European Councill. Lisbon, March 2000

- The EU must become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion.
 That includes not only the transforamtion of the economy, but also a challenging programme for the modernisation of social welfare and education systems
- By 2010, Europe should be the the world leader in terms of of quality of its education and training systems

Objectives by 2010

- All MS should halve the rate of early school leavers and reached 10% or less
- Halve the level of gender imbalance among graduates in MST whilst increasing the total numbers
- Ensure an average % of 25-64 years old with at least upper secundary education of 80% or more.
- Halve the % of low achieving 15 year old in reading mathematical and scientific literacy
- The average of participation in LL of the 25-64 age group should be at average 15%

Firts evaluation, November 2003: Urgent reforms needed

- Efforts are being made in all countries, but the objectives will not be attained
 - Take-up of LLL is low
 - Levels of failures at school and social exclusion remain high (high social and economic cost)
 - No sings of substantial increase of overall investment in human resources
 - EU suffers particularly from low private investment in higher education compared with competitors
 - No evidence of better use of existing resources

A scientist at work



Views about scientists

Bay Morway

6. Forskere i arbeid

1028

. 1



Skriv	
Skriv noen ord o	om hva du tror forskere gjør og hvilke saker de arbeider med
Delas	tor de absprimenter
Oge	sag og drene den!
ME	a unible de mont
100	10 00 Atom Bomber

- "I think they experiment
- with animals
- and kill them.
- And then they develop
- poisonous gases
- and atomic bombs''

Possible reasons.

- Outdated curriculum.
- Science is difficult and « untrendy ».
- Lack of quality teachers.
- Anti- and quasi-science alternatives.
- Stereotypical image of scientists and engineers.

Possible reasons.

- Disagreement among researchers is perceived as problematic.
- Problematic values and ethos of science.
- Dislike of an overambitious science?
- The new image: Big Science and Techno-science.
- Scientists and engineers: no longer heroes?
- The new role models: Not in S&T.
- The communication gap between scientists and the public.

S&T in schools

General findings:

Science teaching is old fashioned carrying an implicit image that science is mainly a massive body of authoritave and unquestionable knowledge.

- Textbook science has no deeper meaning or relevance for the learners and their daily life. The content is often presented without being anchored to social and human needs, neither past or present.
- Science is seen as demanding and difficult.Science is not seen by youngsters as valuable enough to do this effort.
- Science has to compete with other subjects that have more meaning or relevance: less authoritarian with place for oipinion and feelings of the learners.

Commission's statement

- The average age of science professionals is rising, partly due to demographic trends, but also due to career choice amongst young people.
- The process of choosing a science-based or science-related career is characterised by a series of opinion-forming influences and experiences, the choice of subjects at secondary level, and choices on entering tertiary or further education. The **quality and effectiveness** of primary and secondary level education have a great impact on this decision process.
- However, recent analyses reveal that the falling interest among young people for science studies and careers can be attributed in large part to the lack of appeal of study courses at school. Science is perceived as uninteresting and difficult, and so it is not surprising that young people acquire a negative attitude towards it.

Commission's statement

- The purpose of this call is therefore to support actions that identify and disseminate methods, techniques and good practices aimed at enhancing science teaching in schools across Europe through activities and approaches that complement formal curricula.
- The scope of the problem the number of science teachers, the number of pupils, different teaching methods and syllabi demands measures able to have an impact on a commensurate scale. Ways must be found to mobilise of existing resources and networks, as well as all the professions that have a stake in the development and use of science skills.

Objectives of the call.

- The focus will be on providing a mechanism for allowing science teachers, science professionals, education specialists and associated expertise from across Europe to exchange ideas, techniques, and methods to supplement existing science curricula and educational strategies in order to increase the attractiveness and relevance of science studies at schools. The action must involve existing science teachers networks and the use of internet resources to ensure the widest possible dissemination of the shared and newly acquired knowledge among the science teaching profession and associated professions. Proposals must provide an openly accessible resource infrastructure.
- Applicants must also be able to demonstrate an **understanding of how science is taught**, and must be able to combine expertise across relevant professions (science education, research, technology, industry). Proposals should take a broad view of science, including its social context.





pencil - transforming informal science activities into innovative quality tools for science teaching

Pilot projects on new ways to conduct science teaching

Resource centre for informal learning: state of the art and best practices

European science education portal: an on-line reference for innovative teaching

a new **Science Teachers Network** will result thanks to the interactive work between the 3 action lines





consortium

19 partners organised in 3 categories

Science centres, museums and aquarium: 14 institutions open to the public monitoring the pilot projects.

