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Report on ISBE teacher education

SAILS
Strategies for Assessment of
Inquiry Learning in Science

D 4.1 Report on IBSE teacher education

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1. Introduction

In the first year of SAILS, partners selected suitable teacher education materials from those already developed in each country for use in Teacher Education Programmes for the “1st Teacher Cohort” depicted in Figure 1. This cohort consisted of teachers from each country that had diverse experiences of IBSE and these first programmes focused on the pedagogy itself and on implementing inquiry based activities in the classroom. The initial assessment frameworks/instruments have now been prepared and will be embedded within the professional development programmes. Therefore, the continued teacher education of the “1st Teacher Cohort” will include further training in the assessment materials and these teachers will further trial and evaluate assessment frameworks/instruments in their implementation of IBSE. In parallel with this, a new cohort of teachers (“2nd Teacher Cohort” in Figure 1) will begin their teacher education programmes in IBSE that will now include some of these assessment frameworks/instruments within the IBSE teaching and learning materials.

In year three of SAILS, the first cohort of teachers will be supported in implementing all of the IBSE assessment frameworks/instruments developed and piloted, in conjunction with the second teacher cohort. A new cohort of teachers (“3rd Teacher Cohort”) will begin training with IBSE units with fully integrated assessment frameworks. In this way, by the end of year three of SAILS, the developed IBSE assessment frameworks will be embedded within all SAILS IBSE teacher education programmes and will be associated with particular science teaching and learning resources. It is envisaged that at this stage, the SAILS teachers will not only have the skills and competences to be able to teach through IBSE, but also to include assessment of IBSE skills and competencies as part of their classroom practices. This essential activity is a key feature of the teacher professional development programmes which will provide teachers with the opportunity to develop their own IBSE materials and assessment instruments, as it is only when they do this activity that they demonstrate they have embraced this new methodology.

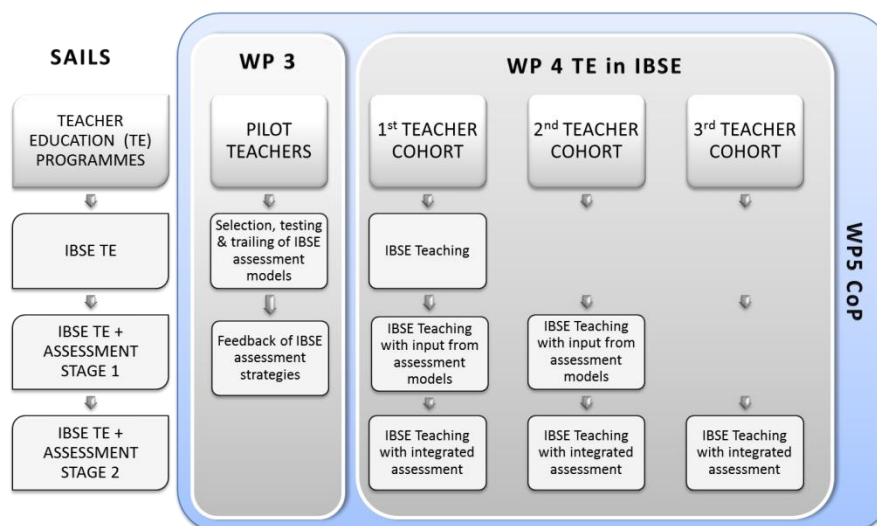


FIGURE 1 PLAN FOR TEACHER EDUCATION

This report provides details of the SAILS teacher education programmes in each country for the first cohort of teachers and the experiences gained from these programmes will inform the development and implementation of the next programmes for the 1st and 2nd Teacher Cohorts. Section 2 details the programme structure and composition in each partner country while the third section highlights the variation in the organisation of SAILS programmes and provides summary details of resources used, where they can be obtained and the languages these are available in.

2. Overview of SAILS First Teacher Cohort

Inquiry workshops have taken place between January 2012 and April 2013 in eleven of the partner countries. As ATiT are not teacher educators, they will not initially run teacher education programmes in Belgium. In the third year of the project, a SAILS CoP will be launched in Belgium and ATiT plan to run a number of SAILS master classes with the support of other partners.

This report outlines the structure and content of each of the countries' workshops. As teachers in each country have different prior experiences of IBSE, scope was given to each partner to develop and implement their own workshops in order to best meet the professional development needs of their teachers. The workshop descriptions are purposely written in a narrative style so that partners can share the detail of their approach to IBSE teacher education and provide information on the resources used. It is hoped that this report would be useful for others implementing IBSE teacher development programmes.

Table 1 shows the numbers of teachers, both in-service and pre-service that have participated in the SAILS teacher education programmes in the eleven SAILS countries. A total of 316 in-service teachers and 210 pre-service teachers have participated as the 1st Teacher Cohort for SAILS.

Country	In-service Teachers		Pre-service Teachers	
	Number of Participants	Total Number of workshop hours	Number of Participants	Total number of workshop hours
Denmark	6	12	13	6
	21	8		
Germany	28	21.5	13	4.5
Greece	20	5		
Hungary			10	32
Ireland	20	10	22	27
Poland	41	21	12	22.5
			21	11.25
Portugal	13	33	5	24
	39	25	4	12
Slovakia	30	12	40	24
Sweden	55	12		
Turkey	7	20		
United Kingdom	36	15	70	12
TOTAL	316	194.5	210	175.25

Table 1: Overview of teacher education workshops in 1st Cohort, indicating the number of participants and the total number of hours of each programme.

2.1 Denmark

Local context

The University of Southern Denmark has focused mainly on in-service teacher training at lower secondary level (grade 7 to 10). Pre-service teacher training for lower secondary school teachers is embedded within the University Colleges which are apart from the universities. Pre-service teacher training for upper secondary level teachers consists of a 5 ECTS course at the master level of their university study. After graduating, teachers become associated in a pedagogical training position before getting a permanent position as teachers. By tradition, the in-service teacher training at the upper-secondary schools is managed by unions for domain specific subject matters. Experience has shown that it is very difficult to get teachers at upper secondary school to attend pedagogical/didactical courses instead of content-specific courses.

IBSE resources

- Articles from a national research journal on science and mathematics education (MONA).
- SAILS CoP national website.

