Project no. 217725

Project acronym: Mind the Gap

Project title: Mind the Gap: Learning, Teaching, Research and Policy in Inquiry-Based Science Education

Dissemination level: PU

Thematic Priority: Science in Society

Funding scheme:

Deliverable N° 3.3

Deliverable title Roundtables and, Public Debate report

Due date of deliverable: Month 20
Actual submission date: 01/12/09

Start date of project: **01/04/2008** Duration: 24 months

Name of Coordinator: Professor, Doris Jorde, University of Oslo, Norway
Name of lead partner for this deliverable: Jens Dolin

Mind The Gap WP3
3.3 Roundtables and Public Debate Meetings, Denmark

To fulfill this workpackage, the Department of Science Education at the University of Copenhagen arranged a public conference and an invited seminar.

The MONA Conference

The Department of Science Education (DSE) is in charge of editing a national, peer reviewed journal of science and mathematics didactics, called MONA, written by and for teachers, researchers and communicators of science. It is financed partly by the subscribers (app. 1.100) and partly by the science faculties at the Danish universities. In order to reach as many people from the science education milieu as possible, we used MONA's good reputation and administrative capacity (for example its subscriber data base) as an organizing basis for the conference.

The conference took place November 18th, 2009, in Middelfart (in the middle of Denmark) with 100 participants, which was the maximum number accepted (consequently, some applicants were refused). We chose the theme *'More and better teachers in Mathematics and Science – why and how?'*. This theme addressed the most pressing present problem within science education in Denmark and gave at the same time opportunity to relate this problem to conceptions of good teaching and teaching for scientific literacy.

The agenda

10.00 Welcome by Jens Dolin, chief editor of MONA, DSE.
10.15 Four lectures with short discussions.
- Torben Kornbech Rasmussen, director, Ministry of Education: *How to improve science teacher education and making it more attractive to become science teachers*.
- Martin Krabbe Sillasen, member of the board of CAND (Centre for applied science didactics): *Experiences from development projects*.
- Steen Hoffmann, member of the board of the high school leader association: *How to overcome the generation shift among science teachers*.
- Yvonne Fritze, Nordic Council of Ministers: *Teacher education across the Nordic countries*.

12.00 Post-It-Session. Participant input to the workshops
13.30 Four parallel workshops
Compulsory school teaching and teacher education
Upper secondary school teaching and teacher education
How to make the teacher job more attractive?
Cross level teachers, network and cooperation between educational levels.
14.50 Plenary session
16.00 Network café.
16.30 Closing session

The four workshops were all lead by a staff member from DSE and the most important results were reported. These four reports (in Danish) are attached as the following files:
Torben_Kornbech_Rasmussen WP3 3.3
Martin_Krabbe_Sillasen WP3 3.3

Steen_Hoffmann WP3 3.3
Yvonne_Fritze Lecture WP3 3.3

The entire conference had very positive evaluations by the participants.

A reflective analysis of the conference was reported in an article in MONA no. 1, 2010, which is attached as: Conference Analysis WP3 3.3 This report was a significant way to meet the 3.3 objective of dissemination of the results of the public debate at the conference to science educators throughout Denmark.

The Stakeholder Seminar

In connection to the conference, we also arranged a national policy seminar for invited stakeholders. The seminar took place at the same conference center in Middelfart and lasted for two days. A letter of invitation was mailed to high ranking stakeholders, such as the heads for the three biggest teacher training colleges, the director for the Ministry of education, the deans for the science faculties at the two biggest universities, the union, the association of big companies, the association of school heads etc.

The invitation letter sketched the overall problems within science teacher education and training and connected these to science teaching. It referred to the Rocard report and to the two EU-projects Mind The Gap and S-TEAM.

