My Museum Tour: Collaborative Poster Creation During School Museum Visits

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Abstract  
Museums have the potential to provide a stimulating learning environment, making the museum a common destination for school field trips. However, learners often cannot link the visit effectively to the rest of their classroom learning activities. This paper describes our work to address this with pervasive technologies, such as mobile devices and tabletops. Our approach is based on constructivist learning, where students collect information from the museum exhibits and then make use of it for a collaborative activity. Our approach aims to integrate the museum visit with class activities before and after the field trip.

We propose My Museum Tour, enabling small groups of students to capture information, on smartphones and tablets, while exploring the museum exhibits. Then, they collaborate at a tabletop to create a poster that answers challenging questions or provocations set by their teacher, to achieve learning outcomes. They take their poster back to the classroom for use in further work, linking with broader learning objectives in the classroom. Key contributions are the support for collaborative and constructivist learning and mechanisms to help students see the links between the formal activities in the classroom and the informal learning in the museum.

Author Keywords  
Tabletop, Collaboration, Education, Museum, Mobile

ACM Classification Keywords  
H.5.3 [Information Interfaces and Presentation]: Group and Organization Interfaces

Introduction  
Museums provide engaging informal learning environments [3]. Tabletops and personal mobile devices are increasingly being used to support learning in environments like museums, where the technology needs to be engaging but remain in the background [4, 5, 7]. Our work explores how these technologies can support school groups, an important class of museum visitors. Typically, classes break into small, self-guided groups to explore the museum or exhibitions, to complete worksheets which structure the learning to achieve set learning outcomes (for example, museums
provide learner and instructor packs, such as that in Figure 2). These worksheets are often a stark contrast to the engaging and multi-modal exhibits increasingly found in museums. Importantly, it can be challenging for students to see the links between the exciting museum exhibits, the written worksheets and their classroom learning.

Our work aims to improve the museum learning experience, aided by pervasive technology in a constructivist learning design [6]. We also aim to link the classroom and the museum experience (Figure 1). Accordingly, we designed My Museum Tour for a two-stage museum experience. First, students use it to capture information of their choice — using smartphones or tablets — while exploring the museum in small groups. Then students work collaboratively at a tabletop (Figure 3) to assemble a poster matching set learning outcomes (replacing the traditional paper worksheet).

The tabletop can enable teachers to review the process of poster creation, seeing how it evolved. Teachers can then assess individual contributions and give feedback to each group. This paper outlines our design for evaluation in an authentic museum environment, and future work, such as enforcing scripted collaboration at the tabletop, so that the learners follow a set procedure to ensure they achieve required learning outcomes during the task.

**Related Work**

Museum exhibits make use of many new technologies, such as tabletops, to create engaging learning experiences that do not require conventional computer skills [4]. These systems are generally installed as part of an exhibit, with content tailored to it (e.g. [1, 9]). This requires significant resources in terms of curating the content displayed on the tabletop. Our approach aims to explore how tabletops can be used for learning in a museum context, without requiring specialised media for the tabletop to be created. This means that the tabletop should complement the museum exhibits, and should be used for collaborating, sharing, assimilating and synthesising information students have captured about the exhibits.

Other related work looks at how visitors can use mobile devices to be guided, or to be encouraged to capture information as they explore the museum. For example, the Museum Detective [11] is designed for guiding the learning activities of school children as they explore museum visits, prompting them with questions in order to uncover hidden information. This is a replacement for the classic worksheet. Also acting as an information assistant, uLearn [8] allows a learner to take photos of visual markers to retrieve more information about artefacts they are interested in. This also provides a record of what the learner has looked at. We aim to go beyond this so that the captured information forms a basis for focussed studies based on the themes in the museum exhibits.

**Design Goals**

Taking into account the previous work on mobile information guides, and the potential of tabletops in museum environments, we designed our system to support students capturing, collaborating and engaging with museum information for constructivist learning. My Museum Tour is based upon the following high-level design goals:

**DG1** Integrate with the learning activities before the museum visit, such as allowing learners to use the mobile application before the visit to capture information in the classroom or local area.

