Final Report

SCIENCEDUC

Renovation of science teaching in European primary education with inquiry methods

Integrating Activity

implemented as

Coordination Action

Contract number: 511164

Project Co-ordinator: Pamela LUCAS

Project website: http://scienceduc.cienciaviva.pt
http://www.xplora.org/xplora/scienceduc

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A. ACTIVITY FINAL REPORT

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1. Scienceduc aims and objectives

The reason why a number of European actors decided to propose the *Scienceduc* initiative to the European Commission is because Europe (as a whole) seemed to be absent from the scene of primary science education, despite a number of national projects and initiatives. This situation is quite unsatisfactory under the scope of the Lisbon objectives i.e. developing education to build a society of knowledge by 2010. The promotion of inquiry science education as contribution for solving this situation was evident. Over the world, the renewal of science education launched on the basis of inquiry-type teaching methods has widely given substantial results, but requires in Europe, major efforts on teacher training, resource elaboration and educational research.

Scienceduc was a proposal devoted to promote inquiry teaching approach on five European countries: Estonia, France, Hungary, Portugal and Sweden. Some actions were extended to Germany and Italy.

Within the framework of the formal education system, Scienceduc main objective was to disseminate the best methods, techniques and practices in science inquiry based teaching in primary schools through the establishment of a European network. In this order, our actions were mainly focussed on 4 topics: teachers training, dissemination of good teaching methods, online collaborative project and evaluation. Coordination actions were transversally carried out to ensure project management, and devoted to reinforce and to develop the existing national programmes in the partners' countries always considering the European cultural diversity. Scienceduc network offered experiments to broad evaluation and discussions inside, between and abroad the partner countries. Because of the network strength, the rate of exchanges between partners progressively increased to succeed into a new common proposal involving all Scienceduc partners (Germany and Italy included) as well as other new 5 partners. The result was Pollen (www.pollen-europa.net), an initiative also founded by the Commission, fostering Scienceduc approach in 12 E.U countries.

The 14 national conferences, the summer school for trainers and the closing general conference organized within Scienceduc framework constituted powerful tools for such network consolidation through exchanges between partners, collection and dissemination of resources. International dimension have also proven to be extremely fruitful, for confrontation of research and current realisations as well as for cooperative work.

Internet, especially Scienceduc website (http://scienceduc.cienciaviva.pt/), the European discoveries website (www.mapmonde.org/europe) and the NUCLEUS portal (www.xplora.org), were key tools for project resources dissemination through Europe, too.

Scienceduc served Europe ambitions and strategic objectives: It contributed to the improvement of the quality and effectiveness of education and training systems in the European Union. It contributed also to facilitate the access to scientific education as well as to open-up education and training systems worldwide; the final aim being to stimulate society interest in science and technology, encouraging scientific literacy. Scienceduc contributed to the establishment of the dialog between high-level scientists and education actors, encouraging the understanding and practice of science and technology by the European society. In many countries new ideas,

innovative experiments, and new curricula have recently emerged and these have led to remarkable realizations. Our project contributed to enhance science education at primary school level.

2. Scienceduc steering committee

- **Estonia*:*** Toomas Tenno, Tartu University, *tenno@chem.ut.ee*
- **Hungary:** Zsuzsanna Gajdóczki, Apor Vilmos Catholic College, *gzsuzsa@enternet.hu*
- **Portugal:** Rosario Oliveira, Ciência Viva, *roliveira@cienciaviva.pt*
- **Sweden:** Sven-Olof Holmgren, The Royal Swedish Academy of Sciences, *soh@physto.se*
- **France *:*** Pamela Lucas, La main à la pâte - ENS, *pamela.lucas@inrp.fr*
- ***Germany* *:** Petra Skiebe-Corrette, The Freie Universität, Berlin, *skiebe@zedat.fu-berlin.de*
- **Italy* :** Anna Allerhand, LUMSA University, Rome, *a.allerhand@katamail.com*

* *associated countries*

3. Project activities and results

3.1 WP1 – COORDINATION

- **D1:** ***Annual Meeting of national deliverable coordinators + Steering Committee + documentation for the potential new EU partners***

Coordination was a wokpackage transversally linked to all other Scienceduc workpackages. The Coordination constituted a focal point to set-up the network around several already existing European innovative programmes with similar approaches as well as the scientific and educational communities. It was centrally carried out by the Ecole Normale Supérieure in Paris. The coordinator assumed the overall responsibility to manage the project and its resources, for properly ensuring the work plan. Management of working groups for each deliverable was also a coordinator task. All Scienceduc actions were validated by the steering committee during meetings held at least twice a year or via e-links.

The partner representatives in the Steering committee were the national coordinators which ensured the responsibility for global coherence, follow-up, monitoring and synthesis of their countries contributions to the project and the production of relevant deliverables prepared in his/her country.

A subcontract with Freie Universität Berlin (Germany) and CIFRE (Italy) allowed the association of those potential new partners, in order to extend Scienceduc actions to these countries.