In-service teachers

Participants and Course format

	Course A	Course B
Number of participants	6	21
Subjects represented	bi/ che/phy	bi/ che/phy
Educational levels represented	Lower secondary level (grade 7 to 10)	Lower secondary level (grade 7 to 10) Upper secondary school (grade 10 to 12)
Course format	Workshops on midweek days after normal school days	Workshops on midweek days during and after normal school days
Number of workshops	4	1 (held twice)
Number of hours/workshop	3	4
Total Number of hours	12	4

Structure and content of in-service Course A

Workshop 1: Introduction to the method	The first workshop took place on September 13th. Here the teachers were introduced first to the SAILS project and the overall aim of the workshop series. Then an introduction to IBSE followed. Before attending the workshops, teachers read two articles from a national
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	<p>research journal on science and mathematics education (MONA). A presentation was given about how to think about teaching using an IBSE approach. We worked with implementing the theory from the articles into their own practices. Then the teachers worked in pairs with a small task without knowing that even though they were working with the same content they were given different questions; some were given open-ended while others were given closed questions. It was only with the presentation of the group work that the teachers realized this difference in questions. From there we had a fruitful discussion on how to ask questions that call for an IBSE approach in answering them. After this, a final discussion was held to ensure that teachers were prepared to create their first theoretical IBSE lesson.</p>
<p>Workshop 2: Working with the specific lesson plan</p>	<p>The second workshop took place a month later on October 25th. At this workshop, teachers presented the work they had done at home in preparing material for teaching sequences using IBSE as a working method. These prepared lessons were presented and discussed with the other participants. The participating teachers also handed in critique of the others' work and further development of the teaching sequences were proposed. Furthermore, there was a talk on how to see IBSE not as <i>the</i> tool but as <i>a</i> tool among others. From that followed a discussion on advantages and disadvantages in using IBSE. The aim of this discussion was to encourage teachers to reflect on their use of methods in their teaching so that they would be able to recognize topics and contexts suitable for using an IBSE approach.</p>
<p>Workshop 3: The iterative process</p>	<p>The third workshop was held another month later on November 22nd. When attending this workshop the teachers had tried out their inquiry lesson plan in the classroom. The main topic for this workshop was therefore to share their experiences of implementing IBSE. The teachers also discussed how to improve their lesson plans for further use. The workshop ended with a talk and discussion on observing other teachers practice. The teachers were then urged to inform the facilitator when they planned to use an IBSE approach in their teaching, in order to get video tapings of their teaching to discuss in the last workshop.</p>
<p>Workshop 4: Reporting experiences</p>	<p>The fourth and final workshop took place on March 14th. Here the experiences from the participating teachers were discussed and there was a follow up on how the teachers benefited from the workshop series and their confidence in using IBSE as an educational tool in science education. There was also a discussion of future workshops on IBSE. The participating teachers were very interested in a follow-up workshop where they could create and discuss more advanced ideas on how to use IBSE in their teaching.</p>

Evaluation of In-service Course A

During the fourth workshop, a discussion was held to determine the effectiveness of the workshop series. An interesting finding in this follow-up workshop was that two of the teachers had used IBSE as an approach to assess understanding of content knowledge. If the students were able to do the open inquiry task teachers took this as a sign of understanding the content prior worked with.

Comment on In-service Course A

The workshop series was offered as free in-service teacher education. The workshops were held in collaboration with the municipality of Svendborg and located at the local upper secondary school to encourage participation of upper secondary teachers. Twenty teachers were initially targeted, but only six attended. These six teachers have been very reliable and have attended all the workshops. Hopes are that this can be improved as the project develops. At the moment, discussions are being held with the regional University College to offer the same system of workshops during the next school year, but in collaboration with the University College as they have an extended network with teachers in the region. We are also considering working together with other Danish universities to propose a joint teacher education in IBSE.

Structure and content of in-service Course B

Workshop 1	Teachers had read literature on how to conduct IBSE teaching before hand. The literature was discussed and examples from their own teaching where put forward as input for the discussion. During the workshop teachers worked on assignments with different foci. The topic was the same, but the guidelines where formed as either open-ended or as closed questions. After a while, the teachers discussed the output of the assignment and the differences between the outlines.
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Evaluation of In-service Course B

There was a follow up discussion ending the workshop. The workshop was part of a longer in-service teacher training program, where the teachers could chose to develop materials within several frameworks, IBSE being one of them.

Comment on In-service Course B

As the teachers had to choose between several approaches to teaching, there has not been a specific focus on IBSE in the developing of materials. The materials developed within the framework of IBSE will be carried on to future participants in SAILS workshops.

Pre-service teachers

Participants and Course format

Number of participants	13
Subjects represented	bi/che/phy/math
Educational levels represented	Upper secondary school (grade 10 to 12)
Course format	Introduction during classes
Number of workshops	3
Number of hours/workshop	2
Total Number of Hours	6

Structure and content of pre-service workshops

Workshop	Students read literature on the IBSE approach and the principles were presented during an oral presentation. Afterwards the students worked on developing their own material within their subject areas
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Evaluation of pre-service workshops

The principles of IBSE were among the topics for an oral exam on a own-developed teaching session.

Comments on pre-service workshops

As this was pre-service teachers with minimum one year before graduating, we have no indications on whether the coming teachers will use IBSE as an approach in their future practice.

2.2 Germany

IBSE resources

- Articles and teaching units from former and running European IBSE projects, ESTABLISH and PRIMAS, that have been found on project pages and scientix.
- Articles and teaching units from former national projects including PIKO (physics in contexts) and ideas from publications in the field of science education.

In-service teachers

Participants and Course Format

Number of participants	28
Subjects represented	phy and science (plus a second subject)
Educational levels represented	Several years of teaching experience at lower and upper secondary level
Course format	One half day plus a 1.5 day workshops
Number of workshops	3 plus
Number of hours/workshop	4.5 h / 8.5 h
Total number of hours	21.5

Remarks: plus means that we will have more workshop in the next months

Structure and content of in-service workshops

Workshop 1 (Kick-off meeting)	<p>Experienced physics and science teachers from different schools, school types, and regions in Lower-Saxony took part in the 4.5 hour long kick-off meetings. Information about the aims of SAILS, the project implementation and project organization were given.</p> <p>In the first activity, the teacher dealt with one example unit for inquiry learning: the water-drop-experiment. This unit can be found in Höttecke (2010)². The lessons of this unit starts with the research question “How many water drops can be placed on a 5-Cent coin?”. The teachers made the central experiment themselves and used a number of experimental setups. Afterwards the whole group discussed at length various issues ranging from the elements of inquiry learning in this unit to the anchorage in the curriculum.</p> <p>A literature review about different views on the topic inquiry based science teaching was given followed by a second activity aiming at showing the spectrum of IBSE units in Europe. For this purpose the teacher rotated on different stations with materials and experiments. They studied several example units from different inquiry based learning projects like Establish or the former national project Physics in Context (piko).</p>
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² Höttecke, D. (2010). Forschend-entdeckender Unterricht. Unterricht Physik, Nr. 119, 21. Jg., p. 4-12.

