Project no. **042938**

**FORM-IT**

**Form – it "Take Part in Research"**

**Instrument**: Specific Support Action

**Thematic Priority**: Science and Society

# Publishable Final Activity Report of Form-it "Take Part in Research"

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# Form – it "Take Part in Research"

## 1 Introduction

### 1.1 Mission of Form – it "Take Part in Research"

The overall aim of *Form-it "Take Part in Research"* was to contribute to the promotion of interest of young people in science and to qualify them for a critical and complex way of thinking and learning.

The future of success of the European Research Area is mainly depending on young people developing skills and competencies to tackle future challenges. The key competencies needed today are self motivated and self directed learning strategies, team-working and communication skills and above all the capacity to differentiate, select, apply and update information from the immense and daily growing global knowledge base. Therefore science education in school is confronted with a high pressure to replace outdated teaching approaches by modern concepts. The plurality of national school systems, didactic traditions and curricula produces a diversity of knowledge levels and skill profiles. Reform and harmonisation programs are being pressed, since it became obvious, that one of the essential factors for the prosperity of the European Economy will be to equip generations of tomorrow with adequate knowledge resources and learning skills.

### 1.2 Research and Education Cooperation Activities

One very promising model of new learning designs is the model of Research and Education Cooperation activities (REC). A REC stands for a cooperation between at least one research partner (e.g., public or private science or technology research institutes, museums, individual researchers) and at least one educational partner (e.g., schools, individual teachers, pupils or students, teacher education, school authorities).
Research and Education Cooperation improves the teaching quality by applying up to date didactic approaches and they raise motivation, performance and ownership of the students in a significant way. Research institutions are interested to be part of collaboration projects and programmes for example because of the close cooperation with schools. To work alongside with the schools may help to attract talented and motivated students.

### 1.3 The Form-it consortium

*Form – it "Take Part in Research"* provides a Specific Support Action for networking experts who work with and on new didactic concepts for science teaching. The consortium assembled experienced institutions out of the three essential player groups of Research and Education Cooperation activities: collaborators, researchers and promoters/financiers. Some of the partners act in more than one of these fields. Experts from eight different countries with different backgrounds and different perspectives on research and education collaborations came together in this project. In addition to the consortium experienced schools participating from the beginning to contribute their practical knowledge.

**Table 1** List of the consortium members

| | |
|---|---|
| Austria | Austrian Institute of Ecology (AIE) |
| Lithuania | Kauno Technologijos Universitetas (KTU) |
| Switzerland | Universität Zürich (UZH) - Institut für Gymnasial- und Berufspädagogik |
| Slovenia | Jozef Stefan Institute (JSI) |
| Netherlands | National Institute for Curriculum Development (SLO) |
| Italy | Università degli Studi Roma Tre -Scuola di Specializzazione all'Insegnamento Secondario del Lazio (RM3-SSIS) |
| United Kingdom | London Southbank University (LSBU) |
| Germany | Freie Universität Berlin (FUB) - Arbeitsbereich für Erziehungswissenschaftliche Zukunftsforschung (Institut Futur) |
| Germany | Robert Bosch Stiftung (RBS) |
| Austria | Bundesministerium für Wissenschaft und Forschung (BMWF) |
| Austria | Bundesministerium für Bildung, Wissenschaft, und Kultur (BMUKK) |
| Germany | Leibniz-Institut für die Pädagogik der Naturwissenschaften Kiel (IPN) |

## 1.4 Main objectives

The objectives of the *Form-it* consortium are

- Supporting the collaboration among institutions running RECs by setting up a European network of experts in science education and education research.
- Increasing the efficiency of national and European science education strategies by identifying and promoting the success factors of Research and Education Cooperation Projects (RECs) in Europe.
- Raising the awareness for the essential framework conditions for initiating, realising and embedding REC.
- Increasing the commitment of policy-makers and other decision-makers in educational issues by promoting the value of the implementation of REC.
- Supporting the development of joint EU research projects related to "Science and Society" by identifying relevant research questions on Research and Education Cooperation as a new model of science teaching.

