

Summary:

development of educational activities in collaboration between museums and schools

Aims:

improve science education in school through the collaboration between science museums and teachers

Main activities:

interactive activities

Narrative:

SMEC is an EU-funded project coordinated by the National Museum of Science and Technology Leonardo da Vinci and the Deutsches Museum. The main aim of the project is to encourage the use of the museum as educational resource for the teaching and learning of science in primary schools, and to contribute to the training of teachers for the development of competence and expertise in using museums.

In particular, the activities aims to:

- a. encourage collaboration between educational institutions and museums for improving training practice and raising the quality of school teaching and learning;
- b. develop pedagogical methodologies and resources for producing, acquiring and applying knowledge in science, to be used individually or jointly by schools, training institutions and museums;
- c. offer support to the teacher in terms of his/her professional development and delivery of the subject in a competent and confident way that can also encourage the creative development of the pupils;
- d. improve museum provisions in order to make museums more effective training and teaching resources;
- e. develop a European dimension through sustained, long-term collaboration between trainers, teachers

and museum educators across countries;
 f. contribute to raising teachers' and pupils' awareness of the shared European scientific heritage;
 g. through various activities and dissemination of educational material encourage communication and collaboration, as well as reflection and debate in the fields of science education, teacher training and museum education.

Target groups

The target groups are primary school teachers, head teachers, advisory teachers, teacher trainers and museum educators. The project aspires to reach not only members of the partner institutions, but more widely educational staff in schools, training institutions and museums in different countries, mainly through the production of educational materials in several languages and by its annual European training course.



Teachers resources

- a. Manual for teachers on teaching science with museums

An introductory book, joint publication of the partner institutions presenting methodological and pedagogical approaches to in-service training in the sciences. It is intended for use by teachers, teacher trainers and museums that want to work explore the collaboration between schools and museums.
www.museoscienza.org/smec/book.html

- b. Manual of good practices of collaboration between school and museum

Educational materials for use by teachers and museum educators in the context of educational projects devised for use of science and natural history museums. The materials propose activities for teachers.
www.museoscienza.org/smec/manual.html

- c. In service teachers training course
- A European in-service training course starting in 2004, and open to teachers and museum educators from all over Europe. The course in 2011 reached the Fifth Edition.
<http://www.museoscienza.org/smec/courses.html>

End user: primary and secondary teachers and museum explainers	Where to find the application or case: www.museoscienza.org/smec/project.html	schools and museums. The studies used observations, questionnaires and testing of the SMEC tools. This best practice has been certified by the internal evaluation of the Museo Nazionale della Scienza e della Tecnologia "Leonardo da Vinci"
Involved actors: teachers, museum staff	Evaluation parameters: Evaluation took place through questionnaires, observations and informal discussions among the staff and with the teachers. The evaluation focused on how to implement the activities in schools and museums in different countries and how to profit from the collaboration between	Duration: open ended.
Location: Deutsches Museum Munich		Additional information or resources: www.museoscienza.org/smec/book.html www.museoscienza.org/smec/manual.html
Connection with the curriculum: multidisciplinary		
Languages available: Italian and English		

Teachers' Competencies

1	subject matter/content knowledge	x
2	nature of science	x
3	Multidisciplinary	x
4	knowledge of contemporary science	x
5	variety of (especially student-centred) instructional strategies	x
6	lifelong learning	x
7	self-reflection	x
8	teaching/ learning processes within the domain	x
9	using laboratories, experiments, projects	x
10	common sense knowledge and learning difficulties	
11	use of ICTs	x
12	knowledge, planning and use of curricular materials	x
13	Information and Communication Technologies with Technological Pedagogical Content Knowledge	

Mapping best practices with main principles



1. Building interest in natural science phenomena and explanations:

The training course is built on a scientific topic and its applications. Through exploration, experimentation, observation, collection of data, development of hypotheses, through first hand involvement of the teachers, the course aims to raise interest in science and technology. Discussion in group aims at developing explanation of the phenomena observed.

2. Building up informed citizens:

Students understanding the nature of Science & Science in society:

Participants are called to understand their own contribution as citizens, the importance of their own participation and critical opinion and how their own choices create an impact on how science and technology are perceived and integrated within society. Moreover, in the course scientific evidence is discussed in connection with ethical, social and legal issues.

3. Develop multiple goals:

- understanding big ideas in science including ideas of science, and ideas about science
- scientific capabilities concerned with gathering and using evidence
- scientific attitudes

Teachers investigate scientific phenomena with interactive activities. They are able to explore notions, phenomena, principles and transformations; they also use the different phases of the scientific method. This allows them to deepen into the science process which means build a scientific knowledge about a range of topics, but understand also how science works and what scientific research means.

4. Understanding students' concepts and learning style about of science phenomena:

The courses aim on the development of knowledge and skills in teachers but concentrate also on a metacognitive reflection, focusing on teachers as learners. On this basis, teachers are also invited to examine their own students' learning and involvement in science as well as problems they might face with the students.

5. Relevance of the content to daily life of students:

The choice of the topic is based not only on its scientific importance but also on its relevance with daily life. Also, the educational methodology adopted by the Museum in the training course (as well as in its education programs) puts at the centre the personal experience and knowledge of each individual. This means that everyday life experience of students is one of the main tools on which training builds. Moreover, the problem solving activities require teachers to use their background knowledge and consequently think of the students' own background.

6. Understanding science as a process not as stable facts. Using up to date information of science and education:

Understanding science as an on-going, not consolidated process emerges from the very activity of experimenting and testing carried out by teachers during the course. On this basis teachers are also encouraged to consider the process they chose to use in order to solve the problem and to collect data in order to confirm or not their hypotheses.

7. Activities for gaining knowledge, not for entertainment, nor for simple imitating of results:

The training course is based on a mix of activities which aim to develop subject-knowledge and skills in science and technology also through the use of interaction, confrontation. the course explores a specific topic not only in terms of its scientific and technological dimensions but also in relation to society, to everyday life and to individuals and the use of emotions. We know that the personal and emotional involvement of participants in the learning experience maximizes the probability for effective learning.

8. Doing science: experimenting, analyzing, interpreting, redefining explanations:

The activities starts with an open scientific question posed by the museum trainer. The teachers conduct experiments to explore different answers following observation, data collection and interpretation, development of prediction and discussion of scientific ideas. The scientific method is the basis of all the work done.

9. Assessment: formative ~ of students' learning and the summative ~ of their progress:

The museum is a informal environment of learning and has a role which is complementary to that of the school. Consequently, visitors' learning is not assessed like in schools. We do not use structured tools or processes for assessing the learning experience of our visitors (schools in this case) as this is not part of our education priorities Informal, personalised, meaningful experiences for each person in a different way is the priority of our education programmes. At the same time, we run self-reflection sessions among education staff in order to analyse how our programmes are developed (education methodologies) and how interaction with the public takes place. The formative and summative assessment are left to the teachers.

10. Cooperation among teachers and with experts:

The training course builds close collaboration between museum experts and teachers as well as collaboration between teachers themselves. This collaboration continues also after the end of the course through update of training or distance support. Moreover, professionals from companies or universities with expertise in different fields are involved in the training. The teachers appreciate very much the discussion with the different experts.