	<p>In the last part of the meeting, the Community of Practice and the platform Scientix were introduced and the next workshops were sketched. Impressions, expectations and first ideas for the work in these workshops were collected.</p>
Workshop 2 (Exchange meeting)	<p>These workshops ran in March and April 2013 for one and a half day each. The main aim was the work on existing or new teaching materials in teams of science educators and science teachers. Some materials will be used in the teaching during the summer term. Improvements and adaptations for special situations will be made at follow-up meetings between August and October 2013.</p> <p>These workshops start with a report on first experiences with inquiry units in the own teaching from the kick-off meeting.</p> <p>In the first activity several units from IBSE in former und running European inquiry projects were presented. Especially units with a duration of one to three hours were chosen.</p> <p>The main part of this work was on improvements of different units for their own teaching under the perspective of inquiry based science teaching. This activity was divided into three periods distributed over the whole workshop.</p> <p>As a result of the kick-off meeting, the concepts of formative and summative assessment were introduced in a short presentation. Feedback in regular science lessons was also discussed.</p> <p>During the last part of the meeting the next steps in the SAILS project (materials, literature for the units, time schedule, etc.) was agreed upon and again an evaluation was made. A follow-up meeting (half-day) will be offered after the summer break, i.e. in August/September 2013.</p>

Pre-service teachers

Participants and Course Format

Number of participants	13
Subjects represented	phy (plus a second subject)
Educational levels represented	Referendare: master of education degree, short teaching experience mostly at lower secondary level (Grades 5-10)
Course format	Workshop (half-day)
Number of workshops	1 plus
Number of hours/workshop	4.5
Total Number of Hours	4.5

Structure and content of pre-service workshops

Workshop 1 (Kick-off meeting)	<p>This half-day workshop for pre-service teachers was similar to the kick-off meeting (workshop 1) for in-service teachers.</p> <p>Differences: A longer period of time was spent on the introduction of the ideas behind inquiry learning and assessment and the teachers had a shorter period of time for studying different example units of inquiry learning.</p> <p>A follow-up meeting with the instructors of teaching of these pre-service students was planned. In the meantime the pre-service teachers will work on the development of teaching materials and present their result after the summer break.</p>
Workshop 2 (Exchange meeting)	<p>In the follow-up meeting in August/September 2013 these pre-service teachers can report on their experiences with inquiry-based science</p>

Evaluations

We are using a one-page evaluation sheet with closed and open questions. In addition, we encourage open discussion about content and structure of the workshops. The evaluation is mainly for feedback purposes. For example, a special presentation on the topic formative and summative assessment was given during the second workshop at the request of many teachers.

The evaluation report has been very positive in general. For example, the introductory example unit (water drop experiment, see above) and the materials have been very appreciated. Some answers to the open questions show that the teachers liked to have time to work on units at the second workshop and some would like to have even longer workshop. They liked the atmosphere and the possibility to work with teacher from other schools. The teachers also expressed their wish to see more example inquiry based science teaching units that can be used in their own lessons and to know more about the assessment strategies in SAILS.

Comments

Since we are planning to work together with the teachers over a long period of time, the workshops have different content and activities. The period for the first cohort of teachers runs between summer 2012 and summer 2013, i.e. within the period of the German school year 2012/13. The participating teachers already made some trials between the kick-off meeting and the first exchange meeting. It seems that the structure of a half-day kick-off meeting and a long exchange meeting (1.5 days) is very fruitful.

There have been some workshops and another workshop is already scheduled (see above). Although place and date are not decided yet, there will be one or two follow-up workshop (second exchange meetings) for in-service teachers in summer.

Many of the teachers are already members in our Community of Practice. However, it is now time for us, science educators and teachers, to animate this platform with life. It is also planned to work with the in-service teachers of cohort 1 in the next school year and in parallel to cohort 2. Cohort 2 will have another distribution of teachers (in-service and pre-service). Particularly, we will work with pre-service teachers without a degree over fourteen weeks on the topic inquiry learning in the next academic year at LUH.

2.3 Greece

IBSE resources

- ESTABLISH and CoReflect projects
- Secondary Education Laboratory Centers for Physical Sciences – EKFE
- Resources published by the faculty of the Department of Science Education

In-service teachers

Participants and Course Format

Number of participants	20
Subjects represented	phy/che/bi
Educational levels represented	secondary and primary education
Course format	1 day workshop
Number of workshops	1
Number of hours/workshop	5
Total number of hours	5

Structure and content of workshops

Part 1	Theory of IBSE, explanation of how to do learning design with CADMOS tool & theory about assessment techniques
Part 2	Hands-on collaborative activities on designing IBSE
Part 3	Presentations and evaluation of IBSE scenarios

A SAILS workshop was organised in April 2013 and attended by 25 teachers (20 being high-school teachers and five primary-school teachers). All of them had good knowledge of learning-design techniques and had previously used learning-design tools like LAMS, MyUdutu, and Dialog Plus.

The workshop was carried out in three parts: At first students were informed about the IBSE method during a two hour lecture session as well as the concept of assessment techniques emphasizing on assessment rubrics. Examples of IBSE scenarios along with related examples of assessments were given. In the second phase, the students formed 12 teams and worked collaboratively for 3 hours.

Then the teachers were asked to:

1. create complex IBSE scenarios on various school subjects using a learning design tool called CADMOS.
2. design and submit items for the assessment of students' performance in the scenario they have created.

Finally at the end of the workshop, 12 IBSE scenarios along with the corresponding assessment items were presented and discussed.

Evaluations

The intention of the evaluation was to see if:

1. the approach followed helps teachers in designing IBSE scenarios and related assessment items and is accepted by the teachers-designers and can guide them when creating learning designs.
2. teachers feel that the approach followed provides them with all the elements needed in order to design their learning scenario and assessment items in an easy and simple manner.

When teachers submitted their designs, they were asked to answer a short online questionnaire comprised of eight closed and one open-ended question. The closed questions investigated whether the learning-design method enabled participants to model complete, pedagogically flexible, adaptable, and reusable IBSE scenarios that are accompanied by assessment items. The open-ended question aimed at getting feedback from the teachers about the organisation and the approach followed in the workshops.

Comments

The evaluation comments were positive. The majority of the participants (79%) were satisfied or very satisfied with the teaching approach followed, the IBSE examples given, and the CADMOS tool. All of them stated that the use of the tool was simple for creating IBSE learning scenarios that seem engaging and that could be accompanied by assessment rubrics. A very important finding was that everybody said that the process of designing an IBSE scenario and the accompanied assessment is straight forward. Most of the teams designed assessment rubrics with several indicators that intended to assess the autonomous and the team performance in an inquiry-learning process.

In the open-ended question, teachers commented that it would be very useful to have several ready-to-use design templates and examples of assessments for IBSE scenarios for various courses.

2.4 Hungary

IBSE resources

- materials from PRIMAS project (accredited 36 hours in-service teacher training programme).
- materials from TÁMOP project (accredited 2-year and 30 hours in-service teacher training programme).
- syllabi of the Institute of Education of the University of Szeged.