## 1.5 Main activities

To achieve these objectives four main activities were realised:

- Analysing Research and Education cooperation activities in the eight consortium member countries (Austria, Germany, Italy, Lithuania, the Netherlands, Slovenia, Switzerland, and the UK) and assembling the found examples in a survey. Based upon this survey a Catalogue of Good Practice Examples of Research and Education Cooperation was developed.
- More than 120 participants discussed the concept of quality criteria underlying the good practice examples at the International Conference: "Bridging the Gap between Research and Science Education", Vienna, from 12$^{th}$-14$^{th}$ March 2008.
- Networking in expert working groups, at workshops and at the International Conference: Networking activities were realised to exchange national experience in science education, to develop a joint strategy for Research and Education Cooperation in Europe and to build up strong partnerships for future cooperation and research in this area.
- Increasing public awareness for excellence in science education: detailed knowledge on innovative REC activities in Europe was disseminated to encourage the implementation of modern science education.

## 1.6 Essential questions

The essential questions that *Form-it* dealt with are:

- What general conditions are necessary to provide high-quality cooperation?
- How is collaboration organised? What partnership models exist?
- Why are many projects successful - but others not?

Elaborating these questions, a discussion on Quality Criteria of successful Research and Education Cooperation projects and their environment was carried out and a common picture was developed as an important base for all discussions, research activities and results along the project.

## 1.7 Results & Reports

The project website www.form-it.eu assembles all public results and reports developed during the project. Via the website the printed versions of the reports may be ordered.
Complex information on Research and Education Cooperation (REC) was collected, analysed and arranged in various reports, guidelines, recommendations, and papers - all elaborated in English, some of them translated, some available in print version, all of them provided for download on the website.

One essential result of the first part of the project was the **Report on Research and Education Cooperation in Europe**. The partners of *Form-it* carried out a survey on the situation of REC activities in their countries. The *Form-it* team described more than 150 REC examples in Austria, Germany, Italy, Lithuania, the Netherlands, Slovenia, Switzerland and the United Kingdom. These illustrate the multifaceted possibilities and difficulties in Science Education, Research and Education Cooperation and innovative didactic concepts.

The report was the basis for the **Catalogue of Good Practice Examples**, a collection of 31 outstanding RECs. Taking into account the very specific national conditions, the selection was carried out country by country on the basis of a common framework and a shared concept of the quality criteria to be used. The main aim was to illustrate the various issues, teaching methods and types of partnerships that were found within the survey. The catalogue functions as a promotion tool increasing visibility and accessibility of RECs in EU-member and Non-member states, and as a reflective tool for a deeper understanding of the possibilities given by these kind of innovative didactic models.
The **International Conference "Bridging the Gap between Research and Science Education" from 12th-14th March 2008 in Vienna**, served on the one hand to present all the work done by the project consortium and provided a platform for discussion and networking for persons involved in REC (teachers, promoters, researchers, students,...). On the other hand, it also formed an essential part within the working process of the whole project: Project findings and results were followed up in four workshops:

* What is good practice in Research and Education Cooperation (REC)?
* How to realise good cooperation projects?
* Could an REC project be an element of modern science education?
* How to use an individual REC to move the system ahead?

European and non-European keynote speakers with a background in science education gave an overview of the situation and of the possibilities and challenges that REC projects have to face. In an interactive exhibition and a poster session teachers, students and scientists presented outstanding cooperation models and gave insights into their work. The **Conference Proceedings** bring together the wide range of inspiring contributions.

