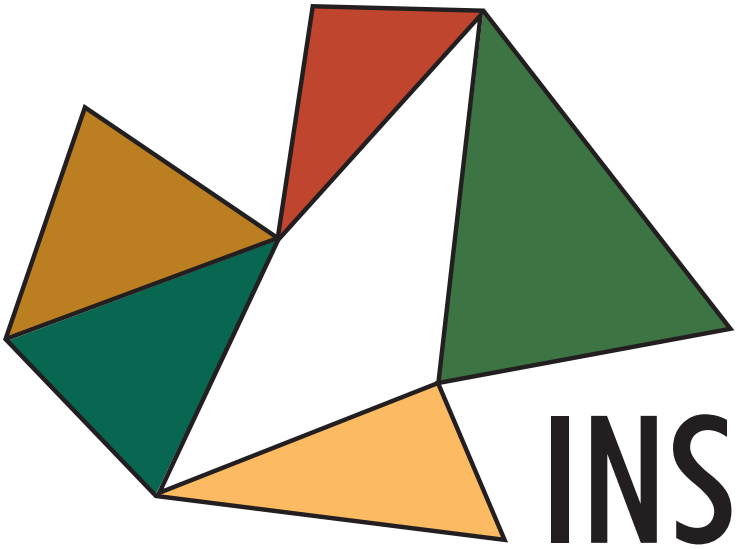

INSTEM

Innovation Networks in Science, Technology, Engineering & Mathematics

INSTEM State of the Art Report

A state of the art report based on an analysis of EC funded inquiry-based learning (IBSE) educational innovation including inquiry-based teaching, gender issues, science career information and on the exploitation of project knowledge beyond the lifetime of projects across the partnership nations.

Executive Summary

Our work demonstrated that a great deal has been achieved to support teachers to develop inquiry-based learning pedagogies throughout Europe. Various resources and support measures such as teaching materials, professional development courses for teachers or support for professional development facilitators - just to mention a few - were developed and made available. However a number of key aspects still remain unresolved. Consequently recommendations were derived from our findings; these are based on the specific projects reviewed but also have wider applicability.

INSTEM Recommendations

Recommendation 1:
There is a need to identify a travel plan for the European learning journey in relation to education until 2050 (or at the 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.)

Recommendation 2:
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.

Recommendation 3:
In order to engage the range of societal actors involved, there is a need for greater synchronisation between policies and actions in primary, post primary and the tertiary sector, and across funding programmes.

Recommendation 4:
Children, as scientists of the future, will have to find interdisciplinary solutions to societal challenges. In order for them to see science in everyday life, and potential career opportunities, they need to be able to see science as inter-connected branches of learning and not as separate linear lines of learning.

Recommendation 5:
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.

Recommendation 6:
A more open interpretation of 'innovation' would support the development of a science-literate society, benefitting educational and career opportunities, social entrepreneurism and creativity.

Recommendation 7:
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.

Recommendation 8:
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.

Recommendation 9:
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.

Recommendation 10:
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.

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International Centre for Excellence in Educational Opportunities University of Liverpool, UK
August 2013

WP5 State of the Art Report:
INSTEM: Innovation Networks in Science, Technology, Engineering & Mathematics (2011-2015)
Comenius Network:
527333-LLP-1-2012-1-DE-Comenius-CNW

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Contents

Introduction

Over the past decade multiple inquiry-based learning (IBSE) projects funded by the European Commission have galvanized advocacy for science education as a direct response of the need to change our educational provision, in order to address the growing societal challenges that we face. For some there was also a desire to increase inclusiveness but this was not the primary driver for much of the work, which focused on the promotion of science through experiential teaching methodology.

To identify the long-term impact and sustainability of project outcomes, an analysis of the current state-of-the-art within the INSTEM eight partner countries was conducted. The report provides a previously unavailable picture of inquiry based science education within eight different EU countries (including two regions within one country) and establishes recommendations for achieving future progress.

