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MuseumScouts: Exploring how schools, museums and interactive technologies can work together to support learning

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ABSTRACT

In this paper we report on the successes and challenges of a creative project involving museums, schools and interactive technologies. The MuseumScouts project is EU Comenius 2.1 funded and involves teachers, teacher educators, museum staff, students and researchers from five European countries: Germany (Berlin and Munich), Lithuania (Vilnius), Portugal (Porto), Austria (Linz), and the UK (Bristol and London).

The MuseumScouts project arises from a European-wide desire to bring schools and cultural and educational institutions such as museums of different kinds, art galleries, science centres and historic buildings, together in collaborative learning experiences. The project aims to develop learner-centred approaches in the 'museum' environment: learners use information they collect during authentic learning opportunities to design short interactive multimedia teaching presentations with collaborative authoring tools. The focus is on knowledge acquisition, transformation and communication.

During a 'museum' visit students (mainly 10–19 year olds but also, in some cases, adult learners) research specific artefacts, using a range of devices, from pencil and paper to Smartphones, to gather information in the form of notes and photographs. They then work in teams to create interactive multimedia presentations about the artefacts to inform and quiz their peers. The authoring tool, 'Evolution', which underpinned the project enables students to collaborate and work online. The principle is of 'learning by teaching': the idea that considering how to convey to others what you have understood yourself is an important process for 'deep' learning.

The project has been run with groups of students at least once in each partner country and twice in several. Countries implemented the project activities in different subject areas, at different stages in the school curriculum and with differing amounts of available time. Student motivation and engagement were notable in all contexts.

We present a review of findings common to all the partners in order to share experiences of implementing this pedagogic approach.

1. Introduction: principles and philosophy

Thinking about how students learn has been radically affected by information and communications technologies (ICTs), in particular by computers, the internet and increasing access to web based resources. The technological tools and media now available are raising questions about the relative status of paper-based and technologically enabled productions. Learners and technologies can now be more mobile; learning can happen anytime, anywhere; distinctions between 'formal' and 'informal' learning are being eroded. Widening the view of when and where learning happens enables productive thinking about building bridges between learning in school and in out-of-school settings such as museums, galleries, historic buildings, libraries, zoological or botanical gardens, science and other cultural centres. (For brevity we refer to all these kinds of institutions as 'museums'.) Most such institutions engage in educational activity and outreach but strong links between them and schools, and which involve sustained rather than one-off activity, are quite rare.

It has long been known that museum education has the ability to motivate and excite learners whilst providing them with new insights and experiences (Mitchell, 1996; Ramey-Gassert, Walberg, & Walberg, 1994). Thus including museum-based activities was the starting point in the MuseumScouts approach to pedagogical design. Museums and galleries offer a wide variety of learning experiences with a unique contribution, work with real objects that emphasises sensory awareness (Kelman, 1995). It is the interaction with authentic

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artefacts that is widely held to be key to museum learning. Kemp (1996) believes that objects in museums can speak to pupils in a different and more visually suggestive way than words. Ramey-Gassert et al. (1994) consider that this enables students to be active participants in their learning through manipulating real objects in a stimulating setting and which can enhance links to conceptual learning back in the classroom. Evans, Mull, and Poling (2002) consider that object centred learning in museums grounds the students' experience of reality.

Rennie and McClafferty (1995) point out that research has shown that visits to science centres and field trips are indeed memorable events. Falk and Dierking (1994) interviewed middle school children and graduating college students and found that 80% of them were able to recall three or more specific things linked to a field trip during their first, second, or third grade. Thus, an effective teacher can call upon the visit experience later in appropriate learning situations.

Griffin (2004) concludes that the shift in museum education research over the past decade to students' views about field trips, to their socially negotiated learning behaviours during field trips and the interaction between learning in the classroom and in the museum, has afforded a deeper understanding of the nature of learning in these contexts. She notes that establishing a clear learning framework for the visit and a clear indication of how the information gathered was to be used following the visit, provided the students with an understandable purpose for their learning.

Rennie (2007), too, emphasises the importance of post-museum visit or post-field trip activities later recapitulating what has been learned in the classroom. Whilst admitting that this is one of the least researched areas of museum visits and field trips she urges teachers to organise post-visit reflection to revisit out of class learning experiences such as field trips museum visits and to build on them in order to maximise learning. For Rennie (*ibid*) organized post-visit reflection emphasises the cumulative nature of learning. Anderson, Lucas, Ginns, and Dierking (2000) also noted the importance to classroom teachers and staff of science museums and similar centres of planning post- as well as pre-visit activities. They found evidence that the integrated series of post-visit activities resulted in students constructing and reconstructing their personal knowledge of science concepts and principles represented in the science museum exhibits, sometimes toward the accepted scientific understanding and sometimes in different and surprising ways.