3.2 WP2 – TEACHERS TRAINING

- **D2*: European Summer school for primary science trainers***

This summer school was organised in Sicily on July 9 to 14, 2005. Forty-eight participants of 18 nationalities attended the summer school.

Belgium	Portugal	United Kingdom
Estonia	Sweden	Slovenia
France	Serbia	Romania
Germany	Spain	USA
Hungary	Netherlands	China
Italy	Switzerland	Argentina

During the meeting, a common basis for the discussion of hands-on teaching and teacher training at primary and kindergarten levels was developed, ideas about good teaching practices were exchanged, and recommendations for the organization of quality teacher training at European level were developed. Participants got the opportunity to work in order to reach a consensual set of definitions of inquiry pedagogy. They have all insisted on the virtues of polyvalence in primary education that allows an easy link between learning in the (natural) sciences and other disciplines, such as mathematics, language, history or geography. Attendants converged on the need for time and continuity of effort to disseminate inquiry teaching. The partnership between education authorities and institutions is necessary in this order. The role of scientists to establish adequate training places was underlined, and they all agreed in the fact that evaluation is a key point for future developments: evaluation of students, evaluation of teachers, and evaluation of

systemic approaches. It is necessary to help the teachers to evaluate their practice and its technical aspects (for example the art of questioning children). Formative evaluation should be connected with the coaching of teachers (by scientists and trainers), measuring their progress, and building confidence. They concluded that exchanges among teachers are extremely valuable and should be encouraged.
The proceedings of this summer school were edited and published by the French National Institute of pedagogical research (INRP) (*see section 6. Scienceduc Productions*).

3.3 WP3 – EVALUATION

- **D3*: Report and database about inquiry based science teaching assessment***

A bibliography was built exclusively with references which tackle effects of inquiry science teaching on children, on teachers of primary school as well as the impact of some local programs promoting such approach around the world. The references search was initially oriented to Scienceduc countries and then opened worldwide since European references are scarce and even inexistent in many European countries.
The data collected by the different studies came from close observation of the teacher and students, from interviews with and questionnaires for teachers, administrators and students, and from reviews of teachers' journals and students' notebooks.
It was impossible to summarize this bibliography since the concepts like inquiry, teaching, learning and attitudes are not well articulated and differently understood according to the local contexts. In addition, research methods are very different and often limited to small scale qualitative studies. This is actually one of the main preoccupations of inquiry defenders, of course also at European level. For this purpose, the International Working Group, set up by the InterAcademies Panel (IAP) on International Issues, is in charge of developing a proposal for providing assistance with evaluation of the implementation of Inquiry-Based Science Education (IBSE) programs for pre-secondary school students in different countries. At least 30 countries, both developing and developed (some European countries included), are known to be implementing some form of IBSE in some of their pre-secondary schools, creating a need for information about the impact of these programs on students and teachers. The aims are to provide help in collection of evidence about implementation, development of instruments for assessing learning, design of evaluation projects and of research. The evaluation is a key point for future developments of inquiry based science teaching.
Scienceduc evaluation database is available in two formats: As an EndNote file (for software holders) allowing powerful searches or as a rtf file, easily read by any word-processing program.

3.4 WP4 - NATIONAL AND INTERNATIONAL DISSEMINATION

- **D5: National conferences**

Fourteen national conferences were organized during 2005 and 2006 over Scienceduc countries. They aimed at extending to new primary schools the science inquiry methods, reaching close to 1000 teachers, researchers, scientists or ministry

representatives locally involved in science education. It was expected the dissemination of the gained experience to other regions and schools. In some cases, in Portugal for instance, the teachers got the opportunity to share the work carried out in schools during the Science Week (November 2005), as a result of the activities started during the 1st national meeting.

List of 14 national conferences organised in Scienceduc countries:

- **Estonia** (31 participants)
Results from the inquiry learning and teaching, Laulasmaa, Oct. 28-30, 2005

- **Germany**
Science is Primary, Berlin, September 27 - 28, 2005 (88 participants)
Science is Primary, Berlin, January 18, 2006 (48 participants)

- **France** (400 participants)
Mathematics, experimental sciences and observation at primary school, Saint Etienne, September 28, 2005

- **Hungary** (130 participants)
Educating through life, Vac, October 14 - 15, 2005 / Oct. 28-29, 2005

- **Italy** (40 participants)
National meeting on Scienceduc, Perugia, Oct. 19-20, 2005

- **Portugal**
Science in kindergarten and 1st cycle schools: Learning from different experiences, Lisbon, September 12 - 13, 2005 / Feb. 13, 2006 (80 participants).
Science in kindergarten and 1st cycle schools: Learning from different experiences, Lisbon, February 13, 2006 (40 participants).

