Welcome to the PROFILES-Newsletter Issue 03/2012

Table of contents

Editorial

Dear readers,

Looking back at app. two years of PROFILES, progress in all project areas can be seen. The first PROFILES conference has been organised and held in Berlin and the first PROFILES Book of invited presenters published (Bolte, C., Holbrook, J., & Rauch, F. (2012; eds.). Inquiry-based Science Education in Europe: Reflections from the PROFILES Project. Alpen-Adria-Universität Klagenfurt). Thanks to the commitment of our partners, newly developed or adapted PROFILES teaching modules were implemented in classes and spread out via networks, expanding in all PROFILES countries. Moreover, partners have started the third and last round of the "PROFILES International Curricular Delphi Study on Science Education" and the second round of continuous professional development courses (CPD).

Furthermore, we are happy to announce the accession of a new PROFILES member: the Karlstad University of Sweden. We cordially welcome you in the name of the PROFILES Consortium!

A major focus of this issue is the 1st PROFILES International Conference on Stakeholders' Views" held in Berlin in September 2012; we include highlights as well as reflections on the project. Another major focus in this issue are PROFILES modules; included here are the module design and layout, a module example from Ireland and the partner from Finland explains experiences with implementing a PROFILES module in class.

This issue also includes progress reports on networking within PROFILES as well as the status quo of the PROFILES Curricular Delphi Study.

Your PROFILES team

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1 Report on the 1st PROFILES International conference

1.1 Highlights of the 1st International PROFILES conference

by Konstanze Scheurer (Freie Universität Berlin, Germany) and Mira Dulle (Alpen-Adria-Universität Klagenfurt, Austria)

Vital exchange during the interactive poster session © Freie Universität Berlin

From the 24th until the 26th of September 2012 the first International PROFILES Conference on Stakeholders Views regarding Inquiry Based Science Education took place in Germany at the Freie Universität Berlin. We would like to express our gratitude to the team of the Freie Universität Berlin whose organization of the PROFILES conference had been very successful! Among the more than 100 participants not only project partners from 20 different PROFILES countries could be found but also colleagues from schools, school-administration and universities that were interested in Inquiry-Based Science Education (IBSE).

Top-class keynote speakers held presentations on selected topics. Peter Gray (Norwegian University of Science &Technology) examined the relevance of IBSE as well as current global developments considering this topic. Shirley Simon (University of London) gave a review on current indicators for Continuous Professional Development (CPD) for teachers, as well as an insight into the support of teacher ownership. Olaf Köller (IPN – Leibniz-Institut für die Pädagogik der Naturwissenschaften und Mathematik, Universität Kiel) gave a presentation on the promotion of scientific literacy in natural sciences. Moreover, he focused on the motivation of pupils as an educational goal and which conclusions could be drawn from empirical studies considering this topic.

In addition, the conference offered teachers a good possibility to “get on stage” themselves: Chrystalla Lymbouridou from Cyprus, Ilmars Rikmanis from Lativa as well as Funda Tunaboylu and Simge Akpullukcu from Turkey reported their experiences with PROFILES and discussed successful as well as problematic issues, which occurred during the course of PROFILES activities, with the audience.

An interactive poster session took place with a buffet including plenty of food and drinks for the conference participants. The posters, which had been created by teachers and partners beforehand, offered a selection of good-practice examples, practical experiences and results of researches considering natural

Lecture Hall © Freie Universität Berlin


Interactive Poster Session © Freie Universität Berlin

science education and Continuous Professional Development (CPD) for teachers, stimulated further discussions and gave suggestions for the implementation of PROFILES modules in classes. In the course of the poster session conference participants exchanged their experiences, knowledge and examples of using IBSE. This session was perceived as very enriching by the participants.

Further suggestions by the PROFILES work package leaders gave insights into results of current developments in the following areas: Stakeholder Involvement and the analyses considering the "PROFILES International Curricula Delphi-Study on Science Education" (Theresa Schulte & Claus Bolte); the creation of innovative learning environments (Jack Holbrook & Miia Rannikmae) as well as measures to support Continuous Professional Development (CPD) and to increase teacher ownership (Avi Hofstein, Dvora Katchevich & Rachel Mamlok-Naaman). Last but not least Franz Rauch pointed out how involvement of participants in the ISBE-Network could be improved.

In 10 parallel workshops, additional PROFILES-topics were elaborated in greater detail. In the light of the Bologna Process, Declan Kennedy from the University College Cork sought to elaborate the meaning of learning outcomes within PROFILES teaching modules.

Thomas Mühlenhoff and Vincent Schneider from the Freie Universität Berlin gave an insight into the statistical analyses of survey data via R-Commander, a software which is seen as very appropriate in analyzing data e.g. the PROFILES Delphi Study on Science Education or other data collected in the context of PROFILES (e.g. regarding students gains) or other interventions.