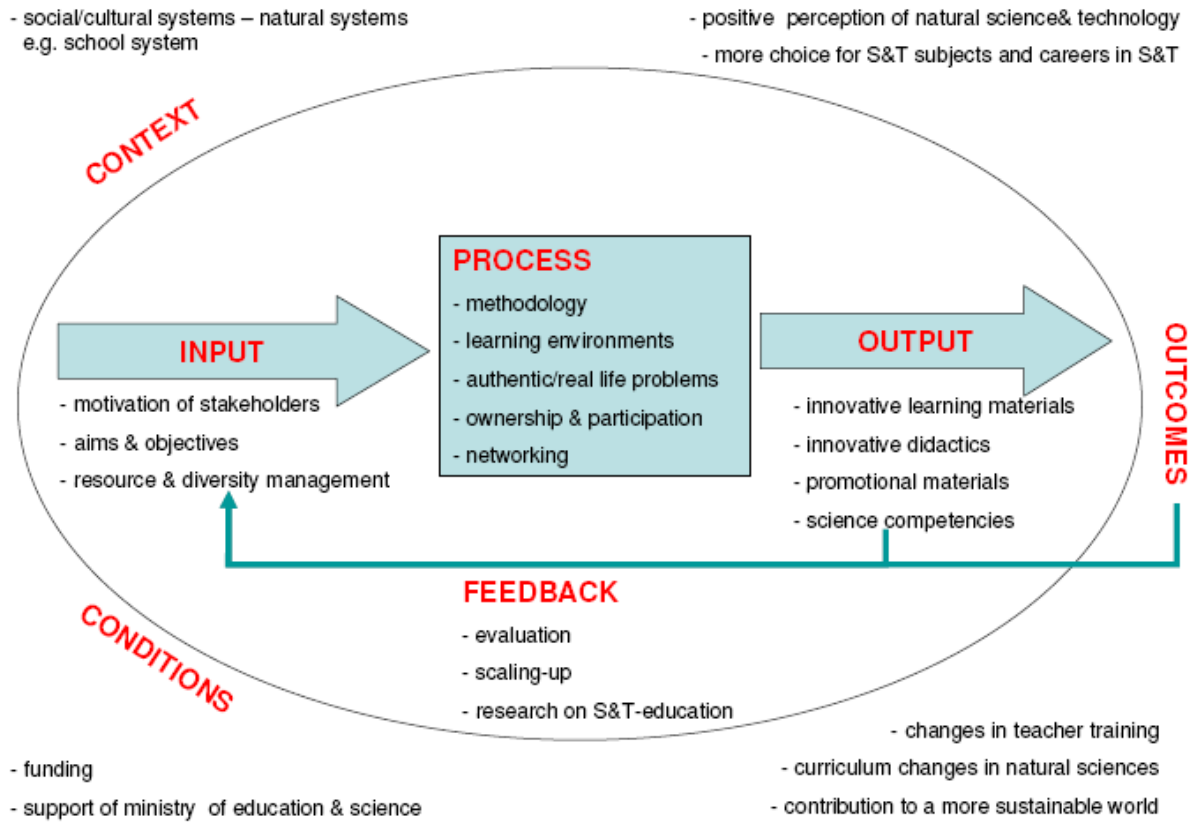
All these project activities resulted in the formulation of **Practical Guidelines for Teachers and Researchers** for initiating, realising and embedding RECs. A joint paper on Recommendations for Policy-makers is addressed to national and European decision-makers within the educational system and the research community to support the realisation of these cooperations.

Many questions within this field of science education still remain unanswered. Some of them were formulated in a Joint Research Report, the **Paper on future research issues** to be considered on the European level within the 7$^{th}$ Framework Programme. Based on this catalogue of research issues, confidential proposal concepts for future FP7 proposals were developed.

# 2 Main aspects of the work

## 2.1 Framework for successful Research and Education Cooperation in Science and Technology

Picture 1: Evaluation of Research and Education Cooperation (REC); Evaluation areas, project phases and criteria




The framework 'Research and Education Cooperation (REC): Evaluation area, project phases and criteria' (Picture 1) was developed by the consortium partners, based on the eight national surveys and on preceding discussion within the *Form-it* consortium and school partners. The guiding principle of the framework development was to learn both from good practice and from the weaknesses of the projects surveyed.

The Framework for Successful Research and Education Cooperation in Science and Technology represents an essential result of the project and the common conclusion about REC environment and contents, achieved by the *Form-it* consortium in the discussion of quality criteria. This framework then became the basis for the ongoing work in the *Form-it* project, therefore for all other project results and products.