The following accepted the invitation:

Anker Steffensen, consultant, High school teachers' union.
Steen Hoffmann, head of high school, representative for the high school leader association.
Brian Krog Christensen, Science education advisor, Ministry of Education.
Bjørn Laigaard, leader of science education, VIA University Collage.
Chresten Kruchov, vice rector, University College Capital.
Stefan Hermann, rector, University College Metropol.
Randi Brinckmann, director, University College Metropol.
Nils O. Andersen, dean of the Faculty of Science, University of Copenhagen.
Henrik Busch, vice dean for education, the Faculty of Science, University of Copenhagen.
Erik Meineche Schmidt, dean of the Faculty of Science, University of Aarhus.
Casper Venbjerg Hansen, education consultant, Danish Industri.
Lene Beck mikkelsen, Director, The NTS-centre for science, technology and health education.

The agenda
November 18th
18.00 Welcome, introduction, participants' interests, defining and contextualizing the problems.
19.00 Dinner.
20.00 Relations between the present science teaching and the formulated problems.

November 19th

9.00 Analysis of possible models for viable science teacher education and training within the whole educational system.
11.00 Discussion of possible policy approaches and future actions.
13.00 Lunch
14.00 Wrapping up and concrete actions.

Results
The discussions were directed according to the following themes:

1. Science teaching as the basis and main reason for many of the problems mentioned. A more inquiry based science teaching as a possible way of improving the science education.
   - the main ideas in Inquiry Based Science Teaching
   - relations between the sciences and science education
   - the different educational cultures in compulsory and upper secondary schools
2. Teacher education for compulsory school, upper secondary school and university.
   - problems within the current teacher education models
   - is it possible to establish a more flexible teacher education program which combines education for compulsory and upper secondary schools and for upper secondary and university?
   - how can you upgrade teachers from one educational level to another?
   - is it desirable to establish a specific teacher education at university?
3. Teacher training models.

The SINUS model was presented and discussed.

   - different in-service training models were discussed
   - cooperation between the present partners was discussed.

4. The new centre for science, technology and health education.
   - the organization and possible content of the centre was discussed.

Apart from the networking function, the stakeholder seminar has had many concrete results. The participants established cooperation about different projects:

- A working group is trying to establish a national course for science teacher training.
- Some of the participants are formulating a common research project about science education (including vocational training).
- An in-service training course for both lower secondary and upper secondary science teachers has been established.
- Some of the participants negotiated possibilities for closer strategic cooperation.

3.3 Roundtables and Public Debate Meetings, England/Wales

A meeting involving a range of stakeholders in science education was held at the University of Bristol on April 23rd, 2010. The primary aim of the meeting was to engage the stakeholders in discussions around science teachers' professional development for promoting inquiry-based science teaching (IBST). There were 23 participants representing universities (e.g. Oxford), funding

agencies (e.g. Nuffield Foundation), professional development organizations (e.g. Science Learning Centres), examination boards (e.g. EdExcel) and schools (e.g. science teachers). The full list of the organizations represented at the meeting is included in the Appendix. There were invited guests from government agencies who were not able to attend due to the impending elections in the UK context inhibiting such participants from making public comments on issues related to policies with political agendas.

The meeting had input from Sibel Erduran from University of Bristol on the role in teacher professional development of the "How Science Works" agenda of the National Science Curriculum of England and Wales; from Matthias Stadler and Silke Roennebeck from IPN via a Skype connection on the SINUS model of professional development in Germany; and Peter Gray from S-TEAM project about the role of IBST across European education systems. The day was video-taped and the issues represented below are evidenced in plenary discussions captured on videotape.

The key issues that emerged from the meeting is as follows:

- The model of professional development for science teachers in England is inadequate in supporting teachers. A day's release from the school even with funding for supply cover can be problematic;

- Despite numerous innovative revisions in curriculum and professional development, impact on practice remains minimal due to the persistence of assessment methods used to evaluate the pupils and teachers;

- Even though there have been exemplar IBST projects nationwide, they haven't had a major impact nationally due to problems with scaling up from project schools to wider network of schools;

- The SINUS model provides a useful and tested approach to validate the effectiveness of professional development agendas. The emphasis on the empowerment of teachers in their own professional development has been received particularly well.

