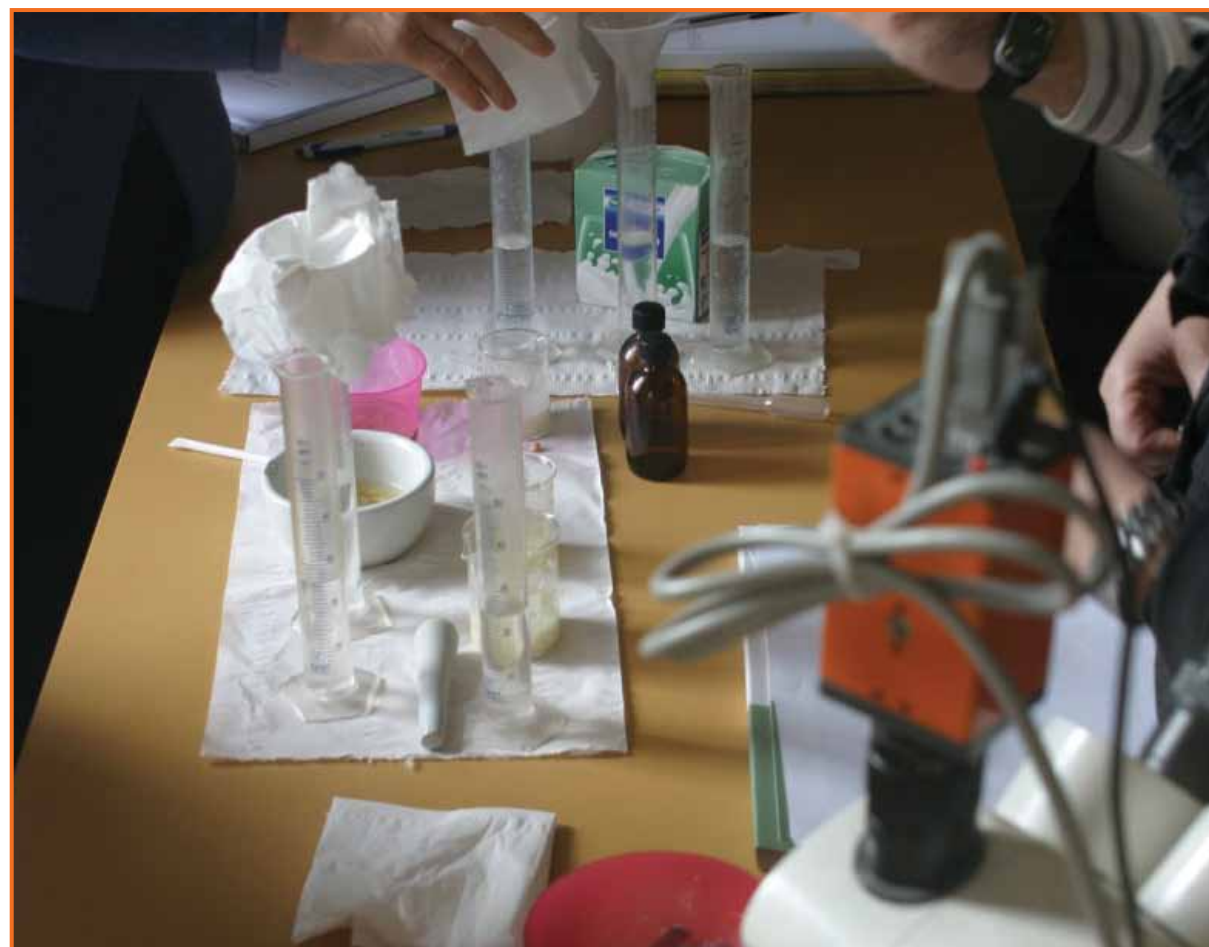


Science in practice



Summary:

The activities of the training course focus on methodologies for science education applied to different topics.