It shows that Research and Education Cooperation projects are influenced by national and local **contexts and conditions**, such as organisation of the national school system or general attitude and policy towards Science and Technology.
Success and quality should always been considered in relation to relative contexts. When beginning an REC two important success criteria are the motivation of stakeholders, together with a clear definition of common **aims** and strategies. Quality is more likely in what the consortium have called a '**WIN 3 setting'**, this means a situation where the three main participant groups of the REC – students, teachers and researchers – gain knowledge and competencies from the partnership.

The quality of RECs is mainly visible during the implementation process: characteristics like **'ownership and participation'**, or **'attention to the ethical and social aspects of science'**, are indicators of quality in whatever context, as well as the use of methodologies where **authentic life problems** and **open ended tasks** are used to develop **critical thinking** in a **creative and collaborative learning environment**. The diversity of RECs allows for many approaches: from more focused RECs to more open-ended ones, from experiences based on scientific research models to activities aimed at social or environmental problems. But within these differences it is still possible to find common quality elements: the time offered for the development of **independent thought**, for example, or the opportunity for students to **make choices** between different points of view, learning materials or activities.
Other important quality points are related to the **'mutual gain hypothesis'**: What have teachers and researchers learned from the REC; has it brought about any changes in local curriculum; are there new hypotheses for future REC activities? In general, What **Science Education Research** is consciously accompanying the REC activities? Education, and Science Education need to be researched, and RECs are very important 'research objects' to reflect upon.

## 2.2 The Report on Research and Education Cooperations in Europe

The first step was to finding innovative Research Education Cooperation projects in the project member states and performing a survey on the situation and possibilities of Research and Education Cooperation projects (REC) in Europe. After using a short prestep questionnaire, the consortium looked for Research and Education Cooperation projects in their countries and carried out the survey with a detailed questionnaire. The survey was carried out in Austria, Germany, Italy, Lithuania, the Netherlands, Slovenia, Switzerland, and UK in summer 2007. A total of 159 RECs were analyzed (11–30 per country). In Germany, additional information was provided from two data bases on learning laboratories and a foundation-funded programme. The National Survey Reports were summarized by the national consortium partners, giving an insight into the respective school systems. The results of the survey led to the **Report on Research and Education Cooperations in Europe** which consists of three parts.

- Part A: Report on Research and Education Cooperations in Europe (general report summarizing the National Survey Reports and drawing first conclusions with respect to success factors, recommendations, and quality criteria; author Universität Zürich - Institut für Gymnasial- und Berufspädagogik)
- Part B: National Survey Reports (from the eight member states represented in the *Form-it* consortium; editor Universität Zürich - Institut für Gymnasial- und Berufspädagogik)
- Part C: Questionnaires (used for the survey, in five languages; editor Universität Zürich - Institut für Gymnasial- und Berufspädagogik)

The Report is available on the project website www.form-it.eu.

## 2.3 The Catalogue of Good Practice Examples

The **Catalogue of Good Practice Examples of Research and Education Cooperation activities** represents the variety of possibilities that RECs can offer: from short but replicable examples to long term collaborations, from examples limited to a small number of schools to large networks, from examples that need strong support and funding to very low cost examples. A large variety of ages, types of school, types of partners, school subjects, thematic orientation and educational methods are assembled within the Catalogue of Good Practice Examples of Research and Education Cooperation activities. The 31 examples collected in the consortium member states and based on the survey are documented in detail, including photos and statements of participants of the collaborations. The catalogue functions as a promotion tool increasing visibility and accessibility of RECs in EU-member and Non-member states, and as a reflective tool for a deeper understanding of the possibilities given by these kind of innovative didactic model. The Catalogue of Good Practice Examples (editor Università degli Studi Roma Tre -Scuola di Specializzazione all'Insegnamento Secondario del Lazio) has been translated to Italian and Lithuanian. The reports in all three languages are available on the website www.form-it.eu. The printed English version can be ordered through the website.

An **online version of the Good Practice Examples**, edited by the London Southbank University to be accessible to the general public, aims to spark the interest for realising, participating and promoting Research and Education Cooperation activities. The link http://www.form-it.eu/examples.htm on the *Form-it* website leads to outstanding examples of RECs that can be accessed by science subject, age of learners or the country where they initiated. It contains a rich and innovative resource for teachers wishing to make science education meaningful using cutting edge research, and is of high interest for researchers and persons curious about the variety of the presented cooperation activities.