The participants filled in an evaluation form at the end of the meeting. The majority of the reflections were very positive. The few comments that were negative related to the use of the technology connection with Germany. It should be noted that the recruitment of participants into this meeting was fairly difficult in the context of England and Wales. Quite a number of invited guests indicated that they had been 'saturated' about the prevalence of the IBST issues in the national context. For this reason, the meeting was delayed and it was incorporated into the extension project, S-TEAM, agenda to feed into a similar output in national trends in stakeholders' perspectives on IBST in England and Wales.

Resources produced for the Mind the Gap project by the University of Bristol team were distributed as follows:

Erduran, S., & Yan, X. (2010). Salvar las brechas en la argumentacion: el desarrollo profesional en la ensenanza de la indagacion cientifica. *Alambique*, 63, pp.76-87.
Erduran, S., & Yan, X. (2009). Minding gaps in argument: continuing professional development to support the teaching of scientific inquiry. Booklet and DVD. Bristol: University of Bristol.

Other forums of engagement of the different stakeholders included seminars at the annual conferences of the ASE 2010 in Reading, UK; ESERA 2009 in Istanbul, Turkey; Ensenanza de la Ciencias Conference 2009 in Barcelona, Spain; Turkey as well as a range of invited talks and presentations worldwide including in Mexico and Austria.

Appendix

Organisations with representatives attending the Bristol meeting

Science Learning Centre, South West of England
Deer Park School, Cirencester
QCA
Science Learning Centre North East
University of Bath
Nuffield Foundation Curriculum Programme
The Office of the Qualifications and Examinations Regulator (Ofqual)
Royal Botanic Gardens, Kew
University of Oxford
Cramlington Learning Village & Science Learning Centre North East
Stroud High School, Stroud, Gloucestershire
Royal Society of Chemistry
Science Learning Centre, East of England
Insitute of Education, University of London
Edexcel
Insitute of Education, University of London
Graduate School of Education, University of Bristol
University of Sussex
The Wellcome Trust
University of Bristol

3.3 Roundtables and Public Debate Meetings, Hungary

One aim of the work-package was to open and conduct a public debate and organize a roundtable meeting. The Hungarian Research Teachers' Association organized chose literacy as a core theme of its annual conference and organized a roundtable meeting after that to introduce the results of this work-package (that were connected to scientific literacy) and then another roundtable. The conference got media support (reports online and in one of the national stations).

"Learning from Each Other" Conference – Changing content of literacy

The Hungarian Research Teachers Association organizes two conferences each year. One of these is called “Learning from Each Other” where research teachers present on their current research results. It is a popular conference among the members and most usually it gets media support therefore we found it a suitable occasion to reach many teachers. Besides, the Association’s membership represents a cross-section of the educational scene in Hungary: there are teachers from kindergarten to higher education level as well as teacher trainers and educational researchers among the regular participants. many of them are also active in other organizations – be them civil or formal national ones, governmental or ministry advisory boards as well.

The Association decided to organize the conference after the Mind the Gap seminar in Budapest (held in October, 2009) where many of our members got familiar with the results from inquiry based science teaching and learnt about the use of concept maps comparing literacy concepts on an international basis in relevant national educational documents. It evoke ideas in those participants and provided a firm background for the proceedings. The conference theme was chosen in a way that invites not only science teachers and educators but also those from the fields of humanities, arts and technology for a common thinking. We found it extremely important as in educational committees and boards most usually experts from all these different fields decide together and it is a well-known experience that possible cross-curricular synergies are not used. Also, there are a lot of prejudices about current trends in science education and some of these are originated from the current situation where little is known about the theoretical background, the methodological basis and the real-life practice of these teaching techniques and ideals. The aim was to highlight current problems (such as the transition from modern to post-modern, industrial to post-industrial paradigms, the risks of global crisis and the need for sustainability, demands from industry – creative, open-minded, co-operating employees – and from society – active citizenship, autonomous decision-makers) and show examples on how raising scientific literacy through inquiry based teaching can support achieving these targets.