Pre-service teachers

Participants and Course Format

Number of participants	10
Subjects represented	Biology, Chemistry, Physics
Educational levels represented	Master
Course format	one-day intensive workshops
Number of workshops	4
Number of hours/workshop	8 hours
Total number of hours	32

Structure and content of workshops

Part 1	Theories of learning, Skills- and ability development (Teacher-training/Master's level)
Part 2	Topics discussed: <ul style="list-style-type: none"> - the current problems and questions of science education; - the role of IBSE method in science education; - example tasks analysed and discussed; - the role of IBSE in developing reasoning skills.

Evaluations

No specific evaluation was carried out with the pre-service teachers.

Comments

The workshops with the pre-service teachers took place in February and March 2013. The material and content of the workshops was the same in each case. The workshop with the in-service teachers will take place in September/October 2013.

2.5 Ireland

IBSE resources

- ESTABLISH project
- Institute of Inquiry material
- Resources developed by CASTeL staff

In-service teachers

Participants and Course Format

Number of participants	20
Subjects represented	phy/che/bio
Educational levels represented	Lower and upper secondary
Course format	2-day summer school
Number of workshops	1
Number of hours/workshop	12
Total number of hours	12

Structure and content of in-service workshops

<i>Introduction to inquiry</i>	<p>Initially, teachers were introduced to inquiry and the SAILS view of inquiry. A profile instrument was then completed to collect evidence of the teachers' attitudes to and understanding of IBSE. Teachers then carried out three small inquiry-based activities that focused on different types of inquiry (guided, structured, and open) and then discussed the learning opportunities that these three types of activities would provide for their students. In this way, the teachers acquired an understanding of the relative benefits of inquiry approaches.</p> <p>In detail:</p> <p>Using the SAP activity from the modified ESTABLISH unit "Exploring Holes", teachers experienced IBSE activities with different levels of inquiry. The particular focus here was to share opinions on the learning that can occur within each level depending on the problem set.</p> <p>The cycle of inquiry was then discussed and teachers carried out a number of small activities to focus on particular skills used in inquiry, e.g. hypothesis tests, making predictions, etc. to develop clear understanding of these terms.</p>
<i>Questioning skills and developing IBSE materials</i>	<p><i>Questioning to drive inquiry</i></p> <p>Using the ice balloons activity adapted from the Institute of Inquiry, teachers were asked to devise questions that they would like to determine answers to in terms of the ice balloons and some additional materials provided. Through a process of discussion, the questions generated could be separated into those that could be investigated and those that could not. Commonalities in the investigative questions were that action verbs were used. This activity was very powerful for teachers to help them to turn questions for students into those that could be better inquiry questions.</p> <p><i>Planning inquiry lesson/topic from curriculum</i></p> <p>Taking a particular topic, teachers discussed how to turn it into an inquiry lesson and then discussed how this could be implemented with their own classes.</p>
<i>Critiquing inquiry</i>	<p>Teachers shared experiences of inquiry lessons and discussed what is happening in an inquiry classroom. There was a discussion on the use of industrial links to</p>

resources	provide students with opportunities for authentic learning experiences. Teachers then critiqued examples of inquiry resources from the ESTABLISH project.
Teachers empowered to develop/adapt their own IBSE activities	<p>The “Subtle Shifts” activity adapted from the Institute of Inquiry was used to show teachers that making small changes to a particular lesson could dramatically change the focus of the learner from “following the recipe” to be actively involved in inquiry learning.</p> <p>Teachers then divided in school groups (or those who were about to teach a particular topic) and time was set aside for them to develop ideas for how they would teach a topic by inquiry. Teachers were asked to try implementing their plans in the classroom. They were encouraged to change even one small thing at a time in their teaching on the path towards inquiry.</p>

Evaluation of In-service Programme

At the beginning of the workshop, teachers were asked to complete a profile instrument which was designed to capture their attitude to and understanding of inquiry. The summer school teachers have now had six months to implement inquiry in their teaching and they have been asked to complete a post-workshop profile. This data is in the process of being collected and will be reported on at a later date. Interviews with selected teachers will also be carried out to gain a deeper insight into how the teachers have implemented elements of the workshop in their normal teaching practice. A short questionnaire designed to gather information on teachers views of the effectiveness of the different elements of the workshop was also used immediately after the workshop.

Teachers found that the workshop showed how they could implement an inquiry approach in the classroom and how to adapt traditional lessons into inquiry lessons. Other outcomes included learning more about questioning, the skills developed in students when they were taught through an inquiry approach and the different types of inquiry.

Most teachers felt the workshop increased their confidence with using an inquiry approach and made them more willing to use this approach in their teaching, while other teachers currently use inquiry in their teaching and gained new ideas.

Teachers found that the workshop provided them with new ideas to try out with their students. A number of teachers found that participation in the workshop encouraged them to increase the number of “student led” activities and encouraged them to reflect on the scientific skills developed in their students.

Areas suggested for inclusion for future workshops included incorporating elements of assessment of inquiry skills and an increased emphasis on adapting mandatory experiments (as set out by the curriculum) to incorporate inquiry.

Pre-service teachers

Participants and Course Format

Number of participants	22
Subjects represented	phy/chem/math
Educational levels represented	Lower and upper secondary
Course format	Weekly workshops

Number of workshops	9
Number of hours/workshop	3
Total number of hours	27

Structure and content of pre-service workshops

<i>Introduction to inquiry</i>	<p>DCU offers two undergraduate degrees for future science teachers with a concurrent model of science education where students study both science and pedagogy at the same time. Each group of pre-service students have a number of inquiry-based science modules. The following example describes a physics module that students take in the second year of their four-year course.</p> <p>In the first six weeks, the pre-service teachers are given a number of IBSE activities that they carry out and critique in terms of thinking behind the development of the activity and the inquiry content. For example, in the first week, students are given an open inquiry and a guided inquiry version of an investigation into the relationship between the angle of incidence and angle of reflection when laser light is incident on a plane mirror. Concepts such as accuracy, systematic error, making repeat measurements, determining the number of data points, etc, naturally emerge and can be discussed at a non-technical level. In the third week, students study two tutorial-type activities related to forces; these are purely thought experiments, which helps reinforce that inquiry is not just experimentation.</p>
<i>Critiquing inquiry activities</i>	<p>In week 4, the pre-service teachers critique a guided-inquiry version of an experiment leading up to students discovering Hooke's Law. This experiment builds on the tutorials from the previous week. In week 5, they carry out guided-inquiry experiments on basic electric circuits. Week 6 is predominantly a discussion session, where students propose and critique inquiry-based experiments for physics topics they may be teaching in the next three weeks during their School Placement.</p>
<i>Developing/adapting their own IBSE activities</i>	<p>Having taught for three weeks and having thus acquired their first experience of teaching, we ascertain students' views of inquiry both on paper and in the classroom by conducting small-group interviews. The final two weeks are assigned to the design of a small number of inquiry-based classes. Students must explain the thinking behind their teaching sequence and educational materials, and explicitly identify the inquiry elements.</p>

Evaluation of Pre-service Programme

Evaluation of the pre-service module took place in the form of a semi-structured interview. Students were interviewed in the groups they had worked on (consisting of 4-5 people). As the emphasis had been on students getting used to inquiry and bringing it to the classroom in their upcoming school placement, this is what the interview focused on.