**DG2** Support capture of media and notes while learners explore the museum exhibits in small groups giving the learners control over what information they want to capture for their poster.
DG3 Support group interaction at the tabletop, encouraging learners to discuss the captured information, and to curate and organise it into a poster that meets criteria outlined by the teacher.

DG4 Save the group process at the tabletop (i.e. the interaction trails) to enable replaying of the group activity to support learner reflection and observation by the instructor.

DG5 Allow all created artifacts to be saved and taken back to the classroom for discussion and further revision, in order to link the museum visit with existing learning objectives in the classroom setting.

My Museum Tour: User View
My Museum Tour has two parts: a smartphone/tablet interface to capture information while students explore the museum, and a tabletop interface for collaboratively sharing and assessing the information to construct a poster based on set learning objectives.

Figure 4 shows the introductory screen of the tablet interface, designed for iOS. A tab bar along the bottom of each screen is used for switching between the information types to capture: photos, sound clips, notes, and QR codes. Figure 5 shows part of the photo tab, used for taking photos and sending them to the tabletop (users can drag a photo to the ‘tabletop’ region, in the top middle of the figure, to the photo sent over the wireless network). The photo appears immediately in the middle of the tabletop. The other tabs behave in the same manner — for example, in the notes tab, users can write notes using the onscreen keyboard (while walking around the museum exhibits), and selected notes can be easily transferred to the tabletop for collaboration. The QR code tab can be used to scan QR codes located around the museum — for example, the QR code for an exhibit may hold a URL with more detailed information (as in [8]), which is saved as a note.

After a group of learners has finished their tour of the museum, they visit the museum’s tabletop (Figure 3) to collaborate on a poster. The tabletop interface, shown in Figure 6, is based on the Cruiser\(^1\) framework. It receives the information sent from the mobile devices (i.e. photos, sound clips, notes), and provides facilities for arranging the items into a poster. This includes the ability to create and arrange basic poster elements, such as backgrounds, titles, text boxes, and containers (the application menu in the middle left of Figure 6 is used to add these, in addition to on-screen keyboards for text entry). A web browser is also available on the tabletop for further research.

A very simple example poster is shown in Figure 7 (The system supports creation of more complex posters). This can be saved to take back to the classroom, using the export tool from the application menu; the poster can be saved as a web-page (and, optionally, published to a museum web site), or as a PDF document to email to the learners and instructor, or copying to a USB stick. The web-page versions of the posters can be later modified in classroom activities on a desktop with existing web-page editing software.

Planned Research Directions
There is a dearth of systematic study of the learning benefits of mobile devices and tabletops in educational settings [2, 10]. The My Museum Tour application will provide a platform for conducting field studies — in a real museum environment with visiting school groups — to gain understanding of educational benefits of this type of system over the conventional paper-based approach that it replaces.

\(^{1}\text{Cruiser: http://chai.it.usyd.edu.au/Projects/Cruiser}\)
The current tabletop activity is unstructured and relies on students following a procedure set by a teacher. This process seems likely to benefit from a scripted approach \cite{12} so that the teacher can define a structure for the activity, with constraints at each stage, that the students must follow. This will allow a teacher to ensure that all groups tackle the problem systematically, to enhance the potential for meeting learning objectives with minimal intervention from the teacher.

Conclusion
This position paper has introduced our My Museum Tour application, designed to support enhanced learning in a museum environment, based on constructivist learning with complementary use of mobile devices and tabletops for collaborative activities. At the same time, our design goals reflect that the museum visit is one component of a broader environment, and so we must ensure the activities in My Museum Tour fit with the activities in the classroom, both before and after the museum visit. The next step is to conduct evaluations to determine the effects of such an application on learning outcomes, and to determine if we achieve the goal of fitting with the pre- and post-visit classroom activities.

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References


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