The following report is based primarily on document reviews and interviews. According to cultural conventions an analysis was carried out in every INSTEM partnership country/ region. The goals of our research were to:

- Investigate the current situation on educational innovation (including inquiry-based teaching, gender issues and science career information);
- Explore how and to what extent project knowledge is used (analysis based on text reviews, interviews, according to cultural conventions);
- Identify the relevant key actors to address during the project to ensure that the results are used and acted on.

This INSTEM report is based on the knowledge gathered from inquiry-based learning (IBSE) projects funded by the European Commission since 2007. The major focus of this report is on the long-term impact and sustainability of project outcomes and it is hoped that these will assist in the clarification of objectives for future project funding at European, national and regional levels.

What is inquiry-based science education? Inquiry is an approach to learning that involves a process of exploring the natural or material world. The process leads to asking questions and making discoveries in the search for new understandings. Inquiry-based science education shares several features with the practice of doing real science.

Founded on the inductive approach to teaching, inquiry-based science education was developed in the 1960s, in the context of the discovery learning movement. In European policies about education, the Rocard Report (2007) supports the reversal of school science-teaching pedagogy from mainly deductive to inquiry-based methods, as a means to increase interest in science. Similar governmental policies or non-governmental pedagogical movements can be found all around the world.

Our research demonstrated that a great deal has been achieved to support teachers to develop inquiry-based learning pedagogies throughout Europe. Various resources and support measures such as teaching materials, professional development courses

for teachers or support for professional development facilitators - just to mention a few - were developed and made available. But a number of key aspects still remain unresolved. Consequently recommendations were derived from our findings; these are based on the specific projects reviewed but also have wider applicability.

A striking feature of the analysis was the absence of children's voices. As the purpose of inquiry-based learning is to enable children to engage with science, at the very heart of this process must be the learning of the child. This raises the very fundamental question as to what do the children themselves think? What are their views on IBSE compared to more traditional teaching methods? What do they think they are learning about science? Do children from different countries think differently about IBSE? There are many more questions of this nature.

Another outstanding feature of the analysis was around the lack of teacher confidence. This should not be interpreted, in any way, as a criticism of teachers, but more of recognition of the very difficult job that they undertake on behalf of society. Most of the projects sought the views and opinions of teachers; however for a variety of reasons the voices of teachers are not clearly audible in the project findings. This appears to be directly linked to the fact that teachers are not being supported by their current education systems to engage with and embrace an inquiry-based teaching methodology, that many welcomed in principle.

A key factor in terms of sustainability of project outcomes was the relationship between European level recommendations and national/regional policy contexts.

These IBSE projects were all funded by the European Commission; however educational policy is devised and implemented at national (regional) level. In order for EC funded project findings to be disseminated in such way that they have a long-term impact, then this lack of relationship has to be addressed.

Without this, it is difficult to see how European funded IBSE projects can actually lead to systemic change at school level.

The eight areas for reflection:

This report highlights eight specific areas for reflection, and identifies, as far as possible, the affiliation of these areas across all the project findings. Four of the areas highlighted, are the aspects that have most commonality between all the projects.

The remaining four identify features, which with hindsight can now be seen to be missing from most project design, delivery and dissemination. Pendulums have been created to provide a visual representation of the various areas of reflection. These are at a pan European level and are drawn from the range of projects reviewed.

Pendulums have been created to provide a visual representation of the various areas of reflection. These are at a pan European level and are drawn from our subjective perspective based upon the range of projects reviewed, an analysis of relevant documents and a number of interviews conducted with national experts, EU project managers and coordinators, heads of science, and teachers in different European countries. Although these numbers are subjective, the different scores are relative to each other and they build up a visual comparison between the aspects discussed.

Area 1:
In order for inquiry-based activities to be successfully implemented in the classroom, they have to be directly linked to national (regional) curriculum developments.