The project partners from Turkey, Finland and Cyprus showed examples how information and communication technology (ICT) can support PROFILES science teaching and learning via different programs and tools: e.g. including robotics in PROFILES modules (Bulent Cavas, Yasemin Ozdem & Pinar Cavas), using social software in pre-service teacher education (Sirpa Kärkkäinen, Anu Hartikainen-Ahia, Tuula Keinonen & Kari Sormunen) and including WebQuests as a focus for student learning via IBSE (Laura and Gabriel Gorghiu).

Peter Labudde from the University of Applied Sciences of Northwestern Switzerland (Deutsch: Fachhochschule Nordwestschweiz) identified an interdisciplinary Science-Technology-Society (STS) approach to science teaching in line with the PROFILES philosophy.

A focus on the development of classroom teaching modules meeting the intentions of PROFILES was highlighted by Jack Holbrook (ICASE), while Ingo Eilks (Universität Bremen), Rachel Mamlok-Naaman (Weizmann-Institute of Science, Israel) and Franz Rauch (Alpen-Adria-Universität Klagenfurt) focused on the potential of action research in overcoming issues so as to develop exemplary practices in the implementation of PROFILES teaching.

Josef Trna and Eva Trnova from the Masaryk University in the Czech Republic gave a


Workshop © Freie Universität Berlin

detailed input on the inclusion of experimentation within different levels of IBSE.

Avi Hofstein, Dvora Katchevich & Rachel Mamlok-Naaman (Weizmann Institute of Science, Israel), Franz Rauch (Alpen-Adria-Universität Klagenfurt) and Dace Namsone (University of Latvia) explained the need to establish evidence of teacher ownership and leadership which goes beyond levels of self-efficacy in utilizing PROFILES teaching modules.

Finally, the "external evaluator" Wolfgang Gräber as well as the "critical friend" Peter Childs presented their thoughts about ISBE, and in particular about the activities of the PROFILES project. The conference was rounded off by a very entertaining and instructive popular scientific evening presentation: The presentation entitled "Some like it hot" by Klaus Roth gave need-to-know-trivia about the history and botany of the chemistry of hot pepper.

Similar to the procedure of the whole conference also the final conference dinner offered a friendly atmosphere for the possibility of vivid discussions and exchanges of experiences between the participants.

All articles, keynotes, lectures, posters and workshops were published as a book. This book can be accessed via the internet: http://ius.uni-klu.ac.at/misc/profiles/articles/view/29

The overall feedback on the conference from organizers and guests was very good and participants stated that they are already looking forward to the next conference, which is going to take place at the end of August/ beginning of September 2014 in Berlin.

Conference Participants © Freie Universität Berlin

Lecture: "Some like it hot" © Freie Universität Berlin

1.2 Reflections on PROFILES

by Peter Childs (University of Limerick, Ireland)

Some strengths of PROFILES:

- The central role of CPD for teachers in the project.
- The role of teachers as equal partners with science educators.
- The focus on the development, testing and dissemination of exemplar materials.
- The emphasis on developing scientific literacy along with science.

This is supported by the recognition in many recent reports of the key role of the teacher in any education reform or innovation.

Should IBSE be the only show in town?

I have some concerns that since the Rocard Report (Rocard, 2007) the EC has decided to put all its science education eggs in one basket – inquiry-based science education (IBSE). This

report led to the EC making IBSE the major focus of its FP6 and FP7 Science and Society calls, which have led to dozens of projects which are focused on IBSE.[1]

The IBSE bandwagon has also been reinforced by the recommendations of the IAP International Conference: *Taking inquiry-based science education (IBSE) into secondary education* (IAP, 2010) and the report of ALLEA *A Renewal of science education across Europe* (ALLEA, 2012).Surely they must be right as the great and the good in European science education are all endorsing IBSE as ***the*** way to improve and develop school science education in the future. There is always a danger in education of following the latest fad and fashion to the exclusion of other approaches, often without a firm basis in evidence. The important question to ask is IBSE supported by the evidence? The answer seems to be no. The book *Visible Learning: A synthesis of over 800 meta-Analyses relating to achievement* by John Hattie presents the results of 800 meta-analysis of >50,000 studies of educational strategies involving >200 million children worldwide. Inquiry-based learning is well down the list of successful strategies (86th out of 138) and doesn't make it above his threshold Size Effect of 0.40. This result is stronger because it looks at the results of many studies across all levels of education and many subjects.

My question to PROFILES and other EC-funded IBSE projects: does the research evidence support us putting all our emphasis for improving school science education on IBSE when other educational strategies have been shown to be more effective in raising student achievement?

How much national impact does PROFILES have?

I don't know the answer to this question, which will vary from country to country in PROFILES, but I raise some issues.

a) Projects are run by enthusiasts for enthusiasts. This is a well-known fact that the people who get involved in science education projects are committed, keen and enthusiastic, whether they are science researchers or school teachers. When the current project is finished these people usually move on to some new project.
b) How much impact outside the project schools does PROFILES have? I don't know the answer but for any project to have a long-term impact it must escape from the confines of the project schools.
c) Is it a passing enthusiasm or a long-term feature of science education? Is IBSE just the latest fad (as I suggested above), with a limited lifetime, or will it become a major feature of European science education for the future? Should it be one amongst a set of useful science teaching strategies rather than the only one?
d) Danger of the impact being too local i.e. being confined only to the project schools and the project countries and not having any wider impact.
e) How does it relate to other FP7 projects in the same country? I know that in Ireland, as one example, there are several EC IBSE projects running (PROFILES, ESATABLISH and SAILS) and at least two other in negotiation (TEMI and Chain Reaction). What is the knowledge of each project among the others? Is there any collaboration or cooperation or sharing of results? Is each project just affecting their group of teachers and science educators, with only limited impact on the totality of science education in that country (or in Europe as a whole)?