Griffin's (2007) reflections on her previous work showed that museum visits supported learning best when students valued the purpose of the visit, had choice in what they did and had a feeling of ownership of their learning. She also pointed out that students need to be able to share their learning with classmates and elders. We can see immediately how new technologies can be involved here, using the web to share outcomes from the museum visits by creating web based reports illustrated with images and information captured on site. Much research on using mobile devices such as personal digital assistants (PDAs) and Smartphones in teaching and learning has centred on this combination of deploying small, handheld devices in the field or during a visit and using the data captured on location to inform and illustrate a web based publication with a target audience of peers or family in mind (Burkett & Wright, 2005; Colley & Stead, 2004; Sharples, Lonsdale, Meek, Rudman, & Vavoula, 2007; Sprake, 2006). The role of image capture with mobile phone cameras or digital cameras is paramount here in enabling the students to transfer representative, personally owned visual information from the context of study to the classroom.

Production of a web based report as an outcome is a classic constructivist way of using technology to link museum based and classroom based learning. The MuseumScouts approach takes this a step further, employing the online authoring tool 'Evolution' rather than a web editor and asking students to collaborate to produce a short, multimedia, web based teaching presentation following their museum visit. The intention is to enable 'learning by teaching', a strategy that has long been believed to bring about effective learning (the Latin proverb "he who teaches, learns" is attributed to Seneca who died in 65 AD), and one that involves the transformation of knowledge believed to be central to 'deep' learning (Entwistle, 2000).

Briggs (1975) made the point that "to teach is to learn twice". When peer tutoring in schools and colleges was appraised by Goodlad and Hirst (1989) they recorded a number of benefits to peer tutors that included a sense of personal efficacy, insight into the teaching and learning process, discovery of meaningful applications of the subject matter as well as the reinforcement of existing subject knowledge. Damon and Phelps (1989) claim that the responsibility for communicating well with their peers that children feel when engaged in peer teaching induces them to gain greater conceptual clarity for themselves. Crook (1994) considers that articulation is important: learners working with others gain by being made to make their thinking public and explicit. These cited cognitive benefits had been tested by Bargh and Schul (1980) who found that undergraduates preparing to teach their peers scored reliably higher than controls asked to learn material themselves on a subsequent retention test. A later study by Dayer (1996) found comparable effects with school students in the fourth grade who were asked to develop an educational computer program to teach the use of plurals in French. Students who gained most from the activity which involved using a graphical authoring tool were in groups that provided fuller, more explanatory feedback in their program.

These processes of transformation involved in re-representing information for teaching others appear to be engendering deep learning. The term 'deep learning' was first put forward by Marton and Saljö (1979) who had identified in students qualitatively different approaches to learning from a text. These were a surface approach where the learner is intent on remembering the content and coping with the task and a deeper level of processing where learners are engaged in meaning making and understanding the significance of the whole piece of work. More recently Atherton (2005) considers deep learning to involve relating knowledge from different sources: new knowledge to previous knowledge, theoretical ideas to everyday experience, evidence to argument and organising and structuring content into a coherent whole. Sims (2006) suggests ICTs can play a role in supporting deep learning. She describes a learner engaged in deep learning as having "high meta-cognitive control and the generic skills of learning, gained through engaging in educational experiences with enriched opportunities and challenges, and supported by various people, materials and ICT, linked to general well-being but crucially focused on learning…". Furthermore Resnick, Lesgold, and Hall (2005) consider deep learning to be a requisite for success in today's ICT rich environment with its new conceptions of knowledge that focus on emerging opportunities and unbounded, multiple sources. Students need skills in argument, inquiry and problem solving, and pedagogical methods are sought that are more likely to engage students in active interpretation and explanation. Students must go beyond simply absorbing pre-digested knowledge to learning how to make knowledge from the information around them.

Another aspect of today's ICT rich environment is the ease of communication between groups. Crook (1994) points out the advantages of using computers to support a collaborative experience of learning. It was anticipated that in the MuseumScouts approach students would collaborate online in the co-construction of the short, multimedia teaching presentations. Crook (*ibid*) considers that using computers for the co-construction of a common object of understanding offers rich possibilities to students for exploratory manipulation whilst providing concrete referential anchors that can effectively support collaborative talk. Crook (1998) went on to point out that "the chances of creating