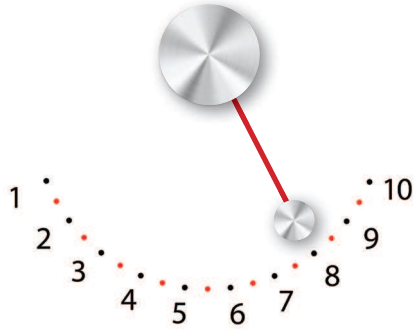
The obligation of meeting national curriculum requirements and ministerial constraints was one of the main concerns and drivers within all the IBSE projects.

Teachers consistently reported that unless IBSE activities are integral to the classroom curriculum, they will encounter resistance in the undertaking of new practices of teaching. However, the implementation of IBSE activities, by their very nature, requires a change in the practices of the teachers and the culture of the schools involved.

It is very difficult for teachers to develop IBSE activities if there is a tension between this and the priorities of the school, specifically when linked to national (regional) policy decisions and priorities.

The successful implementation and influence of EU project activities is therefore dependent on the relationship with national/regional curriculum requirement.

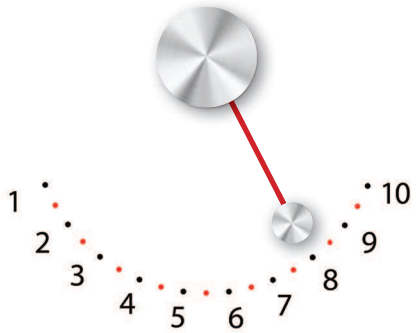
1.1 Curriculum requirements:
Based on the EC funded projects analysed, this pendulum shows to what extent the implementation of IBSE, to be successful, needs to be directly linked to national/ regional curriculum requirements.



(0 is to a small extent and 10 is to a large extent)

"Curriculum specification presents a major design challenge and its implementation requires support, this is particularly important when curriculum change is desired. It is unlikely that curriculum change will occur, even if specifications are redesigned and clearly communicated." (PRIMAS: Policy Report Page 7)

1.2 Delivery practices:
Based on the EC funded projects analysed, this pendulum shows to what extent the implementation of IBSE, to be successful, needs to be directly linked to national/ regional delivery practices.



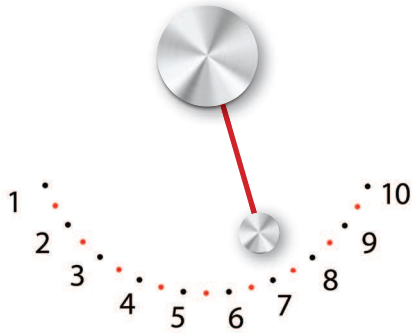
"...such activities need to be supported by specially trained staff, and integrated with school-based learning to ensure that students are able to make connections between experiences and thus construct clear understandings of scientific phenomena." (PENCIL: Deliverable 31-findings-recommendations, page 4.3.ii)

Area 2:
Teachers need to be supported in their implementation of inquiry-based learning in the classroom and this requires provision in both initial teacher training and continuous professional development for teachers.

Projects consistently identified lack of support for the development of the professional skills of teachers to specifically implement IBSE. This included initial teacher training as well as continuing professional development (CPD). Teachers frequently reported inadequate preparation to equip them to carry out new and experimental teaching practices.

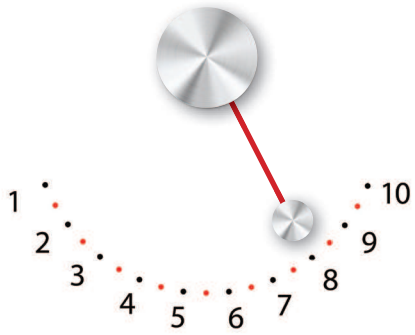
The importance of meeting teachers' needs and expectations was highlighted by many projects. The opportunity for both initial teacher training and CPD was also linked to national policies and funding. For example some countries supported teacher participation in CPD by making it mandatory and funding classroom cover, in other countries involvement with professional development was optional and not supported financially at all.

2.1 Initial teacher training:
Based on the EC funded projects analysed, this pendulum shows to what extent the implementation of IBSE, to be successful, needs to be directly linked to the provision of a good initial teacher training.