[1] details of all science education projects are available on the Scientix website:http://www.scientix.eu/web/guest/home)

How can we ensure sustainability?

Sustainability refers to the development and continuance of a project after the funding stops. Too often when this happens, the enthusiastic science educators move on to a new project and the teachers go back to their old ways. There may be some fading remnants of the project but we cannot guarantee its sustainability or long-term viability or effect on the national education system.

We have to ask the question: 'How do we infect the education system permanently with the PROFILES virus?'

A key problem in sustainability is changing the existing education system in a country, and embedding new ideas within the system. There are a number of problems that make this difficult:

- Traditional, entrenched views (principals, teachers, inspectors, examiners).
- Constraints of the existing science curriculum.
- The examination and assessment strait-jacket.
- The time problem in schools.

Going back to my initial thoughts, the science teacher is the key (and the barrier) to change.

- How do we change a science teacher's existing practices, philosophy and mindset?
- In order to effect change a teacher must want to change or see the value of change in their school.
- Change takes time – 80 hours has been suggested as the time it takes to change someone's entrenched practice, and most CPD is shorter than this and often not sustained.

There is a gap between theory and practice, and between science education research and science teaching and learning (Childs, 2012). Bridging that gap is one of the key challenges to projects like PROFILES in making their work sustainable. As Yogi Berra famously said: *"In theory there is no difference between theory and practice. In practice there is."*

How do we measure the success of IBSE?

a) Should we be evaluating the success of PROFILES in each country separately?
b) How do we measure its success? **On teachers? On students? On the education system?**
c) Are we measuring the effect of PROFILES or the effect of the enthusiastic teacher?
d) Is the investment in IBSE across the EU good value for money and is it having any lasting impact on science education?

I don't have answers to these questions but I think they are important ones to ask. Maybe we should take a lesson from John Hattie and look for the Size Effect on student achievement as the measure of success of PROFILES.

How does PROFILES relate to the other EU projects?

My final question relates to the proliferation of IBSE projects in Europe, to the exclusion of other approaches to improving science education, and how they relate to each other.

- There are many EU FP7 projects in the area of IBSE, but:
- How do they relate to each other? Is there: Overlap? Duplication? Transfer between projects? Agreed ways of evaluating success?

Therefore, we need a meta-analysis of all the EC-funded IBSE projects to draw out general findings, identify best practice and best materials etc.

The ProCoNet and the new Comenius project, INSTEM, outlined at the PROFILES conference by Peter Gray, is a welcome initiative. We need a synthesis, a meta-analysis of all the IBSE projects to ensure all that money was not

wasted and that the effective methods and resources developed through the various projects are made available to everyone.

A final message

- In improving science education in Europe there is no single silver bullet that will solve all our problems.
- PROFILES is not 'the' answer – but we hope it is part of the answer.
- IBSE should only be one of the teaching approaches a science teacher can draw on in their practice, but not the only one.
- The EU needs to invest more widely in science education research and development, not just in IBSE.

At the end of the day, what teachers do is what matters most. I would like to close with a quotation from John Hattie.

Research suggests that *"visible teaching and learning occurs when learning is the explicit goal: when there is feedback given and sought and when there are active, passionate, and engaging people, including teachers, students, and peers participating in the art of learning."* (Hattie, 2009, p. 22)

I would like to make a final plea for all aspects of our teaching to be research-informed pedagogy; curriculum and assessment, and IBSE surely has some part, if not a major part, to play in this.

2 PROFILES Modules

2.1 Requirements of PROFILES Modules

by Jack Holbrook (ICASE, UK)

As PROFILES is a unique project, the teaching modules themselves are also unique. At least two modules from each partner will be translated and displayed at the main PROFILES website. Below aspects by which PROFILES project partners claim these modules are truly unique are put forward. The modules, in fact, meet 3 key criteria: format, structure and focus.

Format

The English version of each module, when made available on the main PROFILES website:

- Uses 'Arial' font for all written script (font size is also controlled for the various headings/main script etc. – see example)
- The front cover page includes the title (& picture if provided) on a grey background
- The heading and footer are of a standard design repeated on each page.
- Margins are generally uniform.

Structure

Each module has:

- a front coverpage (actually two sides which can be back-to-back if desired)
  - The 1st side of the coverpage usually includes: Title (diagram) on a grey background; simple summary of subject area and age level of students; abstract (highlighting the learning – certainly science concepts, but also other learning aspects); the various parts that make up the module (in a tabular format); the creator(s) or the adaptation of the module.