It emerged from the interviews that students' views of the module were generally positive, and they felt that it had helped them understand what inquiry was about. Many still expressed doubts about implementing it in the classroom, most frequently citing time issues.

2.6 Poland

IBSE resources

Resources from:

- ESTABLISH project.
- Fibonacci Project.
- National core curriculum.

In-service teachers

Participants and Course Format

Number of participants	41
Subjects represented	bi/phy
Educational levels represented	lower & upper secondary school
Course format	winter school (completed 20-23.02.2013)
Number of workshops	1
Number of hours/workshop	28x45min
Total number of hours	21

Structure and content of in-service workshops

- Basics of constructivism and IBSE
- Self-assessment tool for science teachers working in IBSE methodology
- Inquiry approach to experiments
- Types of IBSE
- Laboratory and field classes
- Laboratory with data logging devices and other forms of ICT
- Plans of implementation IBSE in own practice
- Summary
- Evaluation

Evaluation of in-service workshops

An evaluation survey was used with the in-service teachers. The participants had to describe what elements of the training were: unknown, new, interesting, boring, useful, and useless. Additionally they were asked to comment on training issues: syllabus, form of realization, instructors and technical issues.

Basic analysis of survey indicates that methodology of IBSE is new and interesting for teachers. As the most useful part of training participants have chosen laboratory classes and integration of ICT with IBSE. As a drawback very intense schedule was pointed.

Comment on in-service workshops

The winter school took place on 20-23 February 2013 at the Jagiellonian University in Poland. Forty one biology and physics in-service teachers from different school types and regions in Poland participated. This event was combined with training for chemistry teachers organized by the ESTABLISH project. The training focused on the basics of IBSE. The second part of training is planned on February 2014 and will focus on assessment in IBSE.

Pre-service teachers

Participants and Course Format

	Course A	Course B
Number of participants	12	21
Subjects represented	physics	biology
Educational levels represented	lower & upper secondary school	lower & upper secondary school
Course format	physics - separate course	biology - included in subject didactics course
Number of workshops	15	3
Number of hours/workshop	2x45min	5x45min
Total number of hours	22.5 (30x45min)	11.25 (15x45min)

Structure and content of pre-service workshops

During the course a mixed approach of theoretical framework and practical IBSE workshops was introduced. Students learned about the basis of IBSE methodology, searched for traces of IBSE in a new science curriculum currently being implemented in Poland, learned how to use a self-assessment tool for science teachers working in IBSE methodology and an assessment tool in IBSE for CPD providers. Students participated in workshops prepared for IBSE methodology, based on new curriculum and ready-to-implement in school practice. Throughout the whole course, a discussion was triggered about feasibility for implementing IBSE in the reality of the Polish school system.

The students completed the course with their own proposals of one hour lessons in inquiry-based science, preferably choosing one of the topics proposed by pupils during interviews at school (if the student had got access to a class).

Evaluation of pre-service workshops

Evaluation of the pre-service module took place in the form of a semi-structured interview. As a final task students had to prepare lesson scenario that is based on IBSE. With the projects, students had to present their reflection on the course: what they have learned, what is the most difficult, what are their concerns and what elements should be extended during next the course.

Students' opinion on the course were generally positive and most of them felt that it had helped them understand what inquiry was about. Many still expressed doubts about implementing IBSE in the classroom, and pointed need of extended school practice.

Comment on pre-service workshops

The form or realization and number of hours for pre-service teachers' courses in biology and physics were significantly different. The difference resulted from the need to adjust the courses to the existing students' curriculum. Although both courses were successful, the advantage of 30 training sessions is noticeable. Extended time has allowed time to provide more examples and more self-practice of the participants, which seems to be a key element necessary for gaining confidence in using IBSE in the classroom.

2.7 Portugal

IBSE resources

- National research projects – *PACC* and *ILIT*.
- International Project *PARSEL*.
- Equipment for analysing the quality of the water.
- Articles from national and international research.
- Sails website - national CoP.

In-service teachers

Participants and Course Format

Number of participants	13	39
Subjects represented	bi, phy/che, nat. science	
Educational levels represented	Primary and Lower Secondary Levels	
Course format	Training course School in the Vegetable Garden: Science curriculum development	Training course 20 hours presence and 5 individual for proposal development = 25 hours Why is there so much talk about INQUIRY across Europe? A proposal to work with the science curriculum in the classroom. (Start in May 2013)
Number of workshops	1	5
Number of hours/workshop	33h	4h
Total number of hours	33	25
Main IBSE content	To support a curriculum development initiative, completely centered on the exploration of a garden, through IBSE activities and the integrated teaching of Science, Mathematics, History, Geography, and English.	Concept of Inquiry; Inquiry in classroom; Inquiry and assessment.

Structure of in-service workshops

Goals for IBSE inside and outside classroom:	<ul style="list-style-type: none"> • To promote the development of competencies for making teachers able to introduce science concepts in the early levels of education; • To promote the development of competencies needed to implement research and experimentation in science education, stimulating children's curiosity and interest in science.
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Goals for learning physics and chemistry in 3rd cycle of basic education:	<ul style="list-style-type: none"> • To promote awareness concerning the importance of selecting, adapting, and building IBSE tasks that contribute to student learning; • To develop the ability to analyse and interpret students' difficulties and students' quality of learning; • To encourage teachers to use developed IBSE tasks in their classrooms.
Goal for assessing learning through IBSE:	<ul style="list-style-type: none"> • To develop teachers' content knowledge concerning assessment of learning through IBSE.
School in the Vegetable Garden: Science curriculum development	<ul style="list-style-type: none"> • IBSE activities inside and outside the classroom (in the garden); • Use of a set of activities that enable students to achieve several stages: from the definition of a problem to the presentation of results; • Preparation and discussion, by trainees, of new proposals for activities to be carried out inside and outside the classroom (in the garden); • Analysis and discussion of the activities that are being performed by trainees.
<p>Why is there so much talk about INQUIRY across Europe? A proposal to work with the science curriculum in the classroom.</p> <p style="text-align: right;">Workshop 1</p> <p style="text-align: right;">Workshop 2</p> <p style="text-align: right;">Workshop 3</p> <p style="text-align: right;">Workshop 4</p> <p style="text-align: right;">Workshop 5</p>	<p>Discuss and take ownership of the concept of Inquiry; development and assessment of tasks centred on Inquiry.</p> <p>1– How does the Portuguese Physical and Natural Sciences Curriculum fits the European trends? 2– What kind of evaluation do teachers and students of Physical and Natural Sciences Curriculum? 3 - How are the natural sciences curricula treated in school textbooks? 4 – Inquiry: challenges of practice.</p> <p>1 – Inquiry, the concept and its importance at a national and international level. 2 – How a museum supports inquiry in science classes.</p> <p>1 – What are students supposed to know to become twenty-first-century literate citizens? 2 – How to create and develop classroom tasks based on three stages: contextualize, develop, and make decisions? 3 – Development of practical activities.</p> <p>1 – How to promote formative assess of inquiry tasks. 2 – What is the teacher's role in inquiry tasks? 3 – Development of practical activities.</p> <p>1 – Practical work: development of an activity, follow up/ discussion. 2 – Workshop evaluation.</p>