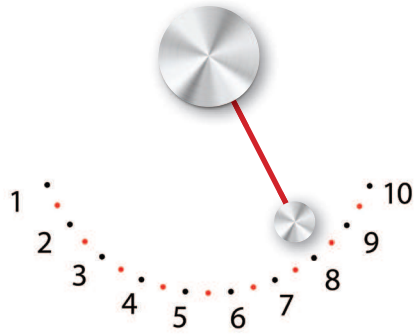
''There are a few difficulties to be faced when putting inquiry-based science education into practice in school. According to the opinion of colleagues, the most critical difficulties are: lack of teacher competence (Initial training) in inquiry based science education; teacher concerns that they could fail by doing something new.'' (PROFILES: Book final, October 2012, page 14)

2.2 Continuous professional development:
Based on the EC funded projects analysed, this pendulum shows to what extent the implementation of IBSE, to be successful, needs to be directly linked to the provision of adequate continuous professional development for teachers.



"The teacher is the paramount factor in educational success…. The quality of an education system depends ultimately on the quality of its teachers." (Sir John Halman, Scientix Conference, May 2011, Brussels)

2.3 Other kinds of support (e.g. support from project managers and coordinators):
Based on the EC funded projects analysed, this pendulum shows to what extent the implementation of IBSE, to be successful, needs to be directly linked to the provision of other kinds of support.



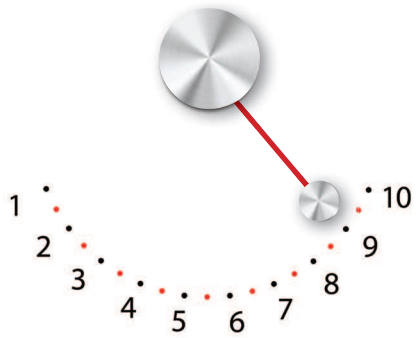
"Continuous support and training: Professional development: it is necessary to provide continued follow-up, support and pressure, because, even with a high quality initial training, change will occur mainly after implementation takes place and evidence of improved students' learning outcomes is perceived." (PRIMAS: International Guide, Professional development providers, page 35)

Area 3:
There is a direct link between successful implementation of inquiry-based learning programmes and the confidence of the teacher in their classroom delivery.

The successful implementation of IBSE within the classroom was improved when the teachers had confidence in their own abilities, in the resources available and the recognition that this work was to the benefit of their pupils and the school. In order to develop and use innovative teaching practices in the classroom, teachers not only require support and resources, they also require a level of confidence in their professional practice.

This can be enhanced by appropriate support and in particular the development of a community of practice. This can be created within a school or through a network of teachers across schools and in partnership with higher education and others, e.g. museums. An aspect of the EC projects that was particularly welcomed by teachers was the opportunity to gain confidence by sharing ideas and approaches outside of the classroom.

3.1 Teacher confidence:
Based on the EC funded projects analysed, this pendulum shows to what extent the implementation of IBSE, to be successful, needs to be directly linked to the teacher confidence in carrying on IBSE activities.



''There are a few difficulties to be faced when putting inquiry-based science education into practice in school. According to the opinion of colleagues, the most critical difficulties are: lack of teacher competence (Initial training) in inquiry based science education; teacher concerns that they could fail by doing something new.'' (PROFILES: Book final, October 2012, page 14)

Area 4:
Effective use of classroom resources by teachers is dependent on their availability and is directly linked to classroom-based pressures e.g. pressure of time.

The successful implementation of IBSE appeared to be directly linked to the effective use of resources. "However, within the projects these were often limited and differed between countries. There was a combination of factors involved," with "Effective use of resources is based on a combination of factors," including: the specific training provided; the confidence of the teachers to deliver their curriculum through IBSE; the priority given to this, at both school level as well as regionally/nationally.