- The 2nd side of the coverpage gives information on: subject, student grade level, content coverage, competencies (learning) to be covered, prior learning expected, approximate number of lessons required. Also indicated is the major thrust of PROFILES using a standard text).

- a section specifically geared to students (Student Activities). This section includes: the scenario (a key aspect to provide a motivational beginning); student activities/tasks (these tasks are operational, but may also encompass questions to answer, etc.
- a section specifically geared to the teacher (Teaching Guide). This section is explicitly geared to providing guidance to the teacher in using the module in their teaching. The guidance can be in the form of a sequential teaching approach, lesson by lesson guidance with learning outcomes per lesson or giving reference to external guidance sources. Very important is that the guidance etc. is seen as suggestions (not mandatory) so that teacher amendment is possible.
- some form of guidance/strategy on assessment (feedback). Usually this is a separate section and give suggestions on how the learning associated with 'education through science' can be undertaken. It is expected that the assessment/feedback is not separated from the teaching (i.e. no teaching time is allotted for this) and hence the usual indicators relate to suggested formative assessment strategies which the teacher may wish to use.
- as an option, teacher notes are included as a final, separate section. The purpose of this is to give background information to teachers, experimental details (including apparatus/chemicals and sample results), references to consult and examples of worksheets, etc. which the teacher may find useful.

Focus

So what is new? The focus is very much related to ensuring a uniquely PROFILES module. In this regard, all modules:

- conform to a PROFILES 3 stage model. At its simplest level this is – teaching starts with a student motivational scenario (which needs to stimulate student involvement and lead to determining the degree of students' prior science learning in the area of relevance);
  teaching then builds on the first stage to develop the student science learning using IBSE (this may involve a wider conceptual science focus so that the learning, explicit to the module, can be interrelated to other prior learning where appropriate);
  the 3rd stage is interrelating the science to society and promote well-reasoned (appropriate use of science), justified decision making (in which society as well as science aspects interact) This part is to strengthening the science learning from merely 'having the ability to' to 'having the capability to' (in other situations).
- recognise that the modules promote science education and that science education is wider than just science content/concepts (although these are obviously an essential component of PROFILES learning). Thus the competencies, learning outcome and the assessment relate to 'education through science' and cover intellectual development, nature of science development, personal development as well as social development abilities (in line with a country's curriculum expectations).
- The goal of science education teaching is to enhance scientific literacy. Thus the IBSE is not solely at the structured level (students following worksheets and trying

to interpret findings). Promotion of 'higher order' conceptual scientific thinking, developing a full range of process skills (especially identification of the scientific problem, planning and risk assessment) are seen as important goals, especially for modules geared to the upper school.

- The foregoing clearly points to the importance of student feedback and hence written records, modelling, argumentation, as well as oral/PowerPoint presentations, are all seen as important in the development of communication skills – a generic learning aspect and hence integral to learning in science lessons.

2.2 Module Example: "Does it really give you Wings?" (Ireland)

This carefully designed, student motivational, module is targeted at transition year students in Ireland, aged 15-17 years. The activities allow students to work as a team in an investigative setting to examine the use of energy drinks in sports and exercise. It requires pupils to investigate the current popularity of both legal and illegal performance-enhancing aids in sport. The aim is then to use this information to evaluate energy drinks available on the market and design their own drink based on the information they have gathered. The module identifies three groups of students, arranged with set tasks. The groups can do all the tasks sequentially, or the class can be divided into groups at the discretion of the teacher e.g. group 1 – average ability pupils; group 2 – more able pupils; group 3 – high ability pupils.

Learning outcomes expected from the module: Students will be able to…	Explain the importance of each food type for the body
	Investigate the daily energy requirement of a sedentary individual compared to an athlete in training
	Investigate the different energy drinks and sports drinks commonly available. Contrast isotonic, hypertonic and hypotonic drinks
	Evaluate and design a sports drink
	Design and conduct an experiment to test the energy content of a range of sports and energy drinks
	Decide whether sports drinks are safe.
Curriculum content	Heat of combustion, use of bomb calorimeter to determine calorific value of foods
Anticipated time	5 lessons (á 80 minutes) Another class period can be allocated at the discretion of the teacher to allow for group presentation and overall feedback
Prior knowledge	The pupils will have examined the area of food and have laboratory experience. Many pupils will have knowledge of the topic from the media and be engaged in sporting activities
Initiating the teaching	The first 4 lines of the initiating scenario states "If I could give you a pill that would make you an Olympic champion - but also kill you in a year - would you take it?" This question was posed to competitive runners before an Olympic qualifying event by Dr. Gabe Mirlin. Shockingly, more than half of the athletes questioned responded saying they would take such a pill. For more information see the module: http://chemweb.ucc.ie/Pro2/learning.htm In this module, students work in teams to find out why people have turned

		to chemistry for sporting success. Students are invited to examine the energy drinks market and decide for themselves if it is all help or hype!
The specific tasks are	**Group 1**	To examine the various food groups and discuss which group is important for energy levels and performance. Investigate what is in energy drinks and sports drinks that draw athletes towards them.
	Group 2	From the information gathered could you design your own sports drink based on the scientific principles you have discovered along the way?
	Group 3	It is the job of your team to investigate the calorific or energy values of a variety of sports drinks. Which one would you rate as the best for sports performance? Can you conduct an experiment to test your theory on a group of your peers? A final decision making tasks for the students is to decide whether all or some sports drinks are safe.

