Requirements for a Multimedia Museum Environment

Emanuela Mazzone
Department of Computing
University of Central Lancashire
Preston, UK
EMazzone@uclan.ac.uk

Matthew Horton
Department of Computing
University of Central Lancashire
Preston, UK
MPLHorton@uclan.ac.uk

Janet Read
Department of Computing
University of Central Lancashire
Preston, UK
JCRead@uclan.ac.uk

ABSTRACT
In this paper we describe a two-part study that was used to establish the requirements for an interactive museum environment for children aged between 5 and 10. The paper outlines how the low-tech interactive environment currently used in the museum was used to produce ideas for a technology-enhanced environment.

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Children in museums, early evaluation, field observation, gathering requirements, interactive educational activities.

ACM Classification Keywords
H.5.1 Multimedia Information Systems: Evaluation/methodology.

INTRODUCTION
The number of museums (even small or local museums) supplied with interactive technology is increasing exponentially, however, it also is common to find a misuse of these technologies when not needed or not used for a proper purpose [4].

Museums play a significant role as learning contexts especially when they provide interactive experiences, which may or may not be technologically enhanced. The best learning in museums occurs when people are engaged cognitively, physically and emotionally [2], and this is even more the case when it comes to children. In order to make any visit an involving and enjoyable experience, it should stimulate curiosity, creativity and fun [6]. Children have to be able to explore concepts with physically interactive experiences, adaptive and reactive information, as well as to play roles of explorers, scientists, and artists, and manipulate images, sounds and objects [4].

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Digital augmentation offers a promising way to enhance and extend the process of learning, especially supporting the exploration and reflection when outside the classroom [9]. The use of mobile devices is particularly effective when applied to a context related activity, equipping learners with reliable tools that enable them to learn anytime and anywhere. In addition, mobile technology can support social interaction, which is of primary importance for sharing information, ideas, constructing understanding and shaping knowledge [3]. Compared to previously well-established technology, mobile devices have the added value of enhancing activities in physical spaces by enabling the integration with located and distributed systems.

There have been some interesting projects conducted using mobile technology in museums; one study describes the creation of hybrid public environments that allow visitors to actively interact with features of the physical, and of the digital, space, engaging visitors in a natural and unobtrusive way [1].

Including children in the early stages of a software development project is not always easy and there is little evidence that this necessarily brings about a significantly improved product. Getting requirements from children can be done in many different ways, and can help to identify children's mental models of the activities as well as inform the tools used to support them. Requirements gathering can be an extended process [5] but when time is short, observations and interviews have been shown to be effective [8].

THE STUDY
In this study, that took part in the UK with school children, the key questions for the researchers were:

- could requirements be predicted by investigating the current low tech system?
- what more could be established by watching children interacting with these products?

The method
The researchers decided to proceed with a systematic observation split in two different phases, followed by a semi-structured interview. The preliminary field

observation of the setting was used as to inform an early heuristic evaluation of the context of interaction, in order to consider its features not depending on the activities to take place. This was mainly based on an ethnographic approach in which, initial work in the setting includes deciding how to best observe, where to be positioned, and how actively to question those in the setting and take notes. With this method, the first few field observations consisted of absorbing and attending to as wide a view of the setting and its activities as possible. As observation and analysis continues, the researchers focus on areas of interest and on developing analytic concepts, issues, and themes related to them, concentrating on certain activities and features of those activities [10].

BACKGROUND

The setting

A local state funded museum, the Harris Museum and Art Gallery in Preston, was chosen for the study. This houses an eclectic mix of historical and contemporary art and exhibits. The programme also includes local history, fine and decorative art, and contemporary craft. The museum has also temporary exhibitions; most of these are accompanied by plenty of events and activities for adults and children, as well as an education programme for schools and colleges. These programmes generally consist of museum tours divided by themes according to the National Curriculum QCA units of work and use the architecture, artworks and artefacts to inspire and enthuse pupils' learning [7].

The participants

The group chosen for the observation was a year 1 class from a local school. They were 18 children, aged between 5 and 6, almost equally divided between male and female, without ethnical mix, accompanied by 4 female adults, either teachers or assistants.

The activities

The theme the researchers selected for their visit observation was sculptures. This was presented to the children as a selected path through the museum, designed in such a way that children looked at all different kinds of sculptures, considering subjects, materials, position and shapes. During the tour the children were given a clipboard with a work sheet. They were asked to draw a copy of a bronze statue (chosen between two) and had to answer to simple questions by ticking the boxes at the bottom of the page. The children had some previous experiences of sculptures, having themselves worked with different sorts of materials and non-human subjects within the school classroom, however this was their first school experience in a museum.

At the end of the tour the children went into an educational room for a practical workshop. This involved them in small groups of three pupils, drawing the face of a person they remembered well and trying to reproduce it with the clay.

Figure 1. Activities in the museum and in the educational room.

The researchers

The two researchers have previous research experience with projects about children interacting with computers, working with them both in schools or dedicated laboratories. This helped them in all the phases of the evaluation, trying to understand the children's perspective both in the early evaluation and in the observation and interacting with them during the interviews.

Procedure

Two days before the school trip, the researchers went to the museum and evaluated the setting having a taste of the tour with the museum guide.

This early evaluation aimed at knowing the environment and foreseeing the possible interaction with the children. After the preliminary visit, the researchers were able to refine the design of the observation (that was to take place two days later) and predict some of the requirements needed to support the visit.

On the day of the museum trip, the researchers followed the group of children, paying particular attention to two of them, selected with the help of their teacher, one amongst the more attentive children and the other amongst the most inattentive ones. This was to try to track the experience of individuals in order to capture as many aspects as possible of different types of child and to deeper understand the child's' point of view.