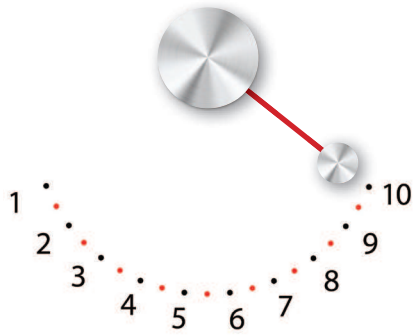
The attitude of teachers and their availability to show their initiative by taking up the

challenge of IBSE was directly related to the pressures that they experience in their working environment. These include tightly defined curricula, burdensome administration and bureaucracy, time pressures and lack of classroom cover etc. The implementation of an IBSE approach was assisted by the use of quality teaching materials, however; it was clear from the reports that the provision of resources alone was not sufficient to embed IBSE in classroom practice.

Note:
During the lifetime of these projects, technology has been developing exponentially and this includes its use within the classroom. Many of the projects developed practical classroom resources using technology. As the growth in technology, and its use in schools, will certainly continue and become more widespread, this needs to be reflected in future projects including the development of resources and materials for the classroom.

4.1 Effective use of resources:

Based on the EC funded projects analysed, this pendulum shows to what extent the implementation of IBSE, to be successful, needs to be directly linked to an effective use of resources by teachers, which is dependent on more than just their availability.



"This analysis was crucial in regards to our objective of providing teachers with materials which encourage them to implement interdisciplinary teaching in their day-to-day teaching, as it helped us from the very beginning to use teachers' actual needs as a basis for the design and production of materials." (COMPASS: Final Report, page 13)

Area 5:
The voices of teachers, as the main actors in the delivery of inquiry-based learning in the classroom, were not very audible within the reports.

The role of teachers in the successful implementation of IBSE is obviously critical. However within the projects examined, their perspectives and voices did not appear strongly represented.

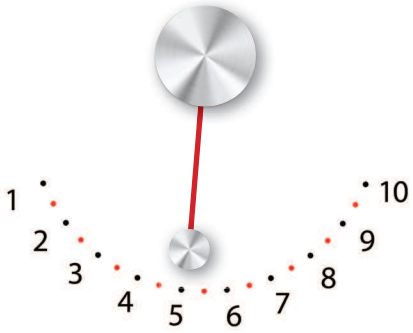
This included their opinions and judgements within the project design and delivery as well as the dissemination. By and large there was a lack of reporting of teachers' considerations, feelings and reactions to the teaching programmes in which they were involved. This was particularly noticeable in the dissemination of project findings.

However, it must be stated that some projects reported a desire to increase teachers' voices and these were represented separately in appendices. This report promotes the inclusion of the perspective of teachers as the key societal actors within the process of systemic changes required to implement IBSE within the classroom.

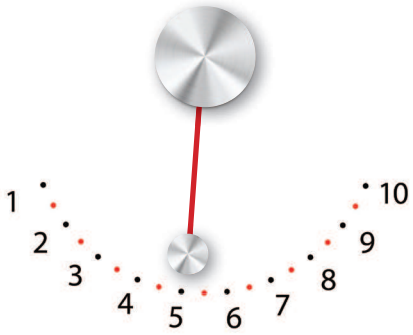
It must also be recognised that giving status to the role of teachers is a crucial first step,

however in order for them to be able to fully participate in future project development and delivery will require support to enable them to come out of the classroom.

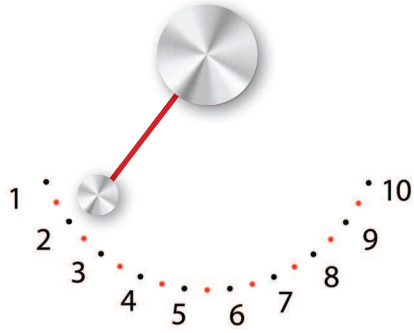
5.1 Within project design:
Based on the EC funded projects analysed, this pendulum shows to what extent teachers were directly involved in the design of the EC funded projects.



5.2 Within project delivery:
Based on the EC funded projects analysed, this pendulum shows to what extent teachers were directly involved in the delivery of the EC funded projects.



5.3 Within project dissemination:
Based on the EC funded projects analysed, this pendulum shows to what extent teachers were directly involved in the process of dissemination of the EC funded projects.