- **Sweden** (90 participants)
  * *Recruitment Seminars - The Royal Swedish Academy of Sciences*
  - Stockholm, Apr. 6 and Oct. 17, 2005

  * *Regional Conferences*
  - Dalarna Börlange, Sept. 29-30, 2005
  - Mälarden Trosa, Sept. 29-30, 2005
  - Västra Götaland Hallsberg, Oct. 4-5, 2005
  - Östra Götaland Oskarshamn, Oct. 10-11, 2005

- **D6: One general (closing) conference: The 2nd European Conference on Primary Science and Technology Education / Science is Primary II - "Engaging the new generation"**

The meeting was organised in Stockholm on October 15 to 17, 2006. It constituted the closing Scienceduc general conference which brought together primary teachers, principles, policy makers, program coordinators, researchers, scientists, teacher trainers, representatives from school administration and mass media. Discussions were focused on European perspectives in Primary Science Education, on development and dissemination of the inquiry-based science education programs to new primary schools. High quality methods for evaluation and research in different countries, teacher training and worldwide science education projects were topics also discussed during the meeting. Nineteen different nationalities were represented in the event (82 participants).
During the conference, participants got a global vision of inquiry-based science education for children and teachers. The meeting helped them to take the measure of

current questions about this long process which is beginning and that has not already given all the answers. It was agreed that once engaged, children have amazing capabilities that are to be trusted to move them forward. The virtues of the process were exposed, for instance and among many others; that children and especially low achievers gain in self-confidence and self-esteem when engaged.

..."What better service could we give these young children than this particular one, if we are to promote their future development, regardless of whether or not they choose a career in science?..."

(extract from Pierre Léna's general conference report)

It is clear that primary school teachers are versatile and happy to deal with science, but some have difficulties with it. They need to better understand what science is, and not necessarily which aspect of science should be taught: A good teacher leads to a good lesson and a good lesson to pupils' success. Thus, working for the improvement of teachers and the ability to evaluate these improvements is almost a guarantee for the success and support of such type of programs. The "time constant" of change in the system of science education is on the order of 5 to 10 years, but a change is possible.

Many positive experiments and suggestions were presented of *in-service training,* but vocational training was essentially not addressed at all. The conference underlined the richness of the European diversity which is very important for the future (many practical examples were provided). It was agreed that we are seen European consciousness increases through concrete examples as Gago's Report, Figel's Report, and Framework Program 7. However a deeper overview of what we call *science education*, a goal that has to be rooted in European visions of science is still needed.

3.5 WP5 – ONLINE PROJECT

- **D6b: Management of "European discoveries" project**

European Discoveries is an online trans-disciplinarily project about science and history in Portuguese, Italian and French and partly in English. Through this project, pupils from 8 to 14 years old are invited to carry out documentary research into one of the 12 major scientific discoveries or inventions; to reproduce the experiment in their classroom using locally available material; to report their research online on a individual or collective multimedia notebook. The discoveries proposed were specially selected to be studied and experimented from the two last years of primary school. They cover more than 24 centuries and 7 European countries. More than 100 classes from 15 countries have already participated to this project. The project will be continued on next scholar year, offering the possibility of participation to new European schools.

http://www.mapmonde.org/europe

3.6 WP6 – NUCLEUS INTEGRATION AND COLLABORATION

- **D7: Reports on integration**

Inspite of few exchanges with other members of the Nucleus cluster, Scienceduc deliverables were published on x-plora portal *(www.xplora.org)* from EUN. Proceedings of the summer school are also on line on this portal, on a DVD edited

by EUN as well as national conferences reports (both sessions). Proceedings of the Second European Conference on Primary Science and Technology Education, the database and report about evaluation are also on line the Nucleus portal (those elements will be included on the new issue of a DVD edited by EUN).
Scienceduc coordinator represented project partners in the NUCLEUS integration group each time that Nucleus coordination requested it. Scienceduc presentation was carried out on 2005 at the Science and Society forum.
http://www.xplora.org/xplora/scienceduc

4. Scienceduc perspectives and conclusions

Scienceduc was a modest project by comparison to the huge task of renovating elementary science education in Europe, however it constituted the first step for Pollen, a more ambitious project that aims to stimulate and support science teaching and learning in primary schools.
The European cultural diversity appeared in the project as a balance with the universality of science. Scienceduc had a strategic impact at 2 levels, in the European countries but also worldwide. The Network was ideally configured to provide an integrated overview of the European diversity.
After 2 years of work, the *Network* and its partners are in a position to start their contribution to a detailed status analysis of science education in European primary schools. The implementation of methods providing reliable missing data is now possible. Pollen project will foster Scienceduc action.

France

In France, Scienceduc contributed to the promotion of contacts between education and scientific communities especially through the National conference of Saint Etienne, where discussions were focused on the establishment of links between science and mathematics and specifically the specificity of inquiry process in mathematics. This was also a way to promote and support educational centres of excellence, reference for pedagogical practices in France. One of the main project issues consisted in opening a window to French education actors on European science education.
Scienceduc allowed us the contribution to European objectives: “Europe should become a worldwide reference of quality education” and to the improvement of the understanding and practice of science and technology by European society.