Evaluation of in-service workshops

- School in the Vegetable Garden: Science curriculum development.
- Why is there so much talk about INQUIRY across Europe? A proposal to work with the science curriculum in the classroom. Runs from May 29 to June 26

The evaluation that teachers have done of the workshop “School in the Vegetable Garden” and the impact that it had on their classroom practices were obtained through an individually written reflective report.

The analysis of the writings enabled us to conclude that the use of different contexts and scenarios to promote learning, becomes a factor that adds value to knowledge "almost dare to think that just the fact that get out of the classroom (...) is the first step in the adventure of meaningful learning ". Tasks promoted out of the classroom in the context of the vegetable garden allowed valuing small observations and lead students to question themselves.

Inquiry tasks led students "to think, to question and reflect on situations, (...) and solve everyday situations, allowing them to develop extremely valuable skills".

Teachers felt that these activities led students "to experience and live unique moments of pleasure and discovery" and that the workshop contributed very effectively to transfer these practices to the classroom in order to encourage children's interest in the research and experimentation. Teachers developed curriculum management activities and frequently resorted to interdisciplinary subjects.

In personal terms, teachers felt more motivated and somehow changed in their teaching practices. The workshop also allowed the exchange of experiences between teachers and collaborative work, which contributed to the promotion of a more critical and reflective action.

Comments on in-service workshops

The training courses for in-service teachers and pre-service teachers are offered for free. In-service teachers will have a diploma on concluding the course.

The training course “Why is there so much talk about INQUIRY across Europe? A proposal to work with the science curriculum in the classroom” will offer five workshops and we expect teachers to discuss and take ownership of the Inquiry concept; to share experiences focused on developing tasks centered on Inquiry; to discuss perspectives of formative assessment; to share experiences focused on assessment tasks and difficulties experienced in both developing and assessing Inquiry tasks.

Due to national constraints, the workshops initially proposed “IBSE inside and outside the classroom” and “Learning physics and chemistry in 3rd cycle of basic education” were replaced by the training course “Why is there so much talk about INQUIRY across Europe? A proposal to work with the science curriculum in the classroom”.

Pre-service teachers

Participants and Course Format

Number of participants	5		4
Subjects represented	Biology-Geology		Physics-Chemistry
Educational levels represented	Lower and Upper Secondary Levels		Lower and Upper Secondary Levels
Course format	Training programme Beach project	Training programme Lake project	Training programme Lake project
Number of workshops	1	1	1
Number of hours/workshop	12h	12h	12h
Total number of hours	12	12	12
Main IBSE content	<p>Creation of a didactic resource. By being involved in the creation of the didactic resource, it is expected that students improve their knowledge concerning IBSE as well as procedural competencies and critical reasoning.</p>		

Structure of pre-service workshops

Goals for IBSE inside and outside classroom:	<ul style="list-style-type: none"> To promote the development of competencies for making teachers able to introduce science concepts in the early levels of education; To promote the development of competencies needed to implement research and experimentation in science education, stimulating children's curiosity and interest in science.
Goals for learning physics and chemistry in 3rd cycle of basic education:	<ul style="list-style-type: none"> To promote awareness concerning the importance of selecting, adapting, and building IBSE tasks that contribute to student learning; To develop the ability to analyse and interpret students' difficulties and students' quality of learning; To encourage teachers to use developed IBSE tasks in their classrooms.
Goal for assessing learning through IBSE:	<ul style="list-style-type: none"> To develop teachers' content knowledge concerning assessment of learning through IBSE.
Beach project	<ul style="list-style-type: none"> Initial visit to the intertidal zone, for direct observation of the local; Search about organisms, environmental conditions, and geologic features that characterize the local as well as search about the human activity at that local and its impacts; Working in groups for creation of several activities for

	exploring the intertidal zone, according to different perspectives: biological, geological, and social (relationship with fishermen).
Lake project	<ul style="list-style-type: none"> • Search about some indicators concerning the quality of the water; • Research about physical, chemical, and biological conditions of the lake, which will involve laboratorial activities: <ul style="list-style-type: none"> ○ Water analysis, and ○ Identification of macro-invertebrates living in the lake. • Working in group for creation of several activities for exploring the lake, according to different perspectives: biological, physical, and chemical

Evaluation of pre-service workshops

- Beach project
- Lake project

These training sessions have been completed. Semi-structured interview were applied to students of Master in Biology Teaching – Pre-service teachers. Their answers allowed us to conclude the following:

The concept of Inquiry was developed in the classroom with their students. Using different problems, students explored texts, photographs, films, and relevant issues that led to the definition of the problem to investigate. Hypotheses were defined and experimental protocols were implemented that contributed, through the data analysis, to verify the hypotheses envisaged, through the manipulation and control of variables, with a critical and reflective attitude.

The development of Inquiry activities in the classroom promotes creativity, curiosity, independence, and ability to investigate nearby environment. The connection to the curriculum emerges due to the possibility of these tasks to promote the articulation with several subjects.

The strategies and actions taken by pre-service teachers to develop inquiry activities in the classroom with their students, paid special attention to preparation and careful monitoring of activities, implementation of strategies for motivating students to the themes and the moment of problem definition emerges as a key moment in the development of these activities.

The major difficulty in preparing activities of this nature concerns the issue of "time". Teachers considered that the development of these activities require more time in the classroom for students to appropriate concepts and procedures. The main difficulties encountered by teachers in relation to student achievement lies in the field of formulating hypotheses, and defining the experimental plan.

Teachers felt that involvement in these activities is beneficial to students and that autonomy and articulation of curriculum subjects have a positive impact on learning progress.