"A good example of societal actor involvement was the General Assembly of the FP7 ESTABLISH project which identified the stakeholders in second level science education as:

- *Teachers and teacher educators of science including science teacher networks;*
- *The scientific community, both local enterprises and multinational industry as well as the science research community;*
- *The students of science in second level schooling;*
- *The parents of the students mentioned previously;*
- *The policy makers in science at second level, including curriculum developers and assessment agencies;*
- *National science education researchers*
- *School Management"*

(ESTABLISH: Deliverable 2-2 delstakeholders, page 3)

Area 6:
Children are the beneficiaries of inquiry-based learning classroom provision, however their voices and perspectives were not reflected in the project reports.

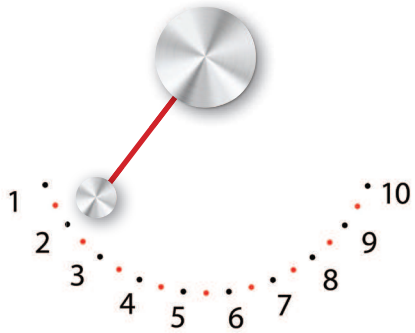
Very few of the projects included the voices and feedback of children. On the rare occasions that they are evidenced, the children are heard through the filter of teachers; for example children's feedback on what they felt during a particular IBSE activity is interpreted and then reported by the teacher. The focus of the projects was on the process of implementation of IBSE. The learning and experience of the children, from their perspective, was not reported.

The need to 'start young' was consistently welcomed within project activities, which is to be applauded. However the gender imbalances within science (girls) and education (boys) was not reflected. Boys and girls have very different approaches and attitudes to learning and specifically to science education, which starts at an early age, and this was not reflected in the projects.

Progression to higher education is directly linked to issues of social inclusion, with the key factors being where the child lives, the income of the family, gender and ethnicity. This report questions why the perspectives of children, particularly those from locally defined minorities, are absent from something that is fundamentally about their learning and future.

6.1 Voices of children:

Based on the EC funded projects analysed, this pendulum shows to what extent children voices' were heard and reported in the EC funded project reports.



"A child who is eleven years old in 2013 will be eighteen and eligible to vote in 2020. The majority of these children will spend the next seven years in the school system -but do we have any mechanisms in place to ensure that their dreams for the future are being included within the strategies and plans for 2020?" (SiS Catalyst; Children as Change Agents for Science and Society www.facebook.com/Siscatalyst, 12th August 2013)

Area 7:
The discussion about inquiry-based science education and the role of teachers and schools in the wider public engagement in science debate was mostly absent in project reports.

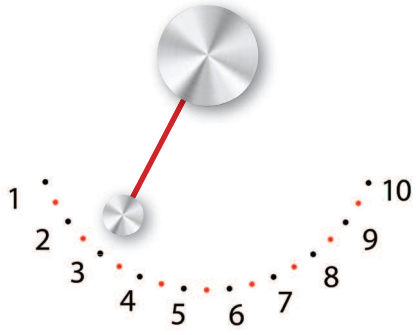
Scientific literacy and skills, will be required by our children for their future employment, as well as equipping them as societal actors working together to co-create cultural and economic growth. At the heart of this is the potential role of schools as stakeholders and intermediaries to the wider community for the public engagement in science. The responsibilities of parents and the

wider community, and their confidence and motivation in supporting children in experimental learning projects, is one that was not considered by the majority of projects.

This report questions the absence of the engagement by IBSE projects with their community through the development of public engagement in science as a driver for cultural changes in education. This in turn questions the role of schools within the process of the public engagement in science. Schools, as conduits to the wider community could be seen as an opportunity, but also be seen as an additional unfunded burden. Schools do not exist in isolation and their involvement as societal actors in a public engagement in science must be in partnership with the range of other actors, including the media, the higher education sector, the business and voluntary sectors as well as through European, national, or regional policies etc.