Estonia

The practical implementation of the hands-on inquiry method in the Estonian schools requires more attention to teacher training efficiency. Estonia is the only country in the Project, which was the part of Soviet Union, where educational system was centrally leaded by the Ministry of Education and department of education of every region (town). The participation of community was very low. To activate the community, at first we have to show the advantages of hands on directed inquiry method compared with the old fashion system learning by heart. The leaders of educational system are still believing that existing system is good and needs only some minor reforms (improvement teacher training..). Simple dissemination do not help. We have good support from department of education of Tartu town and schools and preschools are very much interested of implementation of hands on directed inquiry method into school practice.

"….In Estonia, the working group for the project "Scienceduc" supported the development of teacher guides and other teaching materials based on the hands-on inquiry method. First, three years ago, inquiry materials for kindergarten and primary level were adapted from the STC program (USA). New materials were first implemented in the schools and kindergarten in Pärnu, Tartu and Türi. Teachers who used the new method were very fond of it and provided valuable feedback. Prepared materials were revised and teacher training was more strongly oriented towards the initiative of working teachers to get more useful recommendations for the next steps of development of the new kits and teacher's guides.

We need a broader and more systemic approach to teaching and learning using inquiry, otherwise this new approach will not result in permanent growth in students' development.

The aim of the Scienceduc project was to provide evidence that hands-on inquiry-based learning will help to achieve expected results in students' development of higher-order cognitive skills, thus fulfilling at the same time the goals defined in the Estonian national curriculum….."

(Toomas Tenno, extract from the presentation done at the 2nd European Conference on Primary Science and Technology Education, Science is Primary II - "Engaging the new generation")

Germany

"…As a result of SciencEduc, the Freie Universität Berlin now cooperates with Berlin-Brandenburg Academy of Sciences and Humanities in a project concerning primary science education. In addition, the Freie Universität Berlin is one of the three partners in a contract concerning the German translation of the La main à la pâte website. The other two partners are the French Academy of Sciences together with the Berlin-Brandenburg Academy of Sciences and Humanities. The Freie Universität Berlin also works together with the Swedish Academy of Sciences and their "Science and Technology for All" program.

Both SciencEduc and the follow-up program Pollen have improved contacts to the Ministry of Education in Berlin. Based on these contacts, the ministry has extended the delegation of a teacher to the Freie Universität Berlin to work in the informal science laboratory NatLab, which represents the Freie Universität Berlin in both EU programs.

NatLab was selected by the Robert Bosch Foundation to receive a national award given to initiatives which support science education in school by connecting scientists, teachers and school students. The international connections brought about though SciencEduc and Pollen were mentioned in the statement written by Robert Bosch Foundation explaining their choice of NatLab for this award…."

(Petra Skiebe-Corrette, extract from the presentation done at the 2nd European Conference on Primary Science and Technology Education, Science is Primary II - "Engaging the new generation")

Hungary

"…We have a special school in Vác for children with disabilities (mainly Gypsies), and the teachers were glad to learn about hands-on methods, which facilitate teaching and dealing with these children. These methods (experiments, observations) are very suitable, and create circumstances that allow Gypsy children to feel equal to others, the majority. These children will achieve success, rather than failure. This success will help them assimilate, and perhaps facilitate their performance in other subjects. Scienceduc helped us in this sense…."

(Zsuzsanna Gajdóczky & Bernadett Kkohegyi extract from the presentation done at the 2nd European Conference on Primary Science and Technology Education, Science is Primary II - "Engaging the new generation")

Italy

The aims of the Scienceduc meeting scheduled in Italy, were to plan and organize the operative national network between the Institutes in order to promote scientific education in the primary schools. There were thirteen representatives from over twenty regional institutes, where Pollen project, fostering Scienceduc actions, will be implemented.

Portugal

The Scienceduc project website developed by Ciência Viva and the contribution to creation of communication supports (logo, flyer design) were vital for project dissemination at national and European levels.
Ciência Viva managed to create a community of elementary and kindergarten teachers interested in sharing ideas concerning science activities in schools. Scienceduc contributed to it. Scienceduc actions will be extended through the Pollen project. Although being developed in one specific region, it will be an opportunity for network teachers to benefit from the support materials and activities created within the project.

