



University of Education Freiburg

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INSTEM 6th Newsletter



Conclusion from a successful project

After three years of intensive work on collating project knowledge across a large variety of projects, after establishing sustainable networks through national policy workshops and a large number of dissemination activities, we gathered important insights on how to support innovations in STEM education.

In this newsletter we will first summarize our contribution to EU policies.

Second, we will present a selected number of recommendations from our synthesis report and our state-of-the-art report. More details on the findings as well as on their background can be found in the original reports on the INSTEM website (<http://instem.tibs.at>).

Third, we report on our successful final conference. Again, more information can be found in the detailed conference report on the website.

We hope you enjoy reading this.
Katja Maaß



Education and Culture DG

Lifelong Learning Programme

INSTEM CONTRIBUTIONS TO EU POLICY

According to the Bergen declaration there is a need for greater sharing of expertise to build capacity at both institutional and governmental level. That means we need to achieve an overall increase in the numbers of doctoral candidates taking up research careers within the European Higher Education Area (EHEA). The Bergen declaration highlights the social dimension of the learning process. There is a commitment to making quality higher education equally accessible to all, and stress the need for appropriate conditions for students so that they can complete their studies without obstacles related to their social and economic background. The social dimension includes measures taken by governments to help students, especially from socially disadvantaged groups, in financial and economic aspects and to provide them with guidance and counselling services with a view to widening access (see EU: Bergen declaration: <http://www.cebts.eu/policies/bologna-process/bergen-declaration.php>).

In terms of the above Bergen Declaration it is important to take into account the different components of knowledge, focusing research on learning, education and training issues, or on the role and place of young people in society (CC, 2012).

INSTEM has contributed to the enhancement of young people's role and place in society by connecting the social inclusion agenda, represented by projects such as SiS-Catalyst and schools such as Bodmin College, to the long-standing focus on spreading IBL, represented by projects such as PRIMAS and S-TEAM.

By producing synthesis documents such as the WP2 and WP5 reports, we have contributed to aligning the findings of a large variety of projects in a way which consolidates the message delivered to policy makers, thereby making it more effective. It is widely recognised that the EU cannot directly intervene in school systems, but the wide range of activities carried out by projects associated with INSTEM has undoubtedly initiated long-term change in several countries. For example, in Turkey, the presence of future curriculum developers at S-TEAM seminars has led to the strengthening of IBL within the Turkish science curriculum. Similarly, in France, the Rhone-Alpes region has introduced teacher professional development activities or IBL based on the work of S-TEAM, whilst in Norway PRIMAS and MASCIL have been taken up in the teaching policies of several municipalities. Thus INSTEM has provided a vehicle to continue the work of these projects and turn their short-term activities into long term trends within the education systems of these and other countries.

The INSTEM synthesis reflects the consensus view of consortium partners, who have had experience of STEM projects over many years and who are committed to improving the state of STEM education in Europe and elsewhere. The key message of this report is that there should be a coherent approach to STEM education in Europe during the period of the Horizon 2020 programme and beyond (2014-2025). The funding of STEM education projects by the EC is an important contribution to revitalising teaching and learning in these subjects, and all the projects reviewed here are fully committed to a pan-European movement towards innovative policies in STEM education. INSTEM has succeeded, along with its informal associate ProCoNet, in cross-fertilising between, for example, existing projects in formative assessment for inquiry such as ASSIST-ME and SAILS, and emerging projects in the same area, such as FASMED.

Concerning Horizon 2020 more generally, INSTEM has been instrumental in working with the Responsible Research and Innovation agenda, contributing to EU workshops on public engagement and gender issues, and raising the profile of RRI at a number of major conferences including IOSTE Eurasia Regional Conference 2013 in Antalya, and the Turkish-German Science Education Workshop in Turkey, 2014 or the Eminent Conference in Spain 2015. We have also contributed to the emergence of a new collaboration between the European Physical Society and the Pathway project towards the formation a European Science Education Academy. This is a small but significant step in furthering the sustainable development of STEM education in Europe, since our reports have drawn attention to the need for permanent institutions to continue reform of the STEM education sector.

A further very important step in contributing to EU policies was the writing of the INSTEM's state of the art report. Its influence in EU policy is evidenced by the fact that it is referenced in the Science Education for Responsible Citizenship (SERC) report (EC, 2015: http://ec.europa.eu/research/swafs/pdf/pub_science_education/KI-NA-26-893-EN-N.pdf).