7.1 Role of schools in the public engagement in science:

Based on the EC funded projects analysed, this pendulum shows to what extent the role of schools in the public engagement with science was visible within the projects.



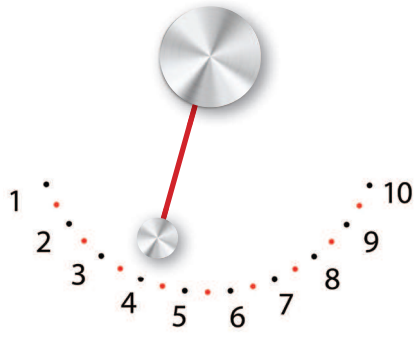
"The dialogue between science and the rest of society has never been more important. As the Europe 2020 Strategy makes clear, to overcome the current economic crisis we need to create a smarter, greener economy, where our prosperity will come from research and innovation. Science is the basis for a better future and the bedrock of a knowledge-based society and a healthy economy. After ten years of action at EU level to develop and promote the role of science in society, at least one thing is very clear: we can only find the right answers to the challenges we face by involving as many stakeholders as possible in the research and innovation process." (Máire Geoghgan-Quinn, European Commissioner for Research, Innovation and Science Odense, Denmark, 23-25 April 2012)

Area 8:
Project recommendations will not be implemented unless they are directly linked into national (regional) level policy developments.

Several projects analysed by this report have produced a series of recommendations to the European Commission on how to improve educational programmes through the implementation of IBSE practices. However, very few projects linked these recommendations to national (regional) policy development. The ownership of educational policy is at national (regional) level. Therefore in order for successful European funded project findings to have any long-term impact, they have to be directly linked to national (regional) policy development.

8.1 Linkages with national (regional) level policy developments:

Based on the EC funded projects analysed, this pendulum shows to what extent the links between project recommendations and national/regional policies were visible.



"According to the Lisbon treaties, the European Commission does not have power in education; projects won't feed into the national system unless they feed into national policies" (Luigi Berlinguer MEP (Italy), 3rd May 2012)

Conclusion

At the heart of all the projects we reviewed was the desire to maximise project findings and ensure a long term impact. However, the lifetimes of projects are often too short to realise substantive changes to educational systems, policies and practices. Projects, by definition, have a limited duration; therefore the long term impact cannot be seen within these timescales. We have had the opportunity to further develop and reflect on the thinking of this wealth of projects; with the specific focus of drawing out the elements for sustainability.

Through the contributions of many European partners and the participation of eight European partner countries (and two regions within one); this analysis primarily aims to provide an insight into the areas of commonalities and aspects that are missing from previous project design, delivery and dissemination. It also highlights what the major achievements have been within IBSE projects and where our focus needs to be in order to bring major improvements in future actions. We would propose that our findings also have a wider application to future European project funding principles.

Sustainability requires individuals to engage and embrace new concepts. This is a process of sowing seeds, and then nurturing and supporting their growth. In reality, this involves an ongoing collaboration between key players and the promotion of innovation and sharing of best practices. Within the IBSE projects, the method was the provision of initial and ongoing training and support for teachers, as well as the improvement of the infrastructure required for IBSE activities. More generally, sustainability will require the development of policies and practices driven by the shared values of society and engaging all the actors involved.

As well as highlighting major achievements, this report intends to suggest that a new approach of sustaining and disseminating IBSE could make inquiry based science education a driver for educational and societal changes.

This opportunity is more valuable, as it also comes at the right time to support the holistic approach of Horizon 2020, and the opportunity to build a more balanced relationship between a science-literate society and the scientific community.

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INSTEM: Innovation Networks in Science, Technology, Engineering & Mathematics (2011-2015)
Comenius Network:
527333-LLP-1-2012-1-DE-Comenius-CNW

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"We do not inherit the Earth from our ancestors; we borrow it from our children".