Sweden

SCIENCEDUC FROM A SWEDISH PERSPECTIVE
by Sven-Olof Holmgren, The Royal Swedish Academy of Sciences

On November 23, 2002, Georges Charpak called a meeting at l'Academie des Scieances in Paris. The aim of the meeting was to explore common interests in supporting primary school Science and Technology (S&T) education in European countries. The participants represented Estonia, Hungary, France, Sweden and Portugal. Later on Germany and Italy has joined as observers.
The Paris meeting was the starting point for the work on a common proposal and application to the EU commission for a project called Scienceduc. The application was accepted for a two-year program starting in late autumn 2004 and the Royal Swedish Academy of Sciences (RSAS) represents Sweden in Scienceduc.
By some mysterious coincidence it has been commonly assumed all over the world that Science, as opposed to classical literacy, is too complicated to be taught in primary school. One of the most important recent insights is that this is completely false. In fact the absolute contrary seems to be true. Small children have naturally (by evolution) engraved mental skills to explore the material (natural) world. In many countries now recent national curricula (in Sweden since 1995) include Science at primary school level. However, in most cases, like in Sweden, teachers and schools are not well prepared and comfortable with this new challenge (even after more than 10 years) and need support and training in order to succeed.
With a very practical experiment based approach for primary school S&T education we have seen very enthusiastic response from children, teachers, headmasters, local school authorities and parents. The special didactics used within Scienceduc has evolved in many countries over many decades and have roots as far back as the first part of 20th century when John Dewey had a particularly strong influence among other places also in Sweden. It goes under different names in different regions but the term "inquiry" that has been coined in the US seems to catch on internationally at the current time. The US National Academies have contributed very effectively to this by initiating many years of dedicated work and important reports in the field of education and learning. The US National Science Resource Centre (NSRC) that emanates from these efforts has directly inspired the initiation and development of

the Swedish NTA program. Next year we will celebrate the 10th year of the RSAS initiative to start the development of NTA in Sweden.
In Sweden each municipality (in total 287) has the economic as well as the pedagogic responsibility for its local school system. In order to secure adequate support for teachers we require a central commitment from each new municipality (or independent private school) to organize teacher training and materiel support. They join an independent economic union (NTA-PoS) and appoint a local coordinator. From the start of Sceinceduc two years ago the number of members in NTA-PoS has increased from 54 to 76 and the program reaches some 58 000 primary school students this semester.
Speaking mainly for the Swedish experience but we believe it is also true more generally to say that there is no single item in this program, which has not been tried before in one way or the other. It seems that it is the systemic approach with specially developed in-service teacher training and materiel support organised by the local school authorities that gives the teachers the means and courage to develop their own classroom practice in S&T.
Within the Scienceduc program Sweden has been actively involved Evaluation (WP3,D3) and Dissemination (WP4, D5, D6). This includes the final conference Primary Science II (October 15 – 17, in Stockholm), which was the last deliverable unit in the Scienceduc project.
From Swedish point of view participation in Scienceduc has been very useful and rewarding. First of all it shows us that the same basic principles should be universal and equally well applicable in very different school system. Nevertheless we have become convinced about the need to adapt the practice and systemic approach to the culture in each country individually. France and Sweden for instance have very different school systems and also quite different practical implementation in La main à la Pâte and NTA respectively. Not only does this give us ideas of how our own programs can be complemented and improved. From a European perspective it gives a rich spectrum of ideas for inspiring other countries to join and form their own implementation. Developing good tools for formative assessment for teaches to use in the classroom is an urgent and challenging need in all countries we believe.
At the Paris meeting Georges Charpak told us about his bold vision of a large common effort to renovate S&T education in Europe in a similar way as CERN has put Europe back on the centre of the map in its field of basic Science after the devastating World War II. CERN is a particularly good example of a European cultural initiative that also has become a truly international endeavour in the best sense of the word. Few people know this better that Georges Charpak who himself at CERN made crucial contributions to the progress of this whole field of Science and the atmosphere in the lab.
The Science is Primary II conference reports very encouraging progress in S&T education in primary school and it is our belief that we start to understand how this can be scaled up in different kinds of national school systems in Europe. This may indeed be a good start in trying to realize Georges Charpak's bold vision. However, it should also be understood that there are many challenges still to meet such as further critical evaluation and directed research to be fed back into the continuous improvement of means, methods, systemic approach and adaptation to the different national school organisations. Substantially more resources could now be well spent in order to speed up the local development and dissemination in Europe.

5. Scienceduc deliverables

Deliverable No	Deliverable Name	WP /Task No	Delivered by Contractor(s)	Planned (in months)	Achieved (in months)
D1	Coordination meetings	WP1	1 - ENS	1 to 24	19
D2	European summer school for science trainers	WP2	1 - ENS	1 to 24	9
D3	Database of available references on evaluation	WP3	2 - RSAS 1 - ENS 3- UT	1 to 24	24
D4	National conferences on methods and practice	WP4	1- ENS 2 - RSAS 3- UT 4- AV 5- Ciência Viva	1 to 12	1 to 24
D5	National conferences on methods and practice	WP4	1- ENS [2] 5- Ciência Viva	1 to 12	15 & 16 [2]
D6a[1]	Conclusion: General Conference on the Project	WP4	2 - RSAS	13 to 24	24
D6b[1]	Management of an on-line school science project: European discoveries	WP5	1 - ENS	13 - 24	24
D7	Reports on integration and collaboration	WP6	1- ENS	1 to 24	24

2 Two countries (Germany - potential new partner and Portugal) organised a second national conference in order to spend funds remaining of the first conference held on 2005. Those conferences were held on January and February 2006.

