Project no. 511165

Permanent EuropeaN resource Centre for Informal Learning

Structuring the European Research Area

Science & Society – European Science Education Initiative

Specific Support Actions

Final Publishable Report

Period covered: from October 1st 2006 to September 30th 2007

Start date of project: October 1st 2004
Duration: 36 months

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Table of Content

1 CRITERIA OF INNOVATION 3

2 MOTIVATION SURVEY 3

3 ELEMENTS OF EVALUATION 5

4 ASSESSMENT OF PENCIL PILOT PROJECTS 5

Publishable results

1 Criteria of Innovation

This report presents eight criteria of innovation, which may be used to identify effective practice in science teaching and learning at the intersection between formal and informal learning contexts. The criteria are derived from the analysis and evaluation of the products and practices of the 14 pilot projects comprising Pencil, and as such build on findings presented in two associated reports, D10 and D31. This report has been prepared by researchers from King's College London, and the University Federico II, Naples.

To identify the criteria and their constituent indicators, researchers analysed data from the individual projects, but also referred to the academic literature wherein issues relating to science teaching and learning are discussed. In addition, the identification of the criteria was informed by the researchers' professional experience in the evaluation of formal and informal learning.

In developing the set of criteria, it is hoped that the innovative programmes pioneered by Pencil pilot projects may inform future partnerships between schools and informal science institutions.

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2 Motivation Survey

Science centres list their main goals with somewhat different words, but the key terms worldwide are as follows: the institute will advance public understanding of science, create positive attitudes towards science and technology, encourage – especially – young people to learn science and take up careers in science and technology, and maximise the opportunities in society for scientific applications. There is a need for evidence to show that these main goals will be realised in the everyday functions of a science centre.

It is important to address this issue in context because the various stakeholders such as relevant authorities, sponsors and visitors need to attest to the effectiveness of the science centre movement. Because they are – still – fairly new

institutions, science centres, in particular, face this question more frequently than other more traditional institutions. Additional data, with the focus on educational research and learning has to be the goal for any developing work at science centres.

The educational role of science centres has been considered more or less as self-evident. However, some classical educational theories can be detected in the principles underlying science centre education, although few educators in these institutions have been explicit in their approach. They have relied, rather, on the practical and common sense application of loosely formulated pedagogy. Everyday knowledge tells us that students are eager to have lessons in informal settings. Field trips, camp schools, visits to industry, to a museum or science centre, or even having an art lesson in the schoolyard, are positive occasions in students' minds. The big challenge is: can this situational motivation be ennobled into real interest into the topic as intrinsic motivation. In the Pencil project, fourteen science centres around the Europe were developing their educational solutions towards best practices to be delivered for large audiences inside science centres and schools via Xplora portal.

According to earlier findings in the literature, the purpose of this study is to investigate the following questions:

1 What is the motivational background of students visiting the science centre exhibition?

2 How does science centre visits affect the motivation of students?

3 Do well-planned visits to a science centre create deep or superficial learning strategies for the students?

4 Is there a difference in the motivational patterns of the students according their school success?

5 Are results of the gender differences in learning similar in school and in science centre learning?

These questions are practical for and relevant to the ways learning in a science centre is organised. However, they are also of wider theoretical interest. The study is designed to test the preliminary results received in earlier research testing the theory of intrinsic and instrumental motivation. Results can also describe the link between formal and informal education, and have potential applications in schools.

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3 Elements of Evaluation

The aim of this report is to present a series of findings emerging from the experiences gathered by Pencil's fourteen pilot projects in carrying out educational programmes at the intersection between formal and informal learning environments and methodologies. For each finding, we propose a recommendation by which future projects may build upon lessons learned throughout Pencil.

The contents of this report are based on a study of Pencil's fourteen pilot projects carried out by University of Naples and King's College London. The data sources include interviews conducted during two evaluation visits to each pilot project, online chats, discussion groups and pilot project internal evaluation reports. Findings and recommendations fall into eight categories covering aspects of interest in the pilot project, including relationships between key players involved in the projects, models and practice of teaching and learning adopted, use of evaluation tools and emphasis on issues of gender equity and social justice.

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4 Assessment of Pencil Pilot Projects

The aim of this report is to present a series of case studies illustrating the work of the 14 pilot projects, whereupon comparisons of common features or experiences may be made. This in turn leads to a set of generalised findings or conclusions about the nature of museum/science centre relationships with schools. Thus, whilst this report provides an assessment of each pilot project (acknowledging the local context in which the projects operated), the emphasis is on the identification of effective practice which may inform future projects which seek to support and strengthen the bridge between formal and informal learning.

The EU-funded Pencil project provided practitioners, policy makers and researchers with a unique opportunity to examine, in detail, the manner in which science museums and science centres may integrate their activities and resources with those of local schools. The project promoted a series of initiatives in which science museums and science centres worked closely with teachers to develop practices which exploit the learning opportunities provided by both contexts.

These initiatives included, among other developments, discussions about the use of informal teaching methodologies which aim to enhance student motivation; the involvement of stakeholders – such as teachers and students – in the design of museum and science centre exhibits and programmes; and approaches for enhancing both teachers and students understanding of the nature of contemporary science.

Each of the 14 Pencil projects was led by a pilot project coordinator (PPC) who was responsible for planning the projects and building partnerships with local schools. The pilot project coordinators were also responsible for conducting the internal evaluations of their projects.

Although the 14 pilot projects varied in content and approach, all the projects sought to explore ways to strengthen the relationships between formal and informal learning contexts. In this way, Pencil created of a network of institutions across Europe and Israel each sharing a common goal. Twice yearly face-to-face meetings and weekly online chatroom discussions supported communication across the network with the intention that, despite differences in the local context, the lessons learnt in one country would be relevant to the work planned, and ongoing, in another.

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