2.3 Experiences from the implementation of a PROFILES module

by Jaana Vartiainen and Esko Väyrynen (Kontiolahti School, Finland)

7th graders were presented with a fictional net article which reported a situation of pollution in the home municipality: Drinking water of Kontiolahti polluted?

Figure 1. A fictional net article used in a scenario

Newspaper Karjalainen reported that water in the municipality of Kontiolahti is unsuitable for drinking and may even be dangerous. At the moment, the authorities do not know the source of the pollution. The municipality has set up a working group which strives to clarify the situation as soon as possible. Help has been asked from all possible organizations in the region. The task for students is to construct a piece of equipment which will extract the extra substances from the water, producing once again clean drinkable water for the inhabitants of the municipality.

After introducing the scenario of the polluted water, students planned different solutions to separate the soluble and insoluble parts of water. They worked at first in pairs, then in groups of four students. They discussed the alternatives, made compromises and pondered the difficulties of choice and combination. Figure 2 shows an example of students' solutions to clean water.

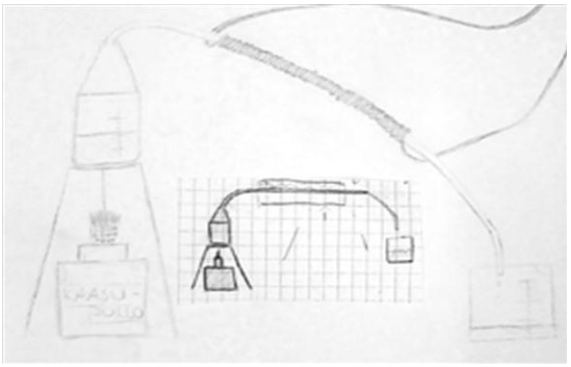

Figure 2. The students' plan for cleaning the water

Finally, students decided to test the equipment shown in Figure 3. They were not aware of the method needed, they only discussed the separation. Using this plan, the students purified water and learned to use the chemical concepts.

Students' experiences

Students enjoyed working independently, taking responsibility and planning themselves the equipment with which they could solve the water purification problem. They also perceived that their learning was improved because they had the possibility to think more for themselves. Students were very proud of their efforts and outputs.

Teachers' experiences

We experienced that during the process we had good opportunities to follow students' work, assess students' learning and other different skills. The learning environment was challenging for us. Before instruction, we had to make extra preparation relating to the inquiry environment and equipment. Also, work with the idea map demanded questions for each group which were to be answered. However, we felt that the students' enthusiasm was rewarding and compensated the extra work. This enthusiasm was also apparent to the parents and the water project had raised a lot of discussion at home.

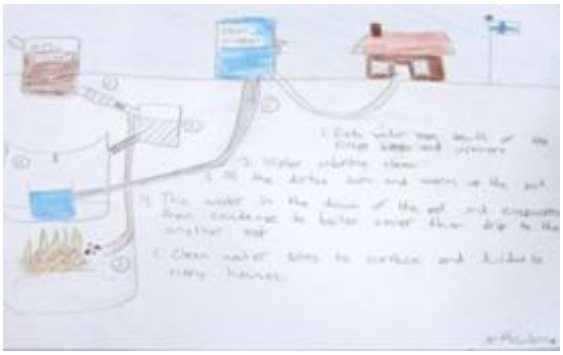

Figure 3. The equipment which students decided to use to separate different substances from water

3 Networking within PROFILES

by Franz Rauch and Mira Dulle (Alpen-Adria-Universität Klagenfurt, Austria)

Networks are support systems based on reciprocity. Those involved can exchange views and information and cooperate within the scope of mutual concerns.

Types of networks

Networks can be distinguished with regard to their complexity, from networks at schools to inter-school networks and networks on local, regional, national and even international levels. Networks on the level of teacher-groups, schools and local structures are likely to be closely linked to instruction and may contribute to improve the regional structures best. Examples of different levels of networks are:

- Networks at school (teacher network)
  A group of science teachers within one school co-operate towards the common aim of enhancing instructional and school development through science/IBSE. They are supported by the head teacher and set themselves up as a steering group in the school to guarantee the coordination and maintenance of the network.
- Networks between schools (school network)
  A school network consists of two or three schools; within this group of schools one leading school is established. Setting up further partnerships (i.e. with the community, partners from science or economy, personnel within the society, etc.) opens the school to the outside.
- Local and regional networks
  At the next level, schools within one school district/region work together, not only on the basis of joint projects among science teachers, but also by exchanging knowledge and experiences in network seminars. A local/regional co-ordination group facilitates the maintenance of the network and includes/supports teacher- and school networks. One important aspect is the involvement of local stakeholders i.e. education, administration, politics, business and NGOs.
- National networks
  Networks on a nation-wide level are structured in the same way as local and regional networks (co-ordination group; annual network conferences) but are more complex structure-wise.