6. Scienceduc Productions

6.1. PRINTED DOCUMENTS

- Edition of Scienceduc flyer (1000 copies).

- G. Charpak, P. Léna, Y. Quéré, 2005. L'enfant et la science : L'aventure de La main à la pâte. Odile Jacob ed., Paris. 241 pp.

- INRP, 2005. European Summer School for primary science trainers: Proceedings (plenary sessions abstracts, workshops testimonies and reports). P Lucas ed., INRP editions: Lyon. 88p.

- Meninos da escola do Serrado aprenderam com a natureza
Newspaper article: Diario de Coimbra –Figueira da Foz, page 11. December 3, 2005.

6.2. ORAL CONTRIBUTIONS

- P. Lucas, "Renovation of science teaching in European primary education with inquiry-type methods – Status report: France" Presentation done during the *2nd European conference on science and technology education at primary school – Science is Primary II: engaging the new generation* (Stockholm, October 15, 2006)

- Toomas Tenno, "Perspectives on inquiry-based learning and national curriculum in Estonia"
Presentation done during the *2nd European conference on science and technology education at primary school – Science is Primary II: engaging the new generation* (Stockholm, October 15, 2006)

- Petra Skiebe-Corrette, "Scienceduc: Status reports from seven ongoing national EU initiatives-perspectives on inquiry and curriculum – Germany. Presentation done during the *2nd European conference on science and technology education at primary school – Science is Primary II: engaging the new generation* (Stockholm, October 15, 2006)

- Bernadett Kkohegyi & Zsuzsanna Gajdóczky, Scienceduc: Status reports from seven ongoing national EU initiatives-perspectives on inquiry and curriculum – Hungary. Presentation done during the *2nd European conference on science and technology education at primary school – Science is Primary II: engaging the new generation* (Stockholm, October 15, 2006)

- Anna Allerhand, Scienceduc action and some perspectives on curriculum and inquiry in Italy. Presentation done during the *2nd European conference on science*

and technology education at primary school – Science is Primary II: engaging the new generation (Stockholm, October 15, 2006)

- Luz Figueiredo (*for Rosario Oliveira*) Scienceduc: Status reports from seven ongoing national EU initiatives-perspectives on inquiry and curriculum – Portugal. *Presentation done during the 2nd European conference on science and technology education at primary school – Science is Primary II: engaging the new generation* (Stockholm, October 15, 2006).

- Britt Lindahl, Scienceduc Evaluation Database. Presentation done during the *2nd European conference on science and technology education at primary school – Science is Primary II: engaging the new generation* (Stockholm, October 15, 2006)

- Marga Napp and Mare Pork, "Seminar on science teaching progress in primary school and kindergarten". Presentation of the reports of evaluation results on inquiry materials used in teacher training and in school practice. Participants: primary teachers and university teachers (trainers). Tartu, Conference centre 24.10.2006

- Toomas Tenno: "Education in the future – trends and possibilities". Teacher's conference. Participants: 423 teachers from the Ida-Virumaa county
New paradigm in school – inquiry hands on methods. European perspective: projects "Scienceduc" and "Pollen". Jõhvi, Palace of culture, 05.10.2006.

- Karin Hellat Workshop and seminar: "Active learning methods for integrating science and other disciplines at primary school. Evaluations from school practice". Participants: 26 primary school teachers. Tartu, Teacher training college, 12.09.2006

- Karin Hellat, Toomas Tenno, "Results and feedback from activities in science lessons in the kindergarten. Evaluation and dissemination of experience". Summer course, participants: 40 kindergarten teachers. Türi college, 17.08.2006.

- Monika Teppo, Toomas Tenno, Miia Rannikmäe, Jaak Kikas, "Active learning methods in science – teacher training and school practice". Seminar and round table with 27 university teachers (University of Tartu and Tallinn University). Türi college, Veskisilla 12.06.-13.06.2006

- Mare Taagepera and Toomas Tenno In-service teacher training activity with the unit "Solids and Liquids" Participants: 8 primary teachers from Vodja school, 19.05.2006

- Mare Pork and Toomas Tenno, "Evaluation of teaching materials and classroom activities using inquiry approach in primary science". Seminar with primary teachers from Tartu county schools. Teacher training college, Tartu, 3.05.-4.05.2006

- Karin Hellat and Juta Jaani How to create a new curriculum in science for kindergarten. Lecture and workshop. Participants: 32 kindergarten teachers. Teacher Training college, Tartu, 21.04.2006

- Toomas Tenno, Hannes Tamjärv and Rein Rebane "Curriculum in school of special needs and inquiry approach", Round table discussion with leaders and staff from Vodja school. Tallinn, Vodja school. 10.04.2006