Appendix 1

INSTEM -
Innovation networks in STEM
http://instem.tibs.at/

Projects analysed in producing this report:

PRIMAS -
Promoting inquiry in Mathematics and science education across Europe
(FP7; University of Freiburg)
(2010-2013)
http://www.primas-project.eu/en/index.do

COMPASS -
Common problem solving strategies as links between mathematics and science
(LLP; Pädagogische Hochschule Freiburg)
(2009-2011)
http://compass.ph-freiburg.de/

LEMA -
Learning and Education in and through modelling and application
(Comenius; Pädagogische Hochschule Freiburg) (2006-2009)
http://www.lema-project.org

S-TEAM -
Science-Teacher Education Advanced Methods
(FP7; Norwegian University of Science & Technology) (2009-2012)
http://www.s-teamproject.eu/

TRACES -
Transformative research activities cultural diversity and education in science
(FP7; University of Naples Federico II)
(2010-2012)
http://www.traces-project.eu/

INQUIRE -
Inquiry-based teacher training for a sustainable future
(FP7; University of Innsbruck) (2012-2013)
http://www.inquirebotany.org/de

SAILS -
Strategies for Assessment of Inquiry Learning in Science
(FP7; Dublin City University) (2012-)
http://www.sails-project.eu/portal

FIBONACCI -
Disseminating Inquiry-based science and mathematics education in Europe
(FP7; La main à la pâte) (2010-2013)
http://www.fibonacci-project.eu/

CREATIVE LITTLE SCIENTISTS -
Enabling Creativity through Science and Mathematics in Preschool and First Years of Primary Education
(FP7; Ellinogermaniki Agogi) (2011- 2013)
http://www.creative-little-scientists.eu/

SIS CATALYST:
Children as Change Agents for Science and Society
(FP7; University of Liverpool) (2011-2014)
http://www.siscatalyst.eu/

PREDIL -
Promoting Equality in Digital Literacy
(LLP-Comenius; FORTH / IACM) (2008- 2010)
http://predil.iacm.forth.gr/project.php

PREMA 2:
Promoting Equality in Maths Achievement 2
(Comenius; FORTH / IACM) (2008)
http://prema2.iacm.forth.gr/main.php

STENCIL -
Science teaching European network for creativity and innovation in learning
(LLL-Comenius; Amitié srl) (2011-2014)
http://www.stencil-science.eu/

CARIPSIE -
Children as Researchers in Primary Schools in Europe (Comenius; Høgskolen i Bergen, Bergen, NO) (2007-2009)
http://prosjekt.hib.no/caripsie/

NTSE -
Nano Technology for Science Education
(LLL-KA3-ICT; Private Doga Education Institutions) (2011-2014)
http://www.ntse-nanotech.eu/

G@me -
Gender Awareness in Media Education
(Comenius; Amt für Lehrerbildung - AfL)
(2006-2009)
http://www.project-game.eu/

PENCIL
Permanent European Resource Centre for Informal Learning
(FP6, ECSITE)
2004/2007

Hands-on Science -
(Comenius network)
(Comenius; University of Minho) (2003)
http://www.hsci.info/

HEGESCO -
Higher Education as a Generator of Strategic Competences
(LLP; The University of Ljubljana) (2007-2009)
http://www.hegesco.org/

Open Science Resources
(E-ContentPlus; Ecsite)
(2009-2012)
http://www.opensciencesources.eu/

PATHWAY -
The pathway to Inquiry based science teaching
(FP7; University of Bayreuth) (2011-2014)
http://www.pathway-project.eu/

SECURE -
Science Education Curriculum Research
(FP7, 2010-2013)
http://www.secure-project.eu/

PROFILES -
Professional reflection oriented focus on Inquiry-based learning and Education through science
(FP7, Freie Universitat Berlin)
http://www.profiles-project.eu/

ESTABLISH -
European Science and Technology in Action: Building Links with Industry, Schools and Home
(FP7, Dublin City University)
2010/2013
http://www.establish-fp7.eu/

The project INSTEM has received funding from the European Union LIFELONG LEARNING Programme (2012-2015) under Grant Agreement n° 2012 -4827 / 001 - 001. The report only reflects the author's - the INSTEM consortium - views. The European Union is not liable for any use made of the information contained herein.