Our conclusions within the INSTEM synthesis and state of the art reports are in line with those of the SERC report and therefore contribute to a long-term movement towards more effective and engaging science/STEM education.

For a strategic and widespread dissemination of our valuable meta-level reports we undertook – among others – the following steps (for details on our concrete dissemination activities, please see our next newsletter (to appear soon)).

- The reports have been passed to appropriate scientific officers in the Research Executive Agency and the EACEA.
- Our work has been shared amongst members of the ProCoNet group of project coordinators and will be promoted by ProCoNet after the end of the INSTEM funding period.
- Several international partners, within the consortium and beyond, will be using INSTEM reports to inform their science education policies and practices.

In turn, our involvement in activities such as those mentioned above has increased overall awareness of current EU projects.

RECOMMENDATIONS FOR THE IMPLEMENTATION OF INNOVATIONS IN STEM EDUCATION

BACKGROUND

During the lifetime of the INSTEM project nine National Workshops and Case Studies were produced. The purpose of the national case studies was to exemplify successful strategies for exploiting synthesised project knowledge. Furthermore, we carried out a review of documents supplied by a variety of STEM (Science, Technology, Engineering & Mathematics) education projects funded in FP7 and the LLP. These activities as well as several dissemination activities and in particular the Final Conference in Freiburg, Germany, June 2015, all allowed for mutual learning and have been used as the basis for these recommendations.

SELECTED RECOMMENDATIONS FROM THE STATE-OF-THE-ART REPORT

- There is a need to identify a travel plan for the European learning journey in relation to education until 2050 (at least 2020). This should be based on the engagement of all societal actors (children, teachers, parents, educational services, governments, business, media, third sector organisations etc).
- Genuine participation by societal actors requires supportive structures (e.g. communities of practice) which enable individuals to gain confidence in their own voice, to know their opinion is valued, respected, and is being listened to. This is particularly true for children and teachers.
- In order to engage the range of societal actors involved, there is a need for greater synchronisation between policies, research and practice.
- Children, as scientists of the future, will have to find interdisciplinary solutions to societal challenges. In order to see science in everyday life, and potential career opportunities, children need to be able to see science as inter-connected branches of learning and not as separate linear lines of learning.

- The desire to promote STEM subjects should provide learning opportunities for students at all levels, with more careful attention given to the needs of locally defined minorities. Underrepresentation of any identified group, including men and women, needs to be addressed from the earliest age.
- In order to equip future researchers with the required skills, there is a need for greater synergy and interaction between educational coordination, support and research. This will require that societal actors take responsibility for this within their own sphere of influence.
- The exponential growth of technological opportunities will require a more open, flexible and innovative approach within the education systems - this includes the development of resources and materials for the classroom.
- The development of Open Science, which includes children, schools and the public within the research process would enable a participatory approach to education, which will further the ambitions of its students, of all ages, in participating in STEM.
- The concept of dissemination (sowing the seeds) needs to be developed to include the active engagement by all societal actors in the process of change, for example by the direct linkages of project findings with regional and national policies and schools seeing their role as a vehicle for public engagement with science.

SELECTED RECOMMENDATIONS FROM THE SYNTHESIS REPORT

Recommendations for European Policy

- Educational change in Europe should be implemented in line with a well-defined long-term vision, which incorporates the best features of national systems.
- There should be a wider interpretation of 'innovation' in relation to educational interventions, to allow for methods complementary to IBL.
- Greater coherence is needed between policies and actions in primary, post primary and the tertiary sector.
- There should be more interaction between science education, the world of work, and research, in order to provide students with a sense of purpose and real engagement with science.

Recommendations for the National level

- There should be better alignment between pedagogy, curricula and assessment systems.
- There should be better coordination between curricula, textbooks, online resources and teacher competence.
- There should be more professional development for teachers, in order to improve their confidence and repertoires of actions in relation to IBL.
- More attention should be paid to student voice and rights in relation to STE(A)M subjects, in order to encourage students, as future citizens, to take responsibility for research and innovation.

Recommendations for the School level

- There needs to be commitment at school governance/management level to implement new practices effectively.
- Inter-disciplinary working and teacher collaboration are essential to maximise the potential of innovations in teaching and learning.