Development of a PROFILES Network System

PROFILES envisages the setting up of networks on different levels (see above) to both maximise the dissemination and to make teachers more aware of the PROFILES project and the goals it has set out to achieve.

For networking and dissemination, the minimum target goals were put forward as:

- By September 2012, cooperation among science teachers in one school (teacher network); dissemination of PROFILES modules to stakeholders in one local structure (district, town).
- By September 2013, cooperation among science teachers in two/three schools (school network); dissemination of PROFILES modules to stakeholders in one region.
- By September 2014, cooperation among science teachers in a local/regional structure (local/regional network); dissemination of PROFILES information to stakeholders nationwide.

Based upon the "State-of-the-Art-Questionnaire" the charts below shows, that all of the partners were able to build on existing networking structures at an early stage (May 2011). The majority are teacher and school networks. Mainly teachers and Formal Educational Institutions are involved. In Austria and Turkey (and in some other countries) also non-educational organizations (like NGOs, businesses) are already part of networks. The number of teachers involved varies. Two partners are not depicted in this map: ICASE (works internationally) and Sweden (joined PROFILES later).[2]

In order to extend the existing channels, all partners were asked to organize networking-meetings to promote the PROFILES-project. As far as possible and appropriate, partners should draw on already existing networks. As a further consequence the partners should bridge the different networks within their countries.

In May 2012, the project partners updated the network questionnaire (State-of-the-Art-Questionnaire) to give insight into the development of their network activities. The findings show that within one year (from May 2011 to May 2012) six partners could increase the number of teachers and formal educational institutions involved in the networking process.

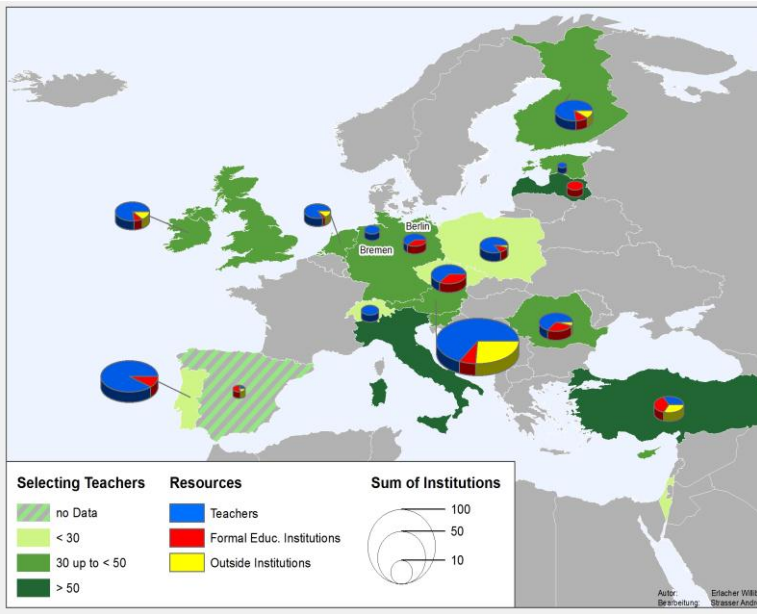

Figure 1. Findings of the State-of-the-Art-Questionnaire (May 2011)

Summary and outlook

Networking could be considered as a constant process. It would be a success if PROFILES could support the start of a networking process which would go on after the end of PROFILES in 2014. The goal should be the maintenance and sustainability of PROFILES networks. To keep networks going, it would be necessary to constantly provide new impulses from inside, but also from outside the network. External perspectives and constant feedback would be the fuel that keeps the

[2] Italy and Slovenia provided data about their resources only at the second round of the state of the art questionnaire in May 2012; United Kingdom left the project.

network going. These would be the factors which maintain the dynamic, flexibility and democracy within networks. The development/training of so called "lead teachers" within continuous professional development (CPD) programmes could be seen as one important factor. (For further information see: Rauch, F. & Dulle, M. (2012).

References:
Rauch, F. & Dulle, M. (2012). How to Involve Stakeholders in IBSE Networks. In C. Bolte, J. Holbrook, & F. Rauch (eds.). *Inquiry-based Science Education in Europe: Reflections from the PROFILES Project.* (pp. 59-67). Alpen-Adria-Universität Klagenfurt (Austria).

4 Findings from the Second Round of the PROFILES Curricular Delphi Study on Science Education

by Theresa Schulte and Claus Bolte (Freie Universität Berlin, Germany)

In the previous PROFILES newsletter, the procedure of the PROFILES Curricular Delphi Study on Science Education and preliminary findings from the first round were introduced. In this article, further findings from round 1 and especially from round 2 with regard to the FUB results are presented.

