SETAC

PATHWAY

Summary:

Collaboration between formal and informal education institution to support science education as a tool for citizenship

Aims:

support both teachers and students in becoming socially-responsible citizens by improving skills and abilities to engage with socio-scientific issues.

Main activities:

interactive activities, survey on motivation, recommendations for practitioners, pedagogy document, teacher resources

Narrative:

SETAC (Science Education As a Tool for Active Citizenship) is funded by the European Union Lifelong Learning Programme and focuses onscience education as among the fundamental tools for developing active citizens in the knowledge society. It is aimed at teachers, students, museum explainers and explores the themes of Health, Energy, Climate Change.

The project is coordinated by the National Museum of Science and Technology Leonardo da Vinci in Milan, Italy within a consortium of by 8 partners consisting of institutions in the field of formal and informal education (schools, museums, teacher training centres, universities) from 5 European countries (Belgium, Denmark, Germany, Italy and Hungary).

The products of the project have been developed for teachers and education professionals and are free to download from the project website.

1. New pedagogy for science education

The pedagogy suggested by SETAC draws on different fields (psychology, museum education, scientific research, civic responsibility) and methods (observation, inquiry, experimentation, chidren'smisconsceptions, authentic questions, dialogue and debate) and considers museums and science centres as fundamental resources.
www.museoscienza.org/setac/resources.asp

2. Teaching resources

The partners devised a series of activities for schools focusing on health, energy and climate change and using inquiry, debate and direct participation in experiments. The activities aim at developing contents, awareness of the role of science in contemporary society, and at stimulating the engagement of young people in dialogue about science. These have been tested with schools in each country and produced resources available for wider use.
www.museoscienza.org/setac/activities.asp

3. Better understanding of student's motivation in dealing with topics of science

A survey of primary and secondary school students was carried out by the partners aiming to understand motivation and its role in engagement with science.
www.museoscienza.org/setac/resources.asp

4. "Quality Science Education: Where do we stand? Guidelines for practice from a European experience"

This is the concluding manifesto that presents the results of the SETAC work in the form of recommendations for practitioners working in formal and informal science learning institutions.
www.museoscienza.org/setac/resources.asp

End user: teachers and museum staff
Involved actors: teachers and museum staff
Location: school and museum
Connection with the curriculum: multidisciplinary
Languages available: English
Where to find the application or case: www.museoscienza.org/setac/default.asp

Evaluation parameters: Evaluation took place through two specific actions: research of students' motivation in science and research of students' misconceptions. The studies used observations, questionnaires and testing of the SETAC tools. This best practice has been certified by the internal evaluation of the Museo Nazionale della Scienza e della Tecnologia "Leonardo da Vinci"

Duration: 3 years
Additional information or resources: www.museoscienza.org/setac/resources.asp www.museoscienza.org/setac/activities.asp www.museoscienza.org/setac/resources.asp www.museoscienza.org/setac/resources.asp

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 education activities, the games and the materials for the teachers (quality guidelines, authentic questions, misconceptions) are all focused in makding a difference for the relationship between students, science and technology.

2. Building up informed citizens:
Students understanding the nature of Science & Science in society:

The project – therefore all outputs – had as a prime objective to enhance active citizenship in relation to science and technology so all materials and outputs were focused to meet such objective. The main tools for that were: active engagement and discussion of science and technology, involvement in issues of current research (health, climate change, energy), experimentation and exploration of the scientific method, connection of science and technology with the social context and implications.

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**

Activities, tools and resources deal with scientific method and science contents. They also invite students to engage actively with specific topics of science – health, energy, climate change, which they explore developing skills and competences, such as observation, problem-solving, development of hypothesis and testing, etc.

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

A specific study on students' misconceptions and on their motivation in science (published on-line) has given the basis for understanding.

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

All resources have been based on the relationship between science and everyday life.

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

The best resource to look at for this is the study on children's misconceptions and also MyTest. Also the education activities that have been designed invite students to experiment actively and reflect on their mistakes.

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

All activities combine knowledge building and enjoyment. Active involvement means using students' everyday experience and already acquired knowledge, therefore also involving their imagination, emotions, interests and personalities.

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

All resourses proposed by SETAC build on this.

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

The project is built on the informal learning approach (through the use of museums and science centres) therefore assessment of students' learning is not among the priorities. However, the project included two research studies which focused on students' misconceptions and on their motivations in science. The studies looked into these concepts and also evaluated how SETAC contributed to their improvement.

10. Cooperation among teachers and with experts:

The whole project was based on cooperation between formal and informal learning institutions.