- Karin Hellat, Toomas Tenno Seminar for science teachers: "Why we need the inquiry approach in teaching and learning science?". Participants: 17 basic school and high school teachers of physics and chemistry. Tartu, Faculty of Physics and Chemistry, 4.02.2006

- Karin Hellat, Seminar for science teachers: "Why we need the inquiry approach in teaching and learning science?". Participants: 18 basic school and high school teachers of physics and chemistry. Tartu, Faculty of Physics and Chemistry, 9.01.2006

- Toomas Tenno (trainer), Teacher training session for primary teachers on "Solids and Liquids" – introductory part. Participants: 13 primary school teachers from Tartu schools, Tartu, 18.11.2005

- Toomas Tenno (trainer), Teacher training session for kindergarten teachers on "Comparing and Measuring" – introductory part. Participants: 18 kindergarten teachers from Tartu county kindergartens. Tartu, Teacher training college, 3.11.2005

- Karin Hellat, Enn Pärtel, State language studies in kindergarten and primary schools. Dissemination of experience of using active learning methods in science classes (Russian speaking schools and kindergarten). Workshop with 21 kindergarten and primary school teachers from Tallinn and Narva. Tartu, Teacher training college, 7.12.2005

- Toomas Tenno (trainer), Teacher training session for primary teachers on "Solids and Liquids" – introductory part. Participants: 12 primary school teachers from Tartu schools. Tartu, Teacher training college, 1. 11.2005

- P. Lucas, "Scienceduc: Renovation of science teaching in European primary education with inquiry methods". Presentation did during *Science and Society: Forum 2005*
(Brussels, March 9-11, 2005)

- P. Lucas "Scienceduc: renovation of science teaching in European primary education with inquiry-type methods". Plenary conference for Scienduc presentation during *European Summer School for Primary science trainers* (Erice, Italy, July 9 - 14, 2005)

- P. Lucas, « Scienceduc : Rénovation de l'enseignement des sciences par la démarche d'investigation scientifique à l'école primaire en Europe ». Contribution during the *Annual meeting of La main à la pâte pilot centers and the French conference « Mathematics, experimental Sciences and observation at primary school »* (Saint Etienne, Sept 27-28, 2005)

- Toomas Tenno, Karin Hellat, Juta Jaani, Ragna Jõesaar, Enn Pärtel, Mare Pork, and / or Meedi Neeme, Selection (on 22 seminars) of Estonian contributions about inquiry based methods (training sessions and conferences)

• Evaluation of results in teacher training: “Inquiry method for primary science education – in service experience, dissemination of knowledge and everyday practice”; 52 teachers and supervisors of Tartu town and county – Tartu, January, 2005

• Russian speaking schools providing courses in Estonian: perspectives with inquiry method”; 38 in-service teachers from Sillamäe, Kohtla-Järve, Narva and surrounding. Narva, January, 2005

• Master course in teacher training: “Inquiry based learning and teaching – challenge for the innovation at school.” 31 master teachers from Tallinn and surrounding Tallinn, Rocca al Mare School, March 2005

• Tartu Using inquiry method in teaching chemistry, 69 in-service chemistry teachers (participants to the annual conference of chemistry teachers) from all parts of Estonia, March 2005

• Inquiry linked to the kindergarden: why we need the first steps in inquiry in pre-school age? 19 kindergarden teachers from Kivike, Mai 2005

• Opening ceremony of ABC celebration, session for primary school teachers: ”First Textbook at school and inquiry science” 183 primary school teachers from all districts of Estonia, Mai 2005.

• “Active methods in teaching science at primary – experience in Russian speaking schools” Summer courses for teachers: 36 in-service teachers Russian speaking schools from Narva and surrounding, June, 2005

• “Where we are in primary science education? – view to the experience at schools of Tartu” Round table discussion with participants of doctoral course in technology of education, Tartu, August 2005

• “Active learning methods and schools for language adaptation at school”: 26 primary school teachers from Narva and Kohtla-Järve, August 2005

• Active learning environment – how to create the curriculum on the bases of inquiry principles? 31 teachers from different schools of South-Estonia, Tartu, October, 2005

6.3. DOCUMENTS ONLINE

• Proceedings of the 2nd European conference on science and technology education at primary school – Science is Primary II: engaging the new generation.
- *http://scienceduc.cienciaviva.pt/home/*
- *http://www.xplora.org/xplora/scienceduc*

• Report of the meeting "Science in kindergarten and 1st cycle schools: Learning from different experiences", Portugal (2nd session)
- *http://scienceduc.cienciaviva.pt/dissemination/*
- *http://www.xplora.org/ww/en/pub/xplora/nucleus_home/scienceduc/national_conferences.htm*

- Report of the meeting Science is Primary, Germany (2nd session)
  - *http://scienceduc.cienciaviva.pt/dissemination/*
  - *http://www.xplora.org/ww/en/pub/xplora/nucleus_home/scienceduc/national_conferences.htm*