## 2.4 The International Conference "Bridging the Gap between Research and Science Education", Vienna, March 2008

The International Conference "Bridging the Gap between Research and Science Education", from 12th to 14th of March 2008, in Vienna was an important milestone in order to exchange national experiences in science education, to develop a common strategy for Research and Education Cooperation in Europe and to build strong partnerships for future cooperation and research in this area. European and non-European experts gave inputs and the project results were discussed and evaluated in four workshops. These support activities facilitated the exchange of experiences and it helped to stimulate the scientific discussion as well as to define relevant research topics beyond FP 7.

120 persons from 17 European and non-European countries (amongst others Australia and Japan) joined the conference. This high international participation shows the huge interest in innovative teaching methods. About 70 participants directly involved in the field of teaching and learning in schools contributed to the conference.

At the conference, plenary sessions and four workshops were held. Key notes led into the specific topics of Research and Cooperation activities. A poster session, an interactive exhibition of the Good Practice REC examples and two performances of Good Practice Examples of RECs dealt with the benefits and challenges of REC and gave an all encompassing insight in RECs and their environment.

The objectives of the conference were to:

- discuss Research and Education Cooperation as a new approach to science education and to compare different cooperation models,
- jointly reflect on quality criteria for different forms of Research and Education Cooperation,
- outline strategies about how to implement Research and Education Cooperation into a modern education and science system on a broader basis and to
- discuss recommendations for policy makers and stake holders.

Four workshops focussed on different aspects of Research Education Cooperation. Members of the *Form-it* consortium acted as workshop leaders. International experts in the field of Research and Education Cooperation or partners in cooperations from the Good Practice Catalogue were invited to give input to the workshops. The workshop leaders invited contributions from attending teachers, scientists and industry representatives. The workshop topics were:

- Workshop 1: What are good practices of Research Education Cooperation? ("Good Practice")
- Workshop 2: How to realise good cooperation projects? ("Implementation")
- Workshop 3: Could a REC be an element of modern science education? ("Education")
- Workshop 4: How to use a single REC project to move the system? ("Curriculum")

In preparation for the poster session a call for posters had been launched in December 2007. The interactive exhibition of 22 reviewed posters and 20 posters of the Good Practice Examples gave an impression of the variety of possibilities within REC. The consortium and their school partners and representatives of Good Practice Examples prepared posters that were presented and discussed within the exhibition. To initiate discussions the posters were presented in the foyer, where coffee breaks were arranged, giving participants numerous occasions to read and discuss the posters.

The abstract of the posters and the presentations and summaries of the workshops are assembled in the Conference Proceedings (editor Austrian Institute of Ecology). All the contributions to the conference are available on the project website www.form-it.eu including a slideshow of the conference, the print version of the proceedings can be ordered.

## 2.5 Practical Guidelines for teachers and researchers and Recommendations for Policy-makers

The Practical Guidelines are addressed to teachers / schools and researchers / universities and aim to support them in starting and maintaining successful Research and Education Cooperation activities. Based on the discussions of the National surveys, the framework 'Evaluation of Research and Education Cooperation (REC): Evaluation areas, project phases and criteria' (Picture 1) and the Good Practice examples within the *Form-it* consortium a set of guidelines was compiled in order to support interested research and educational partners in setting up cooperations as well as improving existing cooperations. The Practical Guidelines include references to the national initiatives of countries participating in the *Form-it* project and to outputs of the project – the "Report on Research and Education Cooperations in Europe" and the "Catalogue of Good Practice Examples".

The main **recommendations to policy-makers** on national level:

- Systematic development and spreading of **model initiatives** and **networking** by the educational authorities and science administration
- **Supply of resources**, e.g. **a time compensation model** for the working time in a cooperation project in order to relieve the teachers and scientists involved as well as **financial support** to secure the sustainability of cooperation activities
- **Integration** of Research and Education Cooperation as a **fixed component of school education** at all ages.
- To include Research and Education Cooperation projects in the research and educational **political discourse** and consider this innovative approach for the improvement of science education in future policy papers may create **support structure**.
- Intensify **research** and **evaluation**: research in the field of Research and Education Cooperation should be intensified and the project partners should be encouraged to implement self-evaluation.

