Playing with history: an analysis of interactive learning through a museum exhibit

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Abstract: Museums exhibits are often considered passive experiences that do not engage their audience, especially with younger students. However, to provide a more engaging learning experience, museums have begun re-inventing themselves by creating interactive exhibits that are supplemented with mobile technology. The objective of our study was to determine whether the design of *Play the Past* facilitated engagement and learning among the students who participated. To do this, our analysis used data that was collected from the mobile devices that were used by students. We hypothesized that students would be highly engaged with the activity and that they would learn how to negotiate profitable trades, which would allow them to complete the Fur Trade hub in *Play the Past*. Our study found that many students were not highly engaged with the game, and that successful mastery of the trading mechanic in the game did not predict completion of the Fur Trade.

Introduction

Museums exhibits are often considered passive experiences that do not engage their audience, especially with younger students (Hall & Bannon, 2006). To provide a more engaging learning experience, museums have begun re-inventing themselves by creating interactive exhibits that are supplemented with mobile technology (Hall & Bannon, 2006). To determine whether people are engaging with and learning from these new types of exhibits, museums have utilized a variety of qualitative methods, such as observations, interviews, and surveys (Hall & Bannon, 2006; Wilde & Urhahne, 2008; Yiannoutsou, Papadimitriou, Komis, & Avouris, 2009; Sung, Hou, Liu, & Chang, 2010). Although these methods are effective for assessing how a small number of museum attendees interact with an exhibit, they do not capture the range of behaviors exhibited by a large number of attendees. Thus, there is a need to collect and analyze the data generated from mobile devices that are used by people within exhibits, which allow us to examine the behavior of many attendees inexpensively.

Despite the novelty of these large-scale data collection and analysis techniques in the museum field, they have been used in Human-Computer Interaction (HCI; Drachen, Sifa, Bauckhage, & Thurau, 2012) and Educational Data Mining (EDM; Stenerson, Salmon, Berland, & Squire, 2014; Halverson, & Owen, 2014; DiCerbo, 2014) research for years. The current study capitalizes on these methods to study *Play the Past* ("Play the Past", 2015); an augmented reality game that has been embedded into an exhibit at the Minnesota History Center. This exhibit was designed to enhance engagement and facilitate learning of historical content by incorporating principles of inquiry-based learning.

Inquiry-based learning in museums

As a result of the prevalence and effectiveness of inquiry-based learning usage in the classroom, many museums have been influenced to transform their exhibits into interactive learning environments (Kaptelinin, 2011; Sung, et al., 2010; Wilde & Urhahne, 2008). This movement has also triggered museums to re-define the learning objectives of visiting a museum exhibit (Hein, 2002). Instead of concentrating on the student's ability to recollect specific pieces of information after experiencing a history museum exhibit, the focus has shifted to motivating students to engage in role-playing as historical figures or actively manipulating historical content through the exhibit (Hein, 2002).

Play the Past

While participating in *Play the Past*, students explore Minnesota history by exploring three distinct hubs; the Fur Trade, Sod House, and Iron Range. For the purposes of this study, we will be focusing on the Fur Trade, where students enter the world of an 1807 fur trading post in Minnesota. At the beginning of the Fur Trade, students use their iPod to gather beaver pelts or purchase items from the store by scanning Quick Response (QR) codes. Afterwards, students are encouraged to trade with each other to simulate the interaction between hunters and trading post clerks during that time period. Overall, the activities in *Play the Past* were designed to provide students with an opportunity to engage in inquiry-based learning with historical content, instead of passively viewing the content within the museum. Although *Play the Past* was designed to facilitate learning and engagement, there is only anecdotal evidence that students are playing the game as was intended.

Current Study

To determine whether or not the inquiry-based learning design of *Play the* Past facilitated engagement and learning, we focused on students during their participation in the Fur Trade. We chose to focus on the Fur Trade because the tasks required of the student were the most complex and challenging within this activity, thus we expected to find a wider variety of behaviors. The analysis used data that was collected from the mobile devices used by students in the exhibit.

Methods

The sample consisted of 7,129 4th to 6th grade students from local elementary schools who participated in *Play the Past* between September 1, 2014 and June 4, 2015. The *Play the Past* application collected behavioral data on each student by logging the tasks that they complete while interacting with the exhibits.

Preliminary Results

Based on our preliminary findings, the Fur Trade hub within *Play the Past* could benefit from a re-design to improve engagement and ensure that the mechanics of the game that the students are supposed to be learning are directly tied to success in the game. This type of redesign should be expected though, because many other inquiry-based learning environments accompanied by technology require several iterations to properly blend a complex learner-centered instructional method with novel technologies (Edelson, Gordin, & Pea, 1999). However, it is important that museums that use mobile technology to enhance the attendee's experience take advantage of the behavioral data that can easily be collected by the device itself to ensure the exhibit is providing the experience it was designed to produce.

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