Augmented Reality to Enhance the Learning Experience in Cultural Heritage Tourism: An Experiential Learning Cycle Perspective

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Abstract

Augmented reality (AR) applications are a powerful, modernized tool with the potential to engage students to develop skills for the future, and enhance the overall learning experience. Kolb's Experiential Learning Cycle has been widely adopted in education studies to develop more appropriate learning opportunities. However, the adoption of the specific model in the context of AR as a learning tool for school children in cultural heritage tourism remains scarce. Hence, this study aims to address the gap in the literature, with an aim to assess how utilizing new and innovative technologies can enhance the overall learning experience in the cultural heritage tourism context. Experiments and three focus groups were conducted and analyzed using thematic analysis, and findings demonstrate a positive response from participants, revealing that new knowledge was gained as a result of the AR experience, thus, supporting the potential of AR in education, and in cultural heritage tourism.

Keywords: augmented reality, cultural heritage tourism, learning experience, experiential learning cycle

1. Introduction

Cultural heritage tourism sites are increasingly relying on innovative technologies to offer a valuable visitor experience (Pallud and Monod, 2010). Mobile enabled AR applications are the ideal technology, with its ability to overlay additional information of the collection in view, providing new knowledge acquisition for the user (Charitonos et al., 2012). Experiential learning on-site, is proven to enhance the learning experience and have long lasting impressions on the visitor (Henderson and Atencio, 2007). Hence, the aim of this study is to assess how the integration of an AR mobile application enhances the learning experience in cultural heritage sites, as viewed from an experiential learning perspective. Kolb's (1984) Experiential Learning Cycle is used as a theoretical foundation. The research aims to contribute to a gap in the literature by exploring the effectiveness of AR as an innovative learning tool for school children within cultural heritage tourism.

2. Literature Review

2.1. Augmented Reality in Cultural Heritage Tourism

This study focuses on AR mobile applications, which enhances the user's surrounding environment and perception of reality (Kounavis et al., 2012), by overlaying virtual annotations on top of real world objects. The mobile device is directed at the point of

interest, and 2D/3D images, icons, texts, or video are superimposed to the users' view (Yovcheva et al., 2012). In tourism, mobile enabled AR applications provide tourists with fast knowledge acquisition of immediate location based information of surrounding points of interest in unfamiliar environments (Yovcheva et al., 2014), thus, empowering consumers to play an active role in co-creating their own experiences (Neuhofer et al., 2013). At cultural heritage sites, a key motivator for AR integration is to enrich the way objects and artefacts are encountered (Charitonos et al., 2012), by offering improved information availability without interrupting the physical space (Tesoriero et al., 2014). Therefore, allowing visitors to explore personal points of interest (tom Dieck and Jung, 2015), discovering new knowledge (Charitonos et al., 2012), and hidden stories of the object in view (Molz, 2012). Due to this, cultural heritage sites are ultimately relying on integrating innovative technologies, as a 'guarantee' in offering a re-energized, valuable visitor experience (Pallud and Monod, 2010), as well as increased competitiveness for the site (Neuhofer et al., 2015). As cultural heritage sites are a crucial aspect of education, this study aims to support existing literature focusing on learning with technologies in cultural heritage tourism.

2.2. Learning Experience in Cultural Heritage Tourism

Learning in cultural organizations encourages creativity and innovative thinking, which influences the development of attitudes and values; whilst emotions such as enjoyment and inspiration, provide motivation to acquire deeper knowledge (Hooper-Greenhill et al., 2003). Moreover, Galloway et al. (2014) identify the integration of new technologies into the learning process as an innovative approach to learning. However, technology alone is not significant enough in enhancing the learning experience; it is the interactive process of the user and the technological device at hand (Bond, 2014), and the commitment, concentration and motivation of the individual (Stewart, 2014), that collaboratively enhances the overall learning experience of the user (Henderson and Atencio, 2007; Bond, 2014). As viewed from the experiential perspective, learning is defined as, "the process whereby knowledge is created through the transformation of experience" (Kolb, 1984:38). Hence, this study adopts the Experiential Cycle proposed by Kolb (1984), whereby emphasis is upon experience as the central role in the learning process. The cycle is continuous and can begin at any point, thus, portraying learning as a continuous lifelong process (Kolb, 1984). Reflective observation and active experimentation is a processing continuum on how people approach a task, whilst concrete experience and abstract conceptualization is a perception continuum, and indicates the emotional response toward the task. The cycle is useful in developing more appropriate learning opportunities than those typically available.

3. Methods

The present study aims to investigate how mobile enabled AR application enhances the learning experience of visitors at a small Jewish museum in the UK. The building is a former synagogue; displaying a historical collection of Jewish objects and artefacts as a means of preserving Jewish heritage. The target market comprises of 75% school children, hence, this study aims to investigate the potential of an AR mobile application; to enhance the learning experience for school children, whilst

supporting the sustainability of the museum. The AR application was purposely designed to offer seamless, ease of use, and was installed on iPads provided by the museum for participants use. On the application, four areas were available for exploration; information about the museum, camera access for AR experience, AR museum map and navigation area, and an interactive quiz based on the AR experience. Overall, there were ten points of interest to be discovered through AR, using a variety of object and QR code recognition. The user was then able to check areas they had visited through AR via the list of hotspots.