The main recommendations addressed to the European commission are to:

- create **standardised general conditions** for a regular cooperation between educational and research institutions in the field of science and technology
- make the **efficiency** of Research and Education Cooperations **visible**
- transfer the **Good Practice Model** throughout Europe
- promote **international linking** of participants: Cooperation between experts should be continued and further intensified across national borders
- initiate **research** and **evaluation** of Research and Education Cooperation projects at EU level and supporting this with financial resources for obtaining and spreading knowledge about the efficiency of Research and Education Cooperation.

The Recommendations for Policy-makers show that the spread and support of the Research and Education Cooperation model is desired and recommended in order to contribute the problems identified in the area of S&T.

Both documents, the Practical Guidelines for Teachers and Researchers and the Recommendations for Policy-makers were edited by Freie Universität Berlin - Arbeitsbereich für Erziehungswissenschaftliche Zukunftsforschung (Institut Futur) and are available in print in English. They can be ordered or downloaded at the project website www.form-it.eu. For more efficient dissemination on national level several translations have been produced – the Practical Guidelines to German, French, Slovakian, Spanish and Romanian; the Recommendations for Policy-makers to Italian and Romanian.

## 2.6 Paper on future research issues

Many questions within the field of innovative didactics in science education still remain unanswered. Some of these questions were identified within the work of the *Form-it* project and formulated in a Joint Research Report, the **Paper on future research issues.** This catalogue of research issues aims to support the development of joint EU research projects related to Science and Society within 7th Framework Programme.

# 3 *Form-it* and the area of science education

## 3.1 Supporting the implementation of Research and Education Cooperation in the educational system

A main objective of *Form-it - "Take Part in Research"* was to increase the efficiency of national and European science education strategies by identifying and promoting the success factors of Research and Education Cooperation Projects (RECs) in Europe.

In Austria, continuous development of national Research and Education programmes is supported by the Ministry of Science and Research, the Ministry of Traffic, Innovation and Technology in cooperation with Ministry for Education, the Arts and Culture: *Sparkling Science* (Ministry of Science and Research) and *Forschung macht Schule* (Ministry of Traffic, Innovation and Technology in cooperation with Ministry for Education, the Arts and Culture). These programmes show the structural implementation of Research and Education Cooperation in Austria and rely partly on the experience of *Form-it*. As the Ministry of Science and Research and the Ministry of Education, the Arts and Culture are members of the *Form-it* consortium, the structural implementation of the programmes www.sparklingscience.at and www.forschungmachtschule.at, synergies between *Form-it "Take Part in Research"* and the programmes are achieved.

The 10-years funding program *Sparkling Science*, supports in the first call of the year 2007/08 projects embedding 4.000 students directly and 11.000 indirectly. About 140 Teachers and 130 researchers are cooperating with students and schools in more than 90 Research and Education Cooperation activities in various disciplines. The initiative *Forschung macht Schule* supports cooperation projects between research and educational institutions, embedding children from kindergarten ages to final secondary schools and is focussed on the natural and technical sciences.

## 3.2 Networking

Experts from non-European countries are integrated in order to know more about top innovative programmes from outside Europe and to initiate an exchange of experiences. Networking within national, European and international networks is an essential strategy tool for accelerating the implementation of Research and Education Cooperations in the European context.

*Form-it "Take Part in Research"* supported networks on national and international level, for example the German network GenaU http://www.genau-bb.de/ that cooperated with the project. *Form-it* has close connections with the international network of Environment and school initiatives ENSI, www.ensi.org, and the EU supported network programme "SUPPORT Partnership and Participation for a Sustainable Tomorrow", http://support-edu.org. Both networks programmes provide a platform for carrying on *Form-it* objectives and for dissemination of its results beyond the end of the project.