2.8 Slovakia

IBSE resources

Resources from:

- ESTABLISH project

In-service teachers

Participants and Course Format

Number of participants	30
Subjects represented	phy/che/bi/math
Educational levels represented	lower & upper secondary school
Course format	Training course
Number of workshops	1
Number of hours/workshop	12 hours
Total number of hours	12

Structure and content of in-service workshops

Introduction to inquiry	<ul style="list-style-type: none"> • Up-to-date science education problems • Active learning strategies • What is inquiry-based science education • Levels of inquiry • Inquiry in national curriculum • Benefits to learning
Experiencing inquiry	<ul style="list-style-type: none"> • Introduction to the selected topics from IBSE point of view (Sound, Disability, Exploring holes, Direct current electricity, Blood donation, Plastic and plastic waste) • Structure of teacher and classroom materials • Teacher in the role of a student carrying out inquiry activities
Teacher as developer	<ul style="list-style-type: none"> • How to implement inquiry activity in the classroom • Developing inquiry questioning skills • Teacher as a developer of inquiry activities • Evaluation of classroom experience

Evaluation of In-service workshops

Teachers' pre- and post-questionnaire about the IBSE as a teaching method.

Comments on in-service workshops

All of our in-service courses are organised with common introductory part for physics, chemistry, biology, and mathematics teachers. Practical teacher training of IBSE activities in the role of students during the course with follow-up verification in school practice (between course meetings) will be evaluated by pre- and post-questionnaire for both students and teachers. Our IBSE in-service teachers training course content is a part of the Ministry of Education certificated course.

Pre-service teachers

Participants and Course Format

Number of participants	40
Subjects represented	phy/che/bi/math
Educational levels represented	lower & upper secondary school
Course format	Lectures/seminars included in subject didactics + special subject: modern trends in education
Number of workshops	4
Number of hours/workshop	2 hours lecture/4 hours seminar per subject
Total number of hours	24

Structure and content of pre-service workshops

Introduction to inquiry	<ul style="list-style-type: none"> • Up-to-date science education problems • Active learning strategies • What is inquiry-based science education • Levels of inquiry • Inquiry in national curriculum • Benefits to learning
Experiencing inquiry	<ul style="list-style-type: none"> • Introduction to the selected topics from IBSE point of view (Sound, Disability, Exploring holes, Direct current electricity, Blood donation, Plastic and plastic waste) • Structure of teacher and classroom materials • Teacher in the role of a student carrying out inquiry activities
Teacher as developer	<ul style="list-style-type: none"> • Teacher as a developer of simple inquiry activities for a part of the lesson

Evaluation of pre-service workshops

Students' pre- and post-questionnaire about the inquiry activities.

Comments on pre-service workshops

For pre-service teachers we integrated IBSE topics into didactics courses (lectures + seminars) and also into special subject: Modern trends in chemistry education.

2.9 Sweden

IBSE resources

Resources from:

- ESTABLISH.
- national research project on socio-scientific issues (SISC).
- Rubrics from formative-assessment material (DiNO).

In-service teachers

Participants and Course Format

	Course- MAH	Course- HKR
Number of participants	25	30
Subjects represented	Biology, Chemistry, Physics	
Educational levels represented	Lower secondary school (year 6-9)	
Course format	Day-time workshops	
Number of workshops	3	
Number of hours/workshop	4	
Total number of hours	12	

Structure and content of in-service workshops

Workshop 1	<p>Introduction to IBSE: Possibilities and difficulties of working with IBSE, designing productive tasks, and research on IBSE. Participants get "homework": Trying out a simple IBSE task in their classrooms</p>
Workshop 2	<p>Follow-up from last workshop: questions and experiences from "homework". Discussion about assessing students' IBSE skills. Participants get "homework": collecting data on students' IBSE skills.</p>
Workshop 3	<p>Follow-up from last workshop: questions and experiences from "homework". Discussion about how to teach and assess communication skills in science education.</p>

Evaluations

The workshops were evaluated through a questionnaire during the last workshop.

Comments

It has not been possible to organize workshops with pre-service teachers during the spring semester. Such workshops are planned during the autumn in 2013.

2.10 Turkey

IBSE resources

- Resources from: Institute for Inquiry. <http://www.exploratorium.edu/ifi/>

In-service teachers

Participants and Course Format

Number of participants	7 science teachers and 2 support staff
Subjects represented	Physics, chemistry, biology
Educational levels represented	Lower and Upper secondary
Course format	Seminars, workshops
Number of workshops	10
Number of hours/workshop	Approx. 2 hours per workshop
Total number of hours	20

Structure and content of in-service workshops

1. seminar	Introduction of SAILS project to teachers.
1. workshop	Introduction of Inquiry Based Science Education (IBSE) and formative assessment to teachers. Sample activities.
2. workshop	Sample inquiry activities were given and discussed with teachers. Teachers were requested to try out some of the discussed activities in their classrooms.
3. workshop	Reflection of implemented activities. Further discussions on IBSE in a context.
4. workshop	Discussion of IBSE activity experiences. Further refining IBSE related concepts with teachers. Discussions on how to assess IBSE skills.
5. workshop	Teachers were requested to develop IBSE activity and get feedback from colleagues. Teachers suggested to use journals for assessment.
6. workshop	Teacher-developed activities were discussed and refined. Samples of student journals were discussed.
7. workshop	Teachers were encouraged to use activities developed by their colleagues in their classrooms and reflect on them.

8. workshop	Students' progression on IBSE skills were discussed. Use of rubrics for assessment and teaching purposes were discussed.
9. workshop	Assessment of IBSE skills further discussed. How to give feedback to students and how to improve their learning with assessment was discussed.
10. workshop	Use of rubrics together with journals was discussed.

Evaluations

No evaluations of these workshops were carried out.

Comments

We have taken a step-by-step approach in introducing IBSE to teachers. We followed the following sequence:

- 1- Asking questions
- 2- Determining variables
- 3- Formulating hypothesis
- 4- Designing and conducting an experiment
- 5- Recording data
- 6- Evaluating data
- 7- Writing a report

We also spent quite a bit of time in discussing how to implement assessment in a way that it would support learning. Participating teachers thought that using student journals and assessment rubrics seemed to be a better way of implementing assessment. Initially, we gave them a few IBSE activities and later they have developed some activities themselves. Teachers implemented IBSE activities and assessment techniques in an elective science course, which, they thought, made it easier for them to try new ways of teaching.

Our work and meetings will continue with the teachers after April 2013.

2.11 United Kingdom

IBSE resources

- ESTABLISH project materials
- INQUIRE project materials
- CASE materials
- AKSIS project materials
- Adaptations of ITE materials

In-service teachers

Participants and Course Format

Number of participants	16 (experts) + 20 (novice)
Subjects represented	Physics, chemistry, biology
Educational levels represented	Lower and Upper secondary
Course format	Workshop + in class trials
Number of workshops	5
Number of hours/workshop	3 hours
Total number of hours	15

Structure of in-service workshops

Workshop 1	Sharing of current ideas and working practices. Opportunity to look at new ideas and to trial and evaluate.
Workshop 2	Exploring what and how assessment can be done. Planning for trialling in classrooms
Workshop 3	Reporting on practicalities of trials and evaluating use in classroom.