Over the course of two days in June 2016, three focus groups were conducted on the museum premises, with a total of 19 school children, aged 7-8 years, from local schools. Letters of consent were distributed to parents and returned to the researcher prior to the focus groups taking place. Pupils were allocated 20 minutes to identify the ten points of interest and complete the quiz; focus groups were then conducted. During the experiments, pupils experienced the museum by themselves without teachers or museum staff. The questions were focused on the four main aspects of Kolb's (1984) Experiential Learning Cycle (concrete experience, reflective observation, abstract conceptualization, active experimentation). Thematic analysis was employed to identify, analyze and report themes emerging from the data set in relation to each of the four main aspects from Kolb's (1984) Experiential Learning Cycle.

4. Findings

4.1. Concrete Experience

Concrete experience explores participants' feelings towards the experience. Participants stated that the AR aspect of the application drastically enhanced the experience, with all participants agreeing that AR made the overall experience increasingly 'fun', 'enjoyable' and 'exciting'. Findings indicate positive feelings towards learning outside of the usual classroom environment, with all participants recognizing the uniqueness of the synagogue. Participants enjoyed being challenged by locating the points of interest and completing the quiz, as it delivered a sense of personal achievement, and allowed participants to confirm the new knowledge acquired. However, certain participants felt that the said aspects where too challenging due to having to remember all the answers at the end. This suggests that, depending on personal ability, the extent of challenge that participants incurred, determined how the overall AR experience was perceived, and the extent to which the overall AR experience was enjoyed.

4.2. Reflective Observation

Reflective observation explored the response to using the AR application to learn in the museum, with key themes arising including the enjoyment of 2D/3D AR avatars, and the enjoyment of text and images with audio. In particular, participants stated that the 3D avatars helped to maintain interest in the learning experience, similarly, with the audio when combined with AR graphics. Uncovering hidden stories through AR where limited information is otherwise available was enjoyed, as it assisted with learning more about the Jewish history. Interestingly, with regards to the avatars, a

number of participants requested visual text, as the combination of visual and audio would assist with learning to speak and read correctly. Additionally, more markers were requested to uncover an increase of hidden stories through AR, as well additional options on the homepage, preferably detailing information about the history of the museum, and a Jewish AR game to play.

4.3. Abstract Conceptualization

In terms of abstract conceptualization, a key theme that arisen from the data was using the quiz to learn. Participants enjoyed using the AR application to explore the museum and learn about the Jewish religion. Conclusively, all agreed that the AR application assisted in obtaining new knowledge and skills, and identified that limited information was available without the AR application. On the contrary, a number of participants found the quiz too challenging post-experience, and suggested completing the quiz during the AR museum experience. The focus groups allowed participants time to reflect and reiterate new knowledge obtained as a result of using the AR application to explore the museum. Interestingly, the majority of new knowledge derived from uncovering additional information through the AR application; supporting that the AR application is an effective learning method that provides continuous learning, as the facts taken from the AR experience have been remembered and reiterated.

4.4. Active Experimentation

During the focus groups, all participants achieved an increase of correct answers on the second quiz attempt. This again supports the effectiveness of the AR application as a learning tool, as all questions linked with information that derived from the AR graphics. Furthermore, the focus groups explored future intention and desire to visit the particular museum again to use the AR mobile application. The aim of this was to explore the base of active experimentation within the cycle, whereby investigating the intention and desirability of the participant to gain deeper knowledge of the museum, indicated a continuation of the learning cycle, and the potential of new experiences to be obtained. It was confirmed by all participants that they would like to visit the museum again, specifically to use the AR application, as well as similar cultural heritage sites that offer a similar AR experience.

5. Discussion and Conclusion

The present study concludes that, beyond being innovative and interactive, AR is a powerful tool that should be strategically implemented at cultural heritage sites; not only to increase competitiveness and ensure sustainability, but to offer a valuable learning experience for its visitors. The adoption of Kolb's (1984) Experiential Learning Cycle was successful in providing a suitable framework to analyze the approach towards the task, and the feelings and emotions felt towards the AR experience. Understanding the emotional response towards using AR technologies is crucial. This is because it determines the future of technology integration and acceptance of visitors within cultural heritage tourism; with a lead to motivate such organizations to invest in AR technologies, that provide the ideal platform to provide an enhanced learning experience. Overall, using new and innovative devices and AR

applications as a learning tool for education in diverse environments, noticeably contributes to a continuous learning process for the individual; opening up a plethora of learning opportunities and new experiences to be explored. Moreover, integrating new technologies promotes future intention to re-visit the museum, as desire to use the AR application in the future is evident, thus contributing to the sustainability of the museum. There are a few limitations in this study. Experiments and focus groups were limited to 19 children and therefore it is difficult to generalize the findings to a wider population. In addition, the study was conducted in a small museum in the UK and further research should be conducted in other cultural heritage sites. Finally, the use of mixed realities is becoming more popular within the tourism context thus, future research should investigate the use of mixed realities (e.g. VR & AR) for the enhancement of the tourism learning experience for school children.

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