The presentations were selected in a way to represent a kaleidoscope of the current situations and all presenters emphasized the importance of progressive pedagogy and pointed out possible ways of cross-curricular co-operation and also real-life examples (good practices, pedagogical situations) linked to science education outcomes. It was also important because other fields of education – especially languages and humanities use various inquiry based methods and have a wider support and acceptance in their practice – therefore learning from these examples and getting familiar with “success stories” from those fields can empower science teachers and teacher trainers and also provide an insight to the everyday experiences of inquiry based teaching.

The conference met its aim to empower participants and provide a meaningful input for the roundtable following it.

The conference took place at the Science Faculty of Eötvös Loránd University of Budapest on January 30, 2010 and was attended by 30 members of the association (15 presenters) and 20 other participants from various fields of education – which was the basis of inviting participants.

The agenda[1]

9.30 Welcome by Erika Fodor, president of HRTA.

9.45 Introduction by Móniuka Réti, secretary of HRTA

- emphasis on Mind the Gap seminar in October and inquiry based science teaching
- inviting participants for sharing ideas and active participation

10.30 Section One: Literacy, School, Culture

- short presentaions about the current situation, problems and the need for paradigm shift followed by questions and debate

  Imre Attila Kovács: The Age of Paradoxes

  Elek István Bondár: Analitical Wandering int he Forest of Pedagogical Concepts

  Ildikó Lennerné Patkó: Secondary Schools – Permeability – Content of Literacy

  Erika Fodor: The Aims of Education in the 21st Century

  Mónika Réti: Learning Environments

13.00 Section Two: Literacy Transfer, Good practices

- specific examples – brief presentations showing different aspects and opportunities for co-operation between science subjects and other fields or exeplar school practices related to inquiry based education followed by discussion

  Mária Laczkó: The Present and Future of Linguistic Literacy

  Csaba Szentpáli: Standing At Cross-Roads? Tradition and Reforms in Teaching Hungarian Language and Literature

  Zsuzsanna Táborosi: The Need and Methods for Teaching about the Present

  Károly Váray: The Science Student Circle and Váray's Pedagogy chemistry teaching

  Zsuzsanna Nyerkiné Alabert: Rapid Rdv with Scinces: Student-Style knowledge Transfer

  Tamás Józsa: Projects about Environmental Consciousness in Building Houses

  Edit Lippai: Legible School - projects

  Katalin Radnóti: Efficiency inTeaching Chemistry and Physics

[1] Two of the planned presentations from the official invitation were cancelled.

Nagy Lászlóné: Conecptual Framework for Measuring and Raising Health Consciousness in School Environment

The conference had a positive evaluation from the participants and the presentations lead to interesting debates about the present situation and wide-spread practices in science education. The good practices proved that inquiry based methods can be efficient in all fields of developing competencies including knowledge transfer and meaningful content (which is one of the most wide-spread fears in public opinion). The motivational background and the changing roles of teachers were also mentioned on many occasions.

The Roundtable Meeting

The first roundtable followed the conference and was intended for teacher trainers, representatives of teacher associations and advisory board experts. The participants were invited to take part in the conference as well in order to get a broader view on the topic as well as Mind The Gap project.

The invitation letter therefore contained the conference agenda and also some facts about current national and international trends and problems in science education – with reference to the Rocard Report, Wings and Weights[2] and Mind the Gap project.

