ready-to-use guidelines on how to measure the success of teacher PD in day-to-day settings as a means of quality assurance in relation to
- (3) Developing a catalogue for policy makers and STEM PD providers, showcasing good-practice examples on how to prepare teachers to deal with diversity
- (4) Collating an annotated collection of STEM PD aims, projects, resources and materials allowing policy makers and PD providers to easily find and select materials with a focus on their purpose, content, quality and potential.

Get in contact with us! Visit <http://stem-pd-net.eu/>

Information on the Policy Briefing

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Coordinator: Prof. Dr. Katja Maaß

Project Manager: Elena Schäfer

Lead partner for this report/IO: Claes Klasander, Linköping University

Pictures:

1. David Wisnieski, <https://www.edsurge.com/news/2014-08-11-the-science-of-learning-three-strategies-for-improving-stem-education>
2. Image: U.S. Department of Energy, <https://energy.gov/diversity/federal-and-external-stem-education-resources>
3. STEM PD Net

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Contact:

International Centre for STEM Education (ICSE), University of Education Freiburg

Kunzenweg 21, D-79117 Freiburg

Email: icse@ph-freiburg.de

Website: <http://icse.eu/>

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