- Evaluation report and database on inquiry based science education at primary school
  - *http://scienceduc.cienciaviva.pt/evaluation/*
  - *http://www.xplora.org/ww/en/pub/xplora/nucleus_home/scienceduc/evaluation_database.htm*

- Scienceduc brochure
  - *http://scienceduc.cienciaviva.pt/home/*
  - *http://www.xplora.org/xplora/scienceduc*

- Jams and Jellies (Classroom activity)
by Ivonne Delgadillo, Fábrica de Ciência Viva, Aveiro
  - *www.cienciaviva.pt/projectos/scienceduc/index.asp?accao=changelang&lang=en*
  - *http://www.xplora.org/xplora/scienceduc* (link)

- The Jam Trail (Classroom activity)
by Luz Figueiredo, Agrupamento de Escolas de Buarcos, Figueira da Foz
  - *www.cienciaviva.pt/projectos/scienceduc/index.asp?accao=changelang&lang=en*
  - *http://www.xplora.org/xplora/scienceduc* (link)

- Food Preservation - Jams and jellies (Classroom activity)
by Luz Figueiredo, Agrupamento de Escolas de Buarcos, Figueira da Foz
  - *www.cienciaviva.pt/projectos/scienceduc/index.asp?accao=changelang&lang=en*
  - *http://www.xplora.org/xplora/scienceduc* (link)

- Young scientists, A very serious game (Online article)
Paulina Mata, Conceição Bettencourt, Maria José Lino, Marília Sousa Paiva
  - *http://www.cienciaviva.pt/projectos/scienceduc/index.asp*
  - *http://www.xplora.org/ww/en/pub/xplora/nucleus_home/scienceduc/national_conferences.htm*

- Proceedings of the European Summer School for science trainers
  - *http://scienceduc.cienciaviva.pt/teachertraining*
  - *http://www.xplora.org/ww/en/pub/xplora/nucleus_home/scienceduc/workpackages.htm*

- Annual meeting of La main à la pâte pilot centers/ French conference « Mathematics, experimental Sciences and observation at primary school » (*Saint Etienne, Sept 27-28, 2005*)- Report
  - *http://scienceduc.cienciaviva.pt/dissemination/*
  - *http://www.xplora.org/ww/en/pub/xplora/nucleus_home/scienceduc/national_conferences.htm*

- Ideas for working on random *(classroom activity in French)* by Claudine Robert & Catherine Houdement
  - *http://www.xplora.org/shared/data/xplora/pdf/aleatoire_en_cycle3.pdf*

- A practical example of interdisciplinarity mathematics-physics: building the notion of angle from physics situations *(classroom activity in French) by Hélène Merle*
  - *http://www.xplora.org/ww/en/pub/xplora/nucleus_home/scienceduc/national_conferences.htm*

- "Science in kindergarten and 1st cycle schools: Learning from different experiences", Lisbon, Portugal
  - *http://scienceduc.cienciaviva.pt/dissemination/*
  - *http://www.xplora.org/ww/en/pub/xplora/nucleus_home/scienceduc/national_conferences.htm*

- Science is Primary, Germany
  - *http://scienceduc.cienciaviva.pt/dissemination*
  - *http://www.xplora.org/ww/en/pub/xplora/nucleus_home/scienceduc/national_conferences.htm*

- Educating through life, Hungary
  - *http://scienceduc.cienciaviva.pt/dissemination/*
  - *http://www.xplora.org/ww/en/pub/xplora/nucleus_home/scienceduc/national_conferences.htm*

- National meeting on Scienceduc, Italy
  - *http://scienceduc.cienciaviva.pt/dissemination/*
  - *http://www.xplora.org/ww/en/pub/xplora/nucleus_home/scienceduc/national_conferences.htm*

- Results from the inquiry learning and teaching, Estonia
  - *http://scienceduc.cienciaviva.pt/dissemination*
  - *http://www.xplora.org/ww/en/pub/xplora/nucleus_home/scienceduc/national_conferences.htm*

6.4. DIGITAL DOCUMENTS

Video

- French conference « Mathematics, experimental Sciences and observation at primary school » (*Saint Etienne, Sept 27-28, 2005*)
  - *http://www.diffusion.ens.fr/index.php?res=cycles&idcycle=228*

DVDs for teachers (EUN – xplora portal):

- Proceedings of the 2nd European conference on science and technology education at primary school – Science is Primary II: engaging the new generation. Stockholm, October, 15 to 17, 2006. (To be published, March 2007 issue)

- Evaluation report and database about impact of inquiry based science education, (To be published, March 2007 issue)

- Annual meeting of La main à la pâte pilot centers/ French conference « Mathematics, experimental Sciences and observation at primary school » (*Saint Etienne, Sept 27-28, 2005*)- Report – Abstracts, powerpoint presentations commented references and general conclusions (2005 issue)

- Proceedings of the European Summer school for science trainers (2006 issue)

DVDs available at
- *http://www.xplora.org/ww/en/pub/xplora/library/software.htm*