By now, all in all more than 2.400 participants (data status October 2012) have been involved in the "PROFILES International Curricular Delphi Study on Science Education" *round 1*. In *round 1*, all participating PROFILES partners developed within the qualitative analysis of their participants' statements a category system. The category systems range from 26 to 167 categories. 42% of the nineteen developed category systems contain between 70 and 100 categories. The median of the sizes of the category systems is 80 categories. A comparison of the category systems on the basis of the FUB category systems shows that the category systems are in terms of content compatible among each other in a large number of cases. Through quantitative analyses on the basis of the respective category systems, the frequencies of the respective category entries can be determined. These results provide first insights about the distribution of category entries in the statements of the participants. In the data of the first round of the FUB PROFILES Curricular Delphi Study on Science Education, 24 out of 80 categories are mentioned by a particularly large number of participants (≥25%), while 9 categories are mentioned by a rather low number of participants (≤5%). Furthermore, the analyses show that the higher mean values of the priority assessments refer to aspects related to everyday life and general education, whereas the lower mean values of the priority values tend to refer to science disciplines. Regarding the assessment of the presence of the categories in educational practice, the higher mean values generally refer to science disciplines whereas the lower mean values refer to aspects related to everyday life and general education.

However, the distribution of category entries in round 1 does not allow conclusions about how far the categories mentioned particularly rarely and particularly often actually reflect what is considered as important or not important and/or how far these findings are potentially influenced by the extent in which these aspects are realized in educational practice. Round 2 sheds more light on this issue.

In round 2, the findings from the analysis of the answers to the open questions in round 1 were reconsidered critically and on the basis of a second questionnaire specified and

condensed. In the questionnaire of round 2, the categories of the respective category systems were reported back to the participants for further assessment. The participants were asked on a 6-tier scale both to prioritize the given categories and to assess to what extent the aspects expressed by the categories are realized in current science education.

Examples of the FUB "top-ten" and "low-ten" priority and practice assessments are shown in Table 1.

Priority	Mean value	Practice	Mean value
Comprehension / understanding	5,3	Curriculum framework	4,8
Rational thinking / analysing / drawing conclusions	5,2	Factual knowledge	4,3
Applying knowledge / creative and abstract thinking	5,1	Chemical reactions	4,2
Judgement / opinion-forming / reflection	5,1	General and inorganic chemistry	4,1
Critical questioning	5,1	Terminology	4,0
Nature / natural phenomena	5,1	Science – biology	4,0
Acting reflectedly and responsibly	5,1	Environment	4,0
working self-dependently / structuredly / precisely	5,0	Science – chemistry	4,0
Motivation and interest	5,0	Structure / function / properties	4,0
Perception / awareness / observation	5,0	Matter / particle concept	3,9
⋮	⋮	⋮	⋮
Learning at stations	3,8	Limits of scientific knowledge	2,6
Botany	3,7	Consequences of technol. Developments	2,6
Analytical Chemistry	3,7	Out-of-school learning	2,5
Zoology	3,7	Ethics / values	2,4
Emotional personality development	3,6	Knowledge about science-related occupations	2,4
Industrial processes	3,6	Emotional personality development	2,3
History of the sciences	3,4	Learning in mixed-aged classes	2,3
Astronomy / space system	3,3	Current scientific research	2,3
Learning in mixed-aged classes	3,1	Astronomy / space system	2,3
Role play	2,9	Role play	2,2

Table 1. Mean values of the highest and lowest ten priority and practice assessments by the total sample (FUB)

Comparing the FUB priority values from round 2 with the frequencies of the FUB category entries in round 1, it appears that those categories assessed as most important in round 2 mostly correspond to the ones mentioned very frequently in round 1. However, it also turns out that most of those categories mentioned only rarely in round 1 are in round 2 *not* the ones considered as most unimportant. This is especially the case for general education related categories.

How far this feature can be found in the other PROFILES Consortium partners' data is currently being investigated. Furthermore, we are investigating to what extent those categories assessed as important are actually considered by the participants as being present in educational practice. This is a question to address in further considerations. We will come back to these aspects and issues in the next PROFILES newsletter.

References:

Schulte, T., & Bolte, C. (2012). European Stakeholders Views on Inquiry Based Science Education – Method of and Results from the International PROFILES Curricular Delphi Study on Science Education Round. In C. Bolte, J. Holbrook, & F. Rauch (eds.), *Inquiry based Science Education in Europe: Reflections from the PROFILES Project* (pp. 42–51). Alpen-Adria-Universität Klagenfurt (Austria).

5 Report on conferences and meetings

5.1 ICCE, ECRICE Conference and Meeting of the PROFILES work package Leaders, Rome, Italy

Apart from the "PROFILES 1st International Conference on Stakeholders' Views" in Berlin (see Chapter 1) the project was presented at the ICCE, ECRICE Conference in Rome (Italy) on the 16th of July 2012. Within three symposia various aspects of the project, like learning environments, continuous professional development and the development ownership of teachers, the evaluation of student gains, different views of stakeholders regarding a desirable science education within a country and the networking concept of PROFILES were introduced to chemistry educators worldwide.
The following day, the PROFILES work package leaders came together to discuss the achievement of further project objectives.