Within the Support network, study visits (former Arion, www.studyvisits.net) are hold. These consolidated study visits programme for education and vocational training specialists bring together education and vocational training specialists and decision-makers. They are stakeholders who want to examine a particular aspect of lifelong learning in another participating country. *Form-it* held a workshop within the study visit (organised by the Austrian Ministry for Education, the Arts and Culture) where the possibilities to realise Research and Education Cooperation activities within their educational environments were discussed. The objective of the *Form-it* workshop was to launch a discussion on the possibilities, challenges and environment of Research and Education Cooperation activities and to present the results of *Form-it*.

The project results were presented within the PREPARE network in the newsletter and in various network meetings. PREPARE (Preventive Environmental Protection Approaches in Europe), www.prepare-net.com, is an informal, independent European network of experts including Turkey and UNIDO and UNEP in the field of cleaner production and sustainable development. The members come from research institutions, administration, governments, industry, and international organizations. PREPARE stands for the joint development of new ideas and initiatives in the area of

cleaner production, sustainable products and systems, and exchange of information and dissemination of knowledge and skills, the stimulation of innovative R&D projects and cooperation between research, administration, industry, and international organizations.

*Form-it* created a network between institutions and networks on national and international level. Institutions and initiatives that deal with new didactic models and education research or with Education for Sustainable Development are partners in this network as well as universities and research institutes, universities of education and promoters and ministries. All of them have a common agenda: to spread and support this new didactic approach.

## 3.3 Dissemination activities on national and international level

The consortium partners have engaged in many dissemination activities nationally and internationally to increase the awareness of REC within the community of science education, within the educational sector and teacher training. For the dissemination activities project information folders and posters have been created. The project website www.form-it.eu assembles the content of the project and presents all available project results, many of them translated into more than one language.

The international dissemination has consisted of:

- Stands, presentations and posters at international, such as the International Conference "Working together on Education for Sustainable Development", in Bordeaux in October 2008; 8th annual Campbell Collaboration, in Vancouver Canada, in May 2008; Science on Stage in Berlin, in October 2008.
- Meetings with international participation, organised by partners of the consortium or with contribution of partners of the consortium
- Spreading dissemination results within the international networks of the consortium and/or participating in network meetings as mentioned above.
- Contacts to universities, political stakeholders and networks in the USA, Canada, Australia and Asia are used for spreading the results and know-how exchange on the topic of RECs by direct mailing to personal and institutional contacts.
- Publications for international peer-reviewed Education journals are planned. Similar publications have already been realised on national level, for example in Italy and the Netherlands.

## 3.4 Conclusions

Scientific literacy is essential for active participation in the high-tech knowledge society. The interest of young people in the field of science and technology (S&T) is, however, rather low – this holds true in particular for girls. The result is, among other things, a low participation in scientific-technical studies – with differences in several countries as regards subjects and participation. Action is needed to inspire the next generation for S&T and to meet the requirements of the knowledge society in the long term. Therefore changes in the present scientific education are necessary. Among others, a stronger problem-based and inquiry-based education is needed in order to encourage children and young people to deal with scientific-technical questions (cf. European Commission 2007).
The model of Research and Education Cooperation is potentially an ideal interface between research and education. It allows a direct contact between researchers and pupils as well as between researchers and teachers. Pupils experience science in context and get an authentic picture of scientists and scientific work. While researchers receive an insight into the reality of the school and learn how to pass on their knowledge to society, teachers can establish their expertise as mediators between the scientific world and the pupils' world and enhance their knowledge of up-to-date research and innovative teaching methods.
Research and Education Cooperation projects should be supported robustly and systematically as an integrated part of how European educational systems connect with science in future. In the view of the

*Form-it* consortium the aim should be that pupils of all ages and backgrounds, girls and boys, should be able to repeatedly experience Research and Education Cooperation during their school education.

*Form-it "Take Part in Research"* demonstrates that Research and Education Cooperation is an emerging and dynamic form of education that can significantly contribute to increasing the interest of young people in science. Both, the framework in which these cooperation activities are placed in and the relations within them, are essential factors in this new didactic concept that helps the educational system to close the gap between science and education.