Networks: ECSITE and EUN, key roles in the project's development.

Academic partners: 2 Universities supporting the development of the Resource Centre (with the support of 2 Ministries of Education).





pilot projects - creating new ways and practices on science teaching

The core of the local project is a **science centre/museum** that groups a number of **schools** and a large part of the science professional field: associations of teachers, laboratories, authorities, etc.

Each science centre/museum will experiment either a new technique or a scientific topic.

14 pilot projects

- Large variety of subjects
- Local European dimension
- Small Big institutions





resource centre - establishment of criteria of innovation and quality (CIQ)

State of the art in informal learning - Seminar Launch

Asses the pilot projects: theoretical background, analyses, new examples of best practices

Evaluation of the projects: definition of CIQ

Motivation Study

- youngster's motivation about science today
- •informal teaching methods influence in career choice





european science education portal

Gateway to scientific learning **resources**, news, projects and practice: acces to results, evaluation, CIQ...

Communication and collaboration platform for science teachers: discuss and exchange experiences

New created science teacher's training: methodologies, technology tools, materials

Management and communication tool of the project





Pilot project 1: National Aquarium, UK

Marine Issues with climate change



To encourage the inclusion of 'climate change' as a part of national curricula and in informal education

Experiment with new teaching approaches, suggestions for modules

Creation of 'Climate-Lab' (database information, interactive manipulation of data...)





Istituto e Museo di Storia della Scienza

permanent european resource centre for informal learning

Pilot project 2: Istituto e Museo di Storia della Scienza (Firenze, Italy)

On-line Acces to History of Science Museums « Objects »



To make the objects of museum collections understable by school

Creation of an interactive laboratory on music and science: Vincenzo and Galileo – Music for Science

Creation of multimedia applications (3 sections: *History, Explore and Simulation*)





Pilot project 3: Exploradôme (Paris, France)

Middle School Student's Use of ICT in Science Learning

To make technology closer to teenagers, specially those from underprivilegied social classes

Development of projects including science and multimedia Creation of a multilingual website with students and teachers products Creation of a website for teachers self learning





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Pilot project 4: Heureka (Vantaa, Finland)

Chemistry for primary schools



To create science education materials by provinding the best content already tested in science centres

Children's Laboratory – development of 5 educational chemistry programs: Bubling Chemistry, Detective Laboratory, Colorful Chemistry, Water Analisys and Rock Examination.

Promotion of new strategies to spread best practices within the use of science centres and schools: handbooks, directories, guides.





Pilot project 5: Nemo (Amsterdam, The Netherlands)

The school's science center.



To develop R&D skills at basic level via an Integrated programme combining in-school lessons and informal learning

Test of the pre-assumption of a higher effectiveness of an Integrated approache vs In-schools curricula only.

Selection of the critical factors for a succeful adaptation of hands-on science curricula.



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Pilot project 6: Deutsches Museum (Munich, Germany)

Mobility Issues with Climate Change



To create a basic understanding of problems and methods of fields of science and technology which are relevant for major political decisions

Setting up of an exhibition « Traffic and environment » and an existing website including interactive activities and games

Development of new school programmes to extend the climate exhibition visits

Organisation of workshops with scientists and politicians



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Pilot project 7: Experimentarium (Copenhagen, Denmark)

FUSE Future Science Education



To prepare an innovative way to increase the attractiveness of science studies and to create new ideas and methods that supplement the existing science curricula

Picked topic: food-technology, health and exercise.

Participative approach: teachers and students design and develop the project, peer to peer.

Creation of a Virtual learning platform: support resources for students



Pilot project 8: Pavillon of knowledge - Ciência Viva (Lisbon, Portugal)

Ludo-Mathematics

pencil



To develop a systematic analysis on the efficency of hands-on tools in the (mathematics) classroom and spreading of best uses and pedagogical practices.