The following accepted the invitation:

Péter Ádám, university professor, department leader at the Central Institute for Physics in Budapest, responsible for Physics teacher training at University of Pécs

Barlai Róbertné, member of Hungarian National Committee for Public Education

Tas Szebedy, vice-president of Hungarian National Committee for Public Education, president of Association of Grammar Schools, representative of the league of secondary school principals

Györgyi Szakácsné Nemere, senior counsellor, Department for Developing Public Education, Ministry of Culture and Education

Luca Szalay, representative of Hungarian Chemistry Association, senior lecturer responsible for chemistry teacher training at Eötvös Loránd University of Budapest

Katalin Gambár, leader of a Talent Centre (Mathematics and Physics), associate professor at Gábor Dénes College in Budapest

Sándor Bán, president of Hungarian Biology Teachers' Association, author of textbooks in Biology for secondary schools

[2] The policy document by the educational committee of the Hungarian President of state László Sólyom contains direct references to the need for inquiry based science teaching and recommendations based on Mind the Gap results. The document is available at: http://www.bolcsektanacsa.solyomlaszlo.hu/letoltesek.htm

András Róka, college associate professor, responsible for Chemistry teacher training practical courses and in-service courses at Eötvös Loránd University of Budapest

László Csorba, researcher at Hungarian Institute for Educational Research and development, appointed lecturer at Eötvös Loránd University of Budapest (courses for Biology teacher trainees), author of textbooks

Gábor Veres,teacher of Biology and Chemistry, expert at several national boards, author of integrated science curriculum for secondary schools

Results

Based on the conference the discussions covered the following topics:

1. Inquiry based science teaching methods as a means for raising students' responsibility, motivation and health and environmental consciousness and empowering participation, autonomous thinking and creativity:

   – the main ideas in Inquiry Based Science Teaching
   – relations between the sciences and science education
   – recommendations for motivating task types
   – real-life experiences and hands-on in science education.

2. Talent development through inquiry based science teaching:

   – motivational effects and choosing careers in science;
   – PISA results, Science Olympiads and the need for raising problem-solving skills – how inquiry based teaching offers an efficient alternative
   – connections and relations between scientific inquiry and inquiry based science teaching.

3. Teacher training models:.

   – the SINUS model as an alternative – how it can be implemented and adapted to Hungarian national in-service teacher training conditions.

   - different in-service training models were discussed

   - cooperation between the present partners was discussed.

Besides networking, the roundtable served as an opportunity for dissemination and also provided input for ongoing educational reforms and policy intentions to renew national science education.

The Stakeholder Seminar and Roundtable Meeting

Based on the success and the inputs of the first roundtable meeting, we invited experts to establish a meaningful co-operation between stakeholders.

The invitation letter sketched the key issues of the former discussion as well as contribution to inquiry based science teaching by Mind the Gap project.

The meeting took place at the Science Faculty of Eötvös Loránd University of Budapest

The following participated the seminar:

Attila Varga, senior researcher, Hungarian Institute for Educational Research and Development, expert and external evaluator in projects involving science education and educating for sustainable development

Barlai Róbertné, member of Hungarian National Committee for Public Education

Erika Fodor, president of HRTA, leading pre-service teacher training instructor, member of several advisory boards including National Talent Council

Gábor Szabó, rector, University of Szeged

Gábor Veres,teacher of Biology and Chemistry, expert at several national boards, author of integrated science curriculum for secondary schools

Györgyi Szakácsné Nemere, senior counsellor, Department for Developing Public Education, Ministry of Culture and Education

Ibolya Revákné Markóczi, associate professor, pre-service teacher trainer, Biology Teacher Training Department of Science Faculty of University of Debrecen

János Iker, university professor, University of West Hungary, head of Science Learning Centre in Szombathely, involved in science teacher training at the University of West Hungary and member of several advisory boards

Katalin Gambár, leader of a Talent Centre (Mathematics and Physics), associate professor at Gábor Dénes College in Budapest

Katalin Radnóti, associate professor, involved in physics and chemistry pre- and in-service teacher training at Eötvös Loránd University of Budapest