- Teacher professional development requires time, space and coherent structures and these need to be given to teachers in order to allow for changes.
- The informal sector has an increasing part to play in implementing innovative forms of science education.
- Classroom environment: The essential precondition for IBL to have any effect is an inquiry-friendly classroom environment, in which student questions are valued and curricula are sufficiently flexible to allow for deviations from planned lessons.
- Supporting teachers to implement inquiry-based learning requires a greater use of professional networks, including collaboration with other teachers, working with the informal sector and working with researchers on new methods, materials and topics.

THE FINAL CONFERENCE OF INSTEM – A SUCCESSFUL FINISH OF A SUCCESSFUL PROJECT

The third annual conference of INSTEM took place from 17th to 18th June 2015 in Freiburg. 95 participants representing various fields of education came together to share knowledge and experience gained in educational projects (funded by the FP 7 as well as the Comenius programme). The aim of this conference was to ensure exploitation in partner countries. Also it was the aim of the conference to ensure exploitation beyond partnership countries through a widespread dissemination of possible models of exploitation and by encouraging participants to actively seek for similar models in their countries.

The first conference day

The introductory speech of the conference was held by Peter Gray who gave the participants an overview of the state of the art in mathematics and science education in Europe and provided insights in Instem conclusions on how to bridge the gap between research, practise and policy

Instem coordinator Katja Maaß focused on successful implementation of inquiry based teaching on a daily basis. Showing the audience some examples, she successfully outlined the possibilities of changing a rigid daily classroom routine into an interesting inquiry based lesson. The examples she used were developed by the Mascil and Primas projects which both focus on linking theory, practice and real world scenarios, particularly by using examples from the world of work.



Afterwards, the two projects Fibonacci and INQUIRE and the ZELF (a centre for teacher professional development) together provided information about project dissemination strategies. In their presentations Dan Sporea (Fibonacci), Beate Epting (ZELF) and Suzanne Kapelari (INQUIRE) addressed the question of how important dissemination is for the implementation of project knowledge and outcomes. This question was raised during the second INSTEM conference (see respective report; <http://instem.tibs.at/node/24#reports>) and in the INSTEM Synthesis Report. The projects' strategies included pupil involvement, teacher training, collaboration with

teacher education, newsletters, flyers, tandem collaborations and workshops in order to enhance teacher understanding of IBSE.

The first conference day continued with a remarkable show-and-tell session of ten different projects which again addressed different dissemination strategies. Afterwards the conference participants had the great possibility to get an "interactive" insight into the different projects while meeting the projects' representatives at the "market of possibilities". The fair-like setting enabled communication, hands on testing of teaching materials, exchange of information and discussions on STEM education and innovation.

The participants of these workshops were invited to join a market of possibilities of the INSTEM conference and engage in discussions with the conference participants. This allowed for a broader variety of people to exchange their thoughts and findings on STEM education.

The second conference day

The second conference day started off with three project presentations by Peter van Marion (SUN), Francesco Cuomo (Traces) and Gültekin Çakmakçı (Mascil), which provided further information on factors which are crucial for a sustainable project implementation.

All three presentations emphasised the importance of collaboration between research and teachers in order to facilitate change and implement project knowledge. Moreover, they highlighted that teachers need communities of practice and professional development, such as teacher training e.g. workshops as in Mascil, in order to implement innovative teaching methods in schools.



After the conference, the participants were invited to visit two German schools (organised by the INSTEM partner institution Walther-Rathenau Gewerbeschule), a lower secondary school and a vocational school. For the conference guest this was a rare and well received opportunity to look inside the German educational system. As can be seen in the images on this page, the guests were given a tour and engaged in discussions about STEM education with the local representatives/teachers.

To summarise, the third international INSTEM conference was well received and offered a great opportunity for all participants, as well as the participants of the mascil workshops, to exchange their experience and knowledge, to learn from each other and particularly to reflect on successful dissemination concepts of innovative science education. “The final conference was a big success! Face to face discussions really help understanding and inform my own perspective and practice. I was able to gather a better understanding of the IBST concept and implementation strategies which I then shared with my own colleagues” (Statement of a participant of the final INSTEM conference). For further information on the conference please have a look at the third conference report (<http://instem.tibs.at/sites/instem.tibs.at/files/upload/INSTEM%203rd%20conference.pdf>).

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