At the end of the visit the children and the teachers were asked a few questions in order to gather their personal perception of the experience and compare the results.

Design of the Early Evaluation

During the early evaluation (when there were no children present), the museum guide simulated a short visit showing the objects she was going to go through, why she selected that path and the activities the children were going to accomplish.

After this short tour at the museum the researchers decided to evaluate the museum visit and activities according to the following criteria:

- Spatial and physical features (position of the object in the place, proximity with other distractive objects,

accessibility to individual or collective sight, chance to touch the object, variety of materials);

- Relevance of the visit contents (ease to understand, to remember, to enjoy, to make links between other objects within the collection and with children personal experience, abstract vs. real representations).

Design of the Observation

During the visit and the activities at the museum the researches decided to take notes of actions, recording comments and taking some still pictures of meaningful moments, (the use of video recorder was not allowed). A grid was prepared to support the observation, according to the relevant elements the children can interact with, both objects and people. The children were observed according to these topics:

- The children's behaviours (as a group and as individuals, related to the context, to the collection, to the activities, the tutors, other children);
- The children's attitudes and changes over the duration of the visit (interest, curiosity, excitement, fun, attention, understanding, distraction, difficulties);
- Worksheet/Workshop activities (how much they can refer to the contents of the visit or to their individual experience).

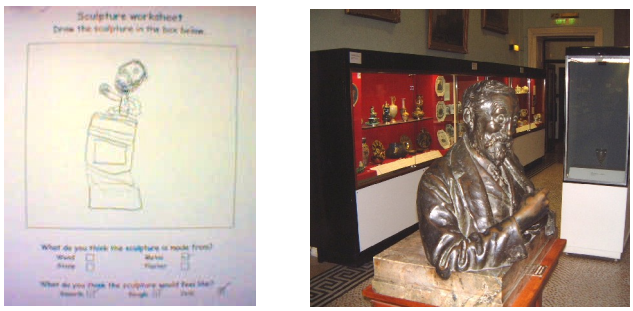

Figure 2. An example of the worksheet and its referring object

At the end of the visit and the workshop activity, the participants were asked a few questions about their impression, the things they remembered, what they liked and disliked. The researchers also interviewed the teachers about the kind of work related to the topic that the children had already done at school and the way in which it was intended to follow up the museum experience.

The data collected with the different methods were integrated and analysed in a joined perspective, in order to compare the various results from the different points of view, such as the experts' evaluation, the activity observation and the participants' impressions.

Results from the Early Evaluation

From the first visit at the museum it was observed that although the tour was designed to be tailored to the children's needs, the environment still presents several biases to a fully successful experience for children. Spatial and physical features are of some constraint to children, affecting the accessibility to some of the objects. Examples of this are:

- the presence of a multitude of different objects close to each other which hinders the possibility of a collective observation;
- the setting of the objects in open spaces which facilitates children to wander around and get easily distracted by attractive objects.

Results from the Observations

The researchers followed the visit with the children and they recorded data through observation and pictures. As the children were in a relatively small group, it was not difficult to monitor both the behaviours of the entire group and of the two chosen children. The differences in behaviour between the more participative pupils were quite clear throughout the duration of the visit, although it didn't prevent all the children from successfully accomplishing the tasks.

The interaction with the museum curator was particularly successful for the majority of the class, who paid attention to her explanations and listened to the questions she asked. The involvement of the children seemed to rise when they were invited to take part in the explanation of the objects by answering questions related both to previous objects of the collection and to their own experiences. This interaction also stimulated discussion between children about possible answers or previous experience.

The activities that were carried out by the children when looking at certain objects helped them to understand the objects better and remember them. The children remembered less clearly the objects that were just shown to them with an explanation but without an activity.

The experience was enjoyed also by the teachers, who considered it very successful, according to the interest and involvement shown by the pupils. They took the worksheets and the clay sculptures back to school, in order to continue the activity, and then integrate and develop the theme in the class.

DISCUSSION

The chosen methods of observation allowed the researchers to build a satisfactory idea of the children interacting with the museum context and to find some answers to the initial questions.

The Match between the two methods

Although the early evaluation was useful as a warning of the possible flaws with the activity, the observation helped to find out other factors that significantly influenced the overall result.

One of these was the interaction amongst people. For example, the high level of distraction embodied in the physical environment did not seem to affect the children's understanding of the main themes, thanks to the interest raised by the museum curator on the objects and a fairly strict control of the school tutors.

A decisive factor was the way the museum guide addressed to children, which had a strong influence on most of them, in terms of attention and participation.

Gathering requirements

The results from the methods applied were used to elicit the requirements for a successful learning experience in the museum. Some of these requirements can be listed as follows:

- Provide different three dimensional views when the environmental features does not allow it;
- Provide the ability to zoom in on details, especially when objects are at difficult heights for children;
- Provide memory of previous objects to access later on the visit or during the activity;
- Avoid distraction with unobtrusive attention catchers;
- Provide a range of links to previous experiences in personal life related to particular topics;
- Support interaction between other children or tutors, by exchanging data or comments or integrating information;
- Support recording the data and keeping track of the experience to reuse in different context for further learning purposes.

CONCLUSION AND FUTURE WORK

The research conducted so far was needed as a preliminary study on gathering requirements for supporting child interaction within museums. Further research will be conducted in different kinds of museums, that are more technology-enhanced and with different interactive learning activities, which may need different types of requirements.

This will lead to the envisioning of possible scenarios supported by mobile devices and evaluated with low-tech prototypes. The specific functionalities of these early prototypes will be more tailored to the single context analysed. Iterative cycles of the design process will be conducted in order to refine the requirements and possibly reach transferable specifications.

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