5.2 GDCP Conference, Hannover, Germany

Experiences gained by undertaking PROFILES were presented by some PROFILES partner at the GDCP (Gesellschaft für Didaktik der Chemie und Physik) Conference that took place from 17th to 20th of September 2012 in Hannover, Germany. Two international symposia were offered by the partners focusing on the PROFILES project in general, on the different meanings of the term Science Inquiry, on the question of how to analyse teachers ownership and student gains or on different PROFILES CPD programmes and the products – the "PROFILES Modules" - developed, adapted and/or optimized in the frame of the PROFILES CPD courses for pre- and in-serve science teachers.

5.3 IOSTE Conference, Hammamet, Tunisia

The PROFILES members from Estonia and Turkey presented the PROFILES project and their teaching experiences at the World Conference of the International Organization for Science and Technology Education (IOSTE) in Tunisia from 28th of October to 3rd of November 2012.

5.4 ESTABLISH Conference, Dublin, Ireland

The 5th biennial Science and Mathematics Education Conference (SMEC 2012) took place on 7th to 9th of June 2012 in Dublin City University, Ireland. With the chosen theme of "Teaching at the heart of learning" this was a joint conference of the Science and Mathematics Education Conference (SMEC) series and the FP7-funded project ESTABLISH, in which the PROFILES project was presented to 240 delegates.

6 Future Events

6.1 Meeting of the PROFILES work package leaders, Vienna, Austria

From 6th to 8th of January 2013 the PROFILES work package leaders will get together in Vienna, Austria, to discuss the achievement of project objectives, the current status of the PROFILES deliverables and further steps to be undertaken in order to lead the project to success. One main topic will be the preparation of the "Book of PROFILES Best Practice regarding IBSE in Europe". Furthermore the work package leaders will negotiate the agenda of the next Consortium Meeting which will be organized and held in Klagenfurt (Austria) in April 2013.

6.2 PROFILES Consortium Meeting, Klagenfurt, Austria

The next meeting of the PROFILES consortium members will take place in Klagenfurt (Austria) from 14th to 18th of April 2013. Current issues and further steps of the project will be discussed among all partners. Furthermore, workshops on how to foster teacher ownership and how to assess and evaluate this as well as workshops on how to analyse students gains will be offered at this meeting.

6.3 NARST Conference, Rio Grande, Puerto Rico

The annual international conference of NARST (National Association for Research in Science Teaching) will take place from 6th to 9th of April 2013 in Wyndham Rio Mar, Rio Grande. PROFILES partners will run two symposia in total and will present posters and paper regarding their work and insights within the project during the conference to further disseminate the PROFILES project's outcomes, its ideas, CPD approaches and objectives. The PROFILES presentations are already accepted by the NARST strand coordinators. Further information is available on: http://www.narst.org/annualconference/2013conference.cfm

6.4 ESERA Conference, Nicosia, Cyprus

The 10th biannual Conference of the European Science Education Research Association (ESERA) will take place from 2nd to 7th September 2013 in Nicosia (Cyprus). The theme of this ESERA conference is "Science Education Research for Evidence-based Teaching and Coherent Learning", underlining aspects of great relevance in contemporary science education research: the need to reflect on different approaches to enhancing our knowledge of learning processes and the role of context, designed or circumstantial, formal or non-formal, in learning science and instruction of science courses. PROFILES consortium partners will attend the ESERA Conference to introduce the project and experiences gained by promoting the PROFILES project, its ideas, approaches and philosophy. Further information is available on: http://www.esera2013.org.cy/nqcontent.cfm?a_id=1

6.5 EARLI Conference, Munich, Germany

From 27th to 31st August 2013 the 15th Biennial Conference of the European Association for Research on Learning and Instruction (EARLI) will take place in Munich, Germany. PROFILES members will attend the conference to present the project and further disseminate its objectives.
Further information is available on: http://www.earli2013.org/

6.6 WorldSTE 2013, Kuching, Malaysia

The fourth World Conference on Science and Technology Education (WorldSTE2013) will be held on the island of Borneo in the city of Kuching, Malaysia from 29th of September to 3rd of October 2013. Organized by the International Council of Association for Science Education (ICASE), in official relations with UNESCO, the World Conferences bring together policy makers, curriculum developers, scientists, science and university educators and researchers, science teacher association officers and of course primary and secondary science teachers. The Declaration makes recommendations for world progress in science and technology education for the following three years. In Kuching, a separate Conference Declaration will be made on the Environment. Further information is available on: http://worldste2013.org/index.html

7 PROFILES activities on Dissemination

An updated list of **PROFILES presentations at local, national and/or international conferences** as well as a list of **PROFILES publications in national or international journals, proceedings and books** you can find on the PROFILES website: http://ius.uni-klu.ac.at/misc/profiles/articles/view/23

SEVENTH FRAMEWORK PROGRAMME – 5.2.2.1 – SiS-2010-2.2.1
Supporting and coordinating actions on innovative methods in science education:
teacher training on inquiry based teaching methods on a large scale in Europe
Grant agreement no.: 2665