László Csorba, researcher at Hungarian Institute for Educational Research and development, appointed lecturer at Eötvös Loránd University of Budapest (courses for Biology teacher trainees), author of textbooks

Luca Szalay, representative of Hungarian Chemistry Association, senior lecturer responsible for chemistry teacher training at Eötvös Loránd University of Budapest

Nagy Lászlóné, associate professor, pre-service teacher trainer, Biology Teacher Training Department of Science Faculty of University of Szeged

Péter Ádám, university professor, department leader at the Central Institute for Physics in Budapest, responsible for Physics teacher training at University of Pécs

Sándor Bán, president of Hungarian Biology Teachers' Association, author of textbooks in Biology for secondary schools

Tamás Józsa, principal of secondary school, member of several expert boards including Educational Committee of Hungarian President of State and National Talent Council

Tas Szebedy, vice-president of Hungarian National Committee for Public Education, president of Association of Grammar Schools, representative of the league of secondary school principals, member of Educational Committee of Hungarian President of State

Zsolt Monszpart, representative of Hungarian Innovation League

Zsuzsanna Bánkuti, senior researcher, Hungarian Institute for Educational Research and Development, leader of projects involving science education

Mónika Réti, HRTA, researcher at Hungarian Institute for Educational Research and Development, member of several expert boards including Educational Committee of Hungarian President of State

The agenda

8 April, 2010

9.00 Welcome, introducing participants and context of the meeting

10.00 Analysis of possible models for viable science teacher education and training within the whole educational system. Exemplar cases of good practices.

13.00 Discussion of possible policy approaches and future actions.

15.00 Wrapping up and concrete actions.

Results

The discussions were directed according to the following themes:

1. Present crisis in science and technology education and science teacher training.
    - expectations from industry as compared to students' achievements and interests

- how inquiry based science teaching may provide a possible solution
- conclusions from Rocard Report and ROSE
- recommendations

2. Science teaching as the basis and main reason for many of the problems mentioned. A more inquiry based science teaching as a possible way of improving the science education.

    - the main ideas in Inquiry Based Science Teaching
    - relations between the sciences and science education

3. Teacher education.

    - problems within the current teacher education models
    - how in-service teachers can be influenced and facilitated
    - current reform ideas and recommendations

4. Teacher training models.

    - introducing SINUS model
    - possibilities and opportunities to adapt SINUS model
    - cooperation between the present partners was discussed.

5. The role of scince Learning Centres, National Competitions and awards.

    - science learning centres as networks supporting science education
    - other models
    - the role of talent development and steps to involve groups that are left behind.

The networking function and sharing information and experiences were extremely important as participants are involved in several expert boards and projects that in many cases work not only separated but isolated from each other. Therefore it is of key importance to establish a shared vision and also to take opinions closer to each other. The present diversity of the Hungarian educational system also calls for such a commonly agreed framework – and as an initiative step, the seminar and roundtable served this goal.

Other activities

As participants in Mind the Gap were involved in several national projects – amongst others: Mónika Réti worked as the secretary of the Hungarian President of State's educational expert committee and was responsible for preparing background material about science education, motivation and other issues, Luca Szalay, Nagy Lászlóné, Erika Fodor and Mónika Réti were involved in writing new frame curricula for secondary schools in Chemistry, Biology and Physics – the ideas and results from Mind the Gap were incorporated in miscellaneous ways in current reform progress.

Mónika Réti was also invited to lead workshops for science teachers in secondary schools and pedagogy centres in Budapest and Pécs where she introduces examples and basic ideas of inquiry based science teaching and also Mind the Gap. In two interviews broadcast in the national radio station MR1 (where she was invited to talk as the educational expert of the president's educational advisory committee) she also talked about inquiry based science teaching. Also she gave talks at the Democratic League of Teachers on March 30, 2010 where she emphasized the need for inquiry based learning.

As an example, concept maps as products from work-package 3 were used in writing Chemistry frame curricula.