

Can Museum Exhibits Support Personalised Learning in Collaborative Classroom Activities By Using Augmented Reality?

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ABSTRACT

This paper proposes a novel approach in integrating seemingly contradictory approaches of teaching and learning via collaborative and personalised learning activities by using augmented reality museum exhibits. The paper highlights the benefits that computer supported collaborative learning and computer supported personalised learning bring or promise to bring to the learner. A proposal is given for a study that will setup a common ground for these two approaches via a location-aware augmented reality museum display. The principal aim of the study is to investigate how the process of learning collaboratively is intertwined with personalised experience of visiting the museum display. Ultimately, the result of the study will provide a new understanding of visitor's experience of museum displays, not only within the context of the museum's location, but also within the classroom where the visit truly begins and finishes.

KEYWORDS: Augmented reality, collaborative learning, personalisation, vicarious learning.

INTRODUCTION

Computer supported collaborative learning (CSCL) has in many ways led the way in bringing novel teaching and learning methods to real-world classrooms. It represents an approach that truly changes the role of the learner from just the receiver of information to the creator and manager of knowledge. Additionally, the emphasis of the role of the teacher also changes to a more interactive and supportive one, guiding the learners in their task of shaping and influencing the knowledge domain as a group and for the group. For many CSCL advocates, such a shift in roles represents an enhancement of the learning experience (Kaye, 1995; Crook, 1994, Koschmann, 1996).

CSCL's approach of leveraging group dynamics and group-based activities to facilitate learning seems to contradict or is at least inconsistent with efforts to personalise the learner's learning experience. Such approach aims to leverage individual characteristics of the learner and adapt the learning or teaching activity to suit those characteristics. The most common approach is to profile for a number of learner's parameters and create an adaptive system that will adapt learning activities and resources to those parameters using certain teaching and learning strategies. Some of the more popular parameters include learner goals (Melis & Andrès, 2005), learner's learning (Seyedarabi & Monthienvichienchai, 2005) and cognitive style (Graff, 2003), and explicit learning preferences (Conlan & Wade, 2004). In short, this approach aims to create the most appropriate learning experience for an individual learner.

This paper will propose a novel approach in integrating these seemingly contradictory approaches of teaching and learning via collaborative and personalised learning activities by using augmented reality museum exhibits. An argument will be made for the integration of CSCL and personalised learning and a study into this integration will be introduced.

PERSONALISED COLLABORATIVE LEARNING

At the surface, the two approaches of CSCL and personalised learning seem to contradict each other both in the goals and in their processes. However, it is possible to argue on closer inspection that the benefits that the two approaches aim to bring to the learner are complimentary rather than contradictory.

In CSCL, the learner is encouraged to consider the action and communication from other learners and to contribute his/her knowledge back to the group (McConnell, 1994). This process requires a degree of metacognitive

reflection on the position of other learners with respect to the learner's own state of understanding of the domain. Such activity allows the learner not to only learn the domain knowledge but also to understand the importance of such knowledge with respect to the group that he/she is working with and also the wider community of practice.

In order to effectively carry out this metacognitive reflection, the learner needs to be able to obtain information that are most appropriate for his/her current position of understanding with respect to the group. Such information can reside in many different forms and levels of description. For example, for a learner to be able make meaningful contribution to a debate on a subject that she is only partially familiar with, it would be necessary for her to do more research into the subject. This could be done via searching through primary resources (such as lecture notes and journals) or, the learner can conduct research through secondary resources (such as simulations, exercises and transcripts of previous group discussions). What is evident is that there is a vast array of resources that the learner will need to be able to access effectively and efficiently.

Such a problem is not dissimilar to those being tackled within the context of personalised learning. One of the chief aims of personalisation is to prevent the learner from experiencing information overload when engaging with the multitude of resources, by adapting or presenting the resources in such a way that best fits the learner profile. For example, a personalised support for the same learner in the above example, would aim to find resources that both matches the subject(s) being debated in the discussion and the gap in the learner's knowledge. In this example at least, CSCL and personalisation seem to compliment each other both in the learning goals and learning processes.