Evaluations of in-service workshops

Evaluation was conducted through discussion in sessions and using a questionnaire.

Pre-service teachers

Participants and Course Format

Number of participants	70
Subjects represented	physics, chemistry, biology
Educational levels represented	Lower and Upper secondary
Course format	Workshops
Number of workshops	2
Number of hours/workshop	6 hours
Total number of hours	12

Structure of pre-service workshops

Workshop 1	Recognising skills and competency outcomes associated with IBL Science activities. Opportunity to look at new ideas and to trial and evaluate.
Workshop 2	Exploring what and how assessment can be done. Planning for trialling in classrooms Reporting on practicalities of trials and evaluating use in classroom..

Evaluations of pre- -service workshops

Evaluation was conducted through discussion in sessions and using a questionnaire.

3. Summary of SAILS First Teacher Cohort

3.1 Common features in the TPD programmes

In nearly all cases, the first component in the teacher education programmes is to provide a discussion about scientific inquiry and the different interpretations of inquiry. Activities are provided to allow teachers to experience inquiry as a student and teachers are provided with resources that they critique and discuss how they can implement and adapt these to meet the needs of the curriculum. After this teachers are encouraged to develop and trial their own inquiry lesson. The ability of teachers to develop their own resources is seen as a critical need in order to implement an inquiry approach. In some cases, where teachers are already experienced in inquiry practices workshops were focused on developing inquiry resources.

Teacher education programmes were provided to 316 in-service teachers across ten countries as shown in Table 2. The organisation of these programmes ranged from one-day workshops to an extended series of workshops, e.g. 10 two-hour sessions. The duration of the in-service teacher education programmes varied from 4 hours to 33 hours.

210 pre-service teachers in eight countries participated in this first cohort of teacher education programmes as shown in Table 3 and were implemented over 1-day to 15-day of workshops and ranged in total duration from 4.5 to 32 hours.

In most cases, partners conducted an evaluation of the in-service workshops using their own usual instruments and there was a wide variation in the methods and scope of these evaluations. These instruments will be further developed for use with teacher cohort two.

3.2 Inquiry resources used

Partners reported using IBSE from many of the large-scale FP7 funded IBSE projects, in addition to resources available from national projects and initiatives. Table 4 lists the projects utilised.

Project	Link	Available languages
ESTABLISH	www.establish-fp7.eu	CS, DE, EL, EN, ET, IT, NL, PL, SE, SK
PRIMAS	www.primas-project.eu/es/index.do	DE, EN, FR, NL
Fibonacci	fibonacci-project.eu/	EN
INQUIRE	www.inquirebotany.org/	BG, DE, EN, ES, FR, IT, NL, NO, PT, RU
Institute of Inquiry	www.exploratorium.edu/ifi/workshops/index.html	EN
MONA	www.ind.ku.dk/mona/abonnement/	DA
Physik in Kontext	www.physik.ph-ludwigsburg.de/piko/ ³	DE

Table 4: List of sources used by partners in SAILS IBSE Teacher Education Programmes.

Identification of each language is: BG – Bulgarian, CS - Czech, FR- French, DA- Danish, DE-German, EL- Greek, EN- English, ES – Spanish, ET-Estonian, IT- Italian, NL-Dutch, NO- Norwegian, PL- Polish, PT – Portuguese, RU – Russian, SE-Swedish and SK-Slovakian.

³ Duit, R. & Mikelskis-Seifert, S. (Ed). Physik im Kontext - Konzepte, Ideen, Materialien für effizienten Physikunterricht. Seelze: Friedrich Verlag, 2010.

Country	Number of Participants	Total number of hours	Number of hours per workshop										Details
			1	2	3	4	5	6	7	8	9	10	
Denmark	6	12	3	3	3	3							Workshops 1-3 at 1 month intervals and workshop 4 after 3 month interval
	21	8	4	4									One half-day workshop, repeated twice
Germany	28	21.5	4.5	8.5	8.5								One half-day workshop plus a 1.5 day workshop, repeated twice after 2/3 months
Greece	20	5	5										One-day workshop
Ireland	20	10	10										Two-day summer school
Poland	41	21	21										Four-day winter school
Portugal	13	33	33										Intensive training programme
	39	25	4	4	4	4	4						5 four-hour workshops and 5 hours supported online
Slovakia	30	12	12										Two-day training course
Sweden	55	12	4	4	4								Day-time workshops
Turkey	7	20	2	2	2	2	2	2	2	2	2	2	Series of seminars/workshops
United Kingdom	36	15	3	3	3	3	3						Series of workshops plus in-class trials
TOTAL	316	194.5											

Table 2: Overview of First Cohort of SAILS IBSE In-service Teacher Education Programmes.

Country	Number of Participants	Total number of hours	Number of hours per workshop															Course Format
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Denmark	13	6	2	2	2													Introduction during classes
Germany	13	4.5	4.5															Half-day workshop
Hungary	10	32	8	8	8	8												Series of one-day workshops
Ireland	22	27	3	3	3	3	3	3	3	3	3							Series of weekly workshops
Poland	12	22.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	Series of 15 workshops for Physics with 2x45min sessions
	21	11.25	3.75	3.75	3.75													Series of 3 workshops for Biology with 5x45min sessions
Portugal	5	24	12	12														Two 2-days training programmes
	4	12	12															One 2-days training programmes
Slovakia	40	24	2	4	2	4	2	4	2	4								Series of 2 hour lectures and 4 hour seminars per subject
United Kingdom	70	12	6	6														Two one-day workshops
TOTAL	210	175.25																

Table 3: Overview of First Cohort of SAILS IBSE Pre-serviceTeacher Education Programmes.

3.3 Next stage of SAILS Teacher Education

The initial SAILS assessment instruments have been piloted by teachers in partner countries and the evaluation of this implementation with teachers is reported in Deliverable 3.1. During the SAILS General Assembly meeting in May 2013, the results of this piloting were gathered and used to further develop these initial assessment instruments. The finalised versions of these instruments will be integrated into future teacher education programmes.

The continued teacher education of the “1st Teacher Cohort” will include further training in these assessment materials and these teachers will further trial and evaluate these assessment frameworks/instruments in their implementation of IBSE.

In parallel with this, a new cohort of teachers (“2nd Teacher Cohort”) will begin their teacher education programmes in IBSE that will now include some of these assessment frameworks/instruments embedded within the IBSE teaching and learning materials.