Organisation of the annual program of workshops for teachers on the use of hand-on materials to teach specifical mathematical fields

Creation of a web-page and on-line forum of discussion of best practices

Creation of a virtual library of hands-on tools (games, gadgets, exhibits)





Pilot project 9: Fondation IDIS-Città della Scienza (Naples, Italy)

Social dimension of Science, Diversity and Gender Issues



To experiment with educational practices on the social dimension of science in order to contrast the image crisis of science specially in young people

Development of new competences in teachers and museum educators

Promotion of critical thinking among the students (activities in school will be transformed in multimedia products displayed in the science centre)

Organisation of several meetings involving students, teachers, professionals, scientists



מוזיאון המדע ע"ש ברנרד בלומפילד ירושלים (ע.ר.) מיסודן של האוניברסימה העברית בירושלים והקרן לירושלים BLOOMFIELD SCIENCE MUSEUM JERUSALEM متحف العلم على اسم بلومفيلد القـ رس

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Pilot project 10: The Bloomfield Science Museum (Jerusalem, Israel)

Health matters

pencil



To establish an essential and on-going link between schools and the Science Museum

Development of up-to-date **teaching tools** to raise the interest and awareness of young students in health

Survey and analysis of health-related activities in Europe and Israel

Organisation a year-long course for teachers

Creation of a website: communication tool and learning materials resource



Pilot project 11: Cité de l'espace (Toulouse, France)

Future technologies



To link the curriculum of formal education with contents of the exhibition « Mission Biospace » by

<u>Cité</u> de

espace

Connecting the formal education subjects (math, physics, life science) with the current technological research (AI, nanotech)

Testing several learning materials (interactive boards, voting devices, E-learning,...) used during the visits

Analysing the elements that renew the perception of children about science by living an experience in a scientific centre



Pilot project 12: Technopolis (Mechelen, Belgium)

Interactive forensic Science: Whodunit?



Familiarise children and teachers in an interactive and informal way with different aspects of forensic science.

TECHNOPOLIS

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Creation of an interactive website Promoting the use of interactive exhibits Preparation of a kit for use in the classroom







Pilot project 13: Universeum, Goteburg – Technikens hus, Luleå (Sweden)

Learning for a Sustainable Society



To develop and test a new method to co-operate between science centres, schools and society

Development of a school program, starting from pupils curiosity

Use of unique science centre competences, environments and exhibitions, unavailable to the schools: talks with decision makers

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Pilot project 14: Ellinogermaniki Agogi (Athens, Greece)

The Virtual observatory



To develop a better understanding of the opportunities which are associated with e-learning methods, contents and resources and their impact in education

Evaluation of the educational perspectives of the use of robotic telescopes in secondary education: website, educational materials and VO activities

Adaptation and improvement of these perspectives for an innovative method for science teaching





University of London

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resource centre - King's College and University of Naples



pencil



To identify the criteria of innovation and quality (CIQ)

Desk research and CILS international meeting: launch seminar and pre-evaluation of pp

Evaluation of 14 pp: definition of CIQ

Science Teachers Conference: validation of CIQ

Establishment of the needs for educators training quality

Motivation survey - To identify the elements that change youngsters attitude towards science

Comparative educational research in 12 EU + 5 new EUcountries

Intrinsic and extrinsic motivation: theoretical background

Pre-tests \rightarrow post-tests \rightarrow delayed post-tests

A framework for evaluation



University of London

- How do stakeholders needs affect the project?
- How do you use lessons from best practices?
- What is the science content and what model of science is portrayed?
- How do partners implement wise decisions?
- How does the project monitor its work?
- To what extent does the project promote social justice and equity?

A framework for evaluation



University of London

- What are the teaching approaches and how do you intend to identify effectiveness?
- How do you add value to PENCIL and the wider education community?
- How are barriers to effectiveness identified and addressed?
- What models and theories are implicit and explicit in the project?



permanent european resource centre for informal learning

european science education portal

- Cutting-edge dynamic **multi-lingual hub** for teachers, science educators, scientists, researchers and learners
- **Online communities** with project monitoring, collaboration and participation tools
- Underpinned by international editorial team and European science teacher network
- Online events and content: training workshops, best practice, teaching and learning resources, learning objects, news, online collaborative activities and projects



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european science education portal

- Learning Management System and Content Management System
- Advanced communication tools, video streaming, collaborative publishing tools
- Standards-compliant metadata solutions for resource repositories
- Decentralised interoperability approaches for content provision
- Leading-edge data harvesting techniques
- Schools evaluation and validation