Museum and community of practice

A museum exhibit is not just a single instance of an item that has no context or relevance. By qualifying to be an exhibit, the item or items have been considered to be of some importance and relevance within a particular domain. With the exception of a few personal collections, most museum exhibits are part of a larger work to give an account of an instant in history of some significance. As such, there is a community of practitioners who understands the significance of the exhibit, be it a world-renowned researcher or a high-school student doing research for her fieldwork assignment. The presence of this community of practice is important as it dictates what knowledge constitutes useful knowledge to the members of the community (Wenger, 1998). From this framework, it is possible to present a situation in which the high-school student may find the opinion of another high-school student who has visited the same exhibit more useful than a detailed analysis given by the world-renowned researcher. The situation highlights the importance of context, both in terms of the knowledge domain and the context in which the exhibit is being visited. Being able to share the experience with like-minded visitors and to learn vicariously from each other's experience is often more useful than being given correct and very sophisticated information that has no relevance to the task in hand.

At the moment, such activity can only take place on-site if both visitors are present or off-site in an asynchronous manner. In most cases, such exchange will not happen even if two visitors with the same interest are standing next to each other. Moreover, when the visit is part of a school field trip, it may also be necessary to structure such activity within the context of a wider assignment or concrete questions that the student need to tackle.

Location-aware augmented reality systems allow the user (or learner) to be able to receive information based on explicit or implicit requests. Conversely, such a system can also enable the learner to make information available to other learners in an explicit or implicit manner. For example, the learner can request information left by other users of the system concerning a particular exhibit, or the system can provide information without the learner's explicit request that, based on the learner's previous activities, there are relevant information that the learner might want to know for her current field assignment (for an example of a related existing system, see Liarokapis, et al. (2004)). However, in order to make such a system truly useful for teaching and learning in today's classroom, access to and the ability to manipulate the augmented reality space needs to be extended to the classroom such that it can be an integral part of classroom activities, allowing teachers and students to make meaningful plans for the visit to integrate with what is being learnt in the classroom.

STUDY PROPOSAL – AUGMENTING AUGMENTED REALITY

This paper proposes a study to investigate how extending access to augmented reality exhibitions into the classroom will facilitate effective collaborative and personalised learning activities for the learners in high-school classrooms.

The study will involve the creation of a location-aware augmented reality exhibit in a London museum and a 3D environment that accurately models the real exhibit, acting as the remote interface to the exhibit in the classroom. This environment will allow students and teachers to augment the virtual space while in the classroom and access

such augmentations, both from teachers and students of the same school and other schools. The exhibit will allow students to access in real-time the augmentations made in the classroom through the augmented reality system when they actually physically visit the exhibit.

Additionally, the study will use a backbone system for profiling the student's learning activities and preferences so that information deriving from augmentations and other sources can be made available to the student when and where appropriate. As part of this profiling feature, the visit of the student to the exhibit will be logged so that the profile can be enriched constantly with each visit and usage.

The study aims to create learning activities based around the augmented reality system that will endure in the long-term, such that multiple schools can reuse and enrich the system with their own experience of the system. One of the first learning activities that will be supported is the ability for individual or group of students to create their own virtual museum by populating it with artefacts collected from the virtual and real-world environment. The goal is to turn augmented reality systems into a truly useful teaching and learning tool, with a cost-effective means of accessing the information contained in it, but with a rich multimodal interface at the exhibit itself.

The scope of the study, extending accessibility and relevance of museum exhibits to the classroom, will place augmented reality in real-world usage context in a distributed environment. The study will explore the relationship between learning in virtual reality space and the ability to extend that space into the real-world using augmented reality. The expected outcome is a clearer indication of how augmented reality systems can be used to contextualise learning – both formal/informal and localised/distributed.

CONCLUSIONS

This paper has presented an argument for a complimentary implementation of CSCL and personalised learning. It has proposed the domain for its investigation to be an augmented reality exhibit for a museum in London with a novel addition of a 3D virtual reality interface that can be accessed remotely from the classroom. It hopes that, by providing an easily accessible environment that the students and teachers can augment with their own contextual knowledge, such a system will be able to facilitate meaningful classroom activities when visiting such exhibits, as well as the fostering a wider community of practice that can grow and create knowledge through its accessible and open features. The overall output of this research will contribute to the understanding of how to implement effective cross-reality teaching and learning.

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