Aims:

To investigate science and technology and raise teachers' and students' awareness about food and correct lifestyle, to help teachers develop their role as facilitators of students' learning, to support IBSE

Main activities:

lab experiments and discussions about the topic

Narrative:

The aim of the course is to examine and experiment teaching and learning methodologies for science education helping teachers to strengthen their competences and role. For this, the course invests in the teachers as learners, as educators of the young and as reflective practitioners. Teachers contribute their own points of view to the discussion, bringing their personal experience to the development of the experiments. At the same time, they are called to think about their students' point of view and learning needs. In this, the parents can also be regarded as important agents, they often influence food choices. Their role in learning is discussed too. The learning and experimentation process within

the course starts with a question posed by the museum experts which leads to initial hypothesis, identification of the parameters to experiment and a first evaluation of the already-acquired notions by the participants. The teachers work in groups on the basis of the question and the hypotheses, aiming to find out the answers on the basis of the data collected through experiments. Group work allows for negotiation of choices, discussion of results, understanding of errors and (indirect) evaluation of the learning methodologies. The final results of the different groups are shared

among all the participants. At the end, museum experts facilitate a general discussion about the methodology adopted as well as about the topic itself. They encourage teachers to focus also on how to adapt the activities to the work in class. Sharing of experiences among the participants is an important part of the course. The teachers discuss among colleagues and with the museum experts sharing experience, solutions of possible problems and ideas for projects that integrate the topic of the course in the class activities.

Methods of learning/training:

inquiry, experimentation, collaborative learning, scientific method, discussion

End user:

in-service teachers secondary school
Involved actors: teachers, the Region of Lombardy authorities, private company

Location:

National Museum of Science and Technology Leonardo da Vinci

Languages available:

italian

Evaluation parameters:

Discussion with teachers. This best practice has been certified by the

internal evaluation of the Museo

Nazionale della Scienza e della Tecnologia "Leonardo da Vinci"

Duration:

2 days, 16 hours

Optimum number of participants:

20

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:

In this training course, interest on natural science phenomena is achieved through the focus on lab experiments on food, in particular milk. The topic allows teachers to deepen their knowledge on the scientific aspects of food and to understand the relation between science, the individual and society. Teachers are called to work and reflect at different levels, as individual learners and as facilitators of the learning of theory students. The tools used are practical activities, observing, questioning and investigating to stimulate their curiosity and the learning process.

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

The discussion about commercial products deriving from milk stimulates teacher and the students to become aware of how food is not an abstract scientific content but is part of our life and is influenced by the market. The course aims to show how food science and technology are part of the choices we make everyday –for example at the supermarket -- and how it is influenced by a range of different stakeholders.

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

Group work and negotiation as well as the hands-on scientific experiments help teachers - and later on students - to understand what is meant by scientific method and to develop skills for reasoning on the basis of evidence. This brings to an understanding of the issues addressed by science and scientists themselves, but also aims to encourage a scientific mode of thinking by people in their own lives. Food is a very common topic and also a scientific one. Teachers are asked to recognize the scientific and every day meaning of words referred to food, for example: additives, artificial, natural.

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

All teachers have a personal and social background knowledge about food. This is the starting point of all the activities. The training focuses on the connection between the participants' background knowledge and the activities experienced in the course all of which aim to develop a wider idea of science.

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

All teachers have a personal and social background knowledge about food. This is the starting point of all the activities. The training focuses on the connection between the participants' background knowledge and the activities experienced in the course all of which aim to develop a wider idea of science.

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

The experiments conducted do not always reach the results expected by the teachers. One of the most important learning tools in this course is the 'error' if treated in an adequate way. The error is addressed and analyzed by tutors and participants not only so that teachers can reflect on what did not work, but also in order to develop awareness of science as a continuing process.

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

Curiosity and enjoyment are used not as aims in their own right, but are integrated in the learning process as tools to gain new knowledge.

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

The scientific method in all its developmental phases lies at the basis of the training course, and is then brought into the teaching process in the classroom. It is used to analyze and understand the topic, it is used as a learning method for teachers as facilitators.

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 teachers collaborate with their colleagues and the experts of the museum during the course and after the course. On-line collaboration is not widely used among Italian teachers. All training courses are followed by structured meetings between museum staff and teachers, in order to offer additional support as well as by distance help each time is needed by teachers.

The collaboration between teachers and with the museum experts aims at solving common problems and adapting the activities proposed to their classes and their experience.