

"The Role of Museums in Science Education: Arguments from the Field and from the Case of the National Museum of Science and Technology Leonardo da Vinci"

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Abstract

1. The role of museums in science education is to:

- contribute informal education methodologies to build learning and understanding in science
- address all citizens and all learners, and engage them *directly* and *actively* in science-oriented experiences
- support teachers as facilitators of learning in the classroom and contribute directly to their training
- offer a range of resources to support the science curriculum
- support science-career professional orientation
- facilitate a direct relationship between the scientific/research community and citizens
- be an open arena for the debate on science.

2. Lessons learned

a) "Inquiry-based (science) education" (IBSE) is at the heart of museum learning at international level.

IBSE is a powerful method that can help both students and teachers build knowledge and understanding, and develop skills and competences in STEM.

At the same time, research and practice show that IBSE can also be an important tool for the development of 'knowledgeable citizens' and for promoting all 'arguments' of science (cultural, utility, democratic, economic, social, participative).

MUST implements IBSE in all its education programmes, especially in its 13 interactive labs.

b) Research in informal learning, in education trends and a constant educational innovation should be at the basis of the work of formal and informal learning institutions if these want to make a difference in science education.

After several years of practice and participation in EU-funded projects (on science education and on Science & Society), in 2009 MUST has launched CREI (the Centre for Research in Informal Education) aiming to carry out educational research and to develop resources for science education.

CREI does research in informal learning methodologies with the objective to reinforce learning and understanding in science.

Research started with IBSE but goes beyond that, to the following approaches:

- Science and Society (methods and tools for engagement in the science debate, including students and teachers)
- Tinkering and making (approaches for developing a scientific attitude, as well as experimental and digital-oriented skills)
- Engineering (Engineer-design process as a tool to problem solving).

c) Teachers are a key figure in science education and museums can play a fundamental role in their professional development. However, teacher training should not be seen as the mere 'transmission of information' but as the development of competences and skills and an inquiry-based attitude to science education.

Since 2005, MUST has a structured and extensive teacher training programme building on three levels:

- 'teacher as learner' in her own right, building knowledge and understanding in science
- 'teacher as educator', building teaching methods and skills for experimental work in the classroom
- 'teacher as researcher', reflecting on her own role as facilitator of learning.

d) Impact in science education means not only bringing innovative methods and tools into the curriculum, but also building relationships with stakeholders: from scientists to policy makers (advocacy).

MUST has an extended advocacy strategy for science education and citizen engagement, inviting stakeholders to experience methods and tools directly (for example in our interactive labs) in order to build personal experience and understand the value of museums for science education. This goes to scientists, researchers, journalists, policy-makers.

At the same time, impact and advocacy also mean that the museum can have a role in making researchers aware of the importance of communicating their work. In several occasions during European projects, MUST has been responsible for the training of researchers and for creating contexts and conditions so that the research community can directly engage with society.

3. What should be done in the future

a) Acknowledge the role of museums as facilitators of learning in science and as competent mediators in communication of science in society. Build further and more explicitly in museums' contribution to science education.

b) Promote cooperation between museums and the research community, acknowledging however that the two have diverse (although equally valid) competences that need to be seen as complementary.

RRI does not mean mixing roles: museums can make the difference in science education by building on their already-existing knowledge and expertise in communication and learning in STEM.