

## **DESIGNING AND IMPLEMENTING A MOBILE AUGMENTED REALITY APPLICATION TO SUPPORT LEARNING HISTORY IN THE CLASSROOM**

Sepideh Tavajoh<sup>1\*</sup>, Marcelo Milrad<sup>2</sup>, and Mohammed Ahmed Taiye<sup>3</sup>

<sup>1</sup>*Department of Information Science, Faculty of Art & Humanities, Linnaeus University,  
Sweden, Email: sepideh.tavajoh@lnu.se*

<sup>2</sup>*Department of Media Technology and Computer Science, Linnaeus University,  
Sweden, Email: marcelo.milrad@lnu.se*

<sup>3</sup>*Department of Information Science, Faculty of Art & Humanities, Linnaeus University,  
Sweden, Email: ahmadtaiye.mohammad@lnu.se*

(\*Main presenter and corresponding author)

### **ABSTRACT**

**Introduction:** Debates about the use of digital technologies in the humanities have grown in recent years. The discussions aim to develop a long-term approach to learning humanities through immersive digital technologies, which provide a more interactive and engaging learning experience than traditional methods (Bakker et al., 2012; Münster et al., 2021). Immersive technologies, such as Virtual Reality (VR) and Augmented Reality (AR) allow students to access and explore the different learning materials in a hands-on and interactive manner, so they can make the learning process more accessible and inclusive (Boboc et al., 2022). The study described in this paper focuses on learning history and cultural heritages in schools supported by a mobile application we have designed. The application uses several interactive technologies including AR.

**Problem statement:** The use of AR technology in teaching and learning humanities in schools has the potential to mitigate some of the challenges that teachers and students frequently face while educating history lessons in schools. According to Chin & Wang (2021), one of the issues associated with teaching history and culture relates to students' engagement with the subject's content. AR technology has the potential to bring history and culture *alive* for students by providing interactive and immersive experiences that engage their senses and capture their attention while also promoting comprehension, validation, retention, and accessibility of subject content (Chin & Wang, 2021). Creating a sense of authenticity using interactive technologies can improve the perception of historical unimaginable concepts related to a cultural event or ancient monuments (Boboc et al., 2022; Low et al., 2022; Sharples 2015). Accordingly, our work has been guided by the following the research question: *How can the use of immersive technologies affect learning history and culture through an interactive approach?*

**Objectives:** The study's goal was to develop an interactive teaching and learning approach that uses mobile and immersive technology, such as AR and image

recognition, to increase students' engagement in the history classroom. Through these technologies and following the background presented in the previous section, the emphasis was on involving students in problem-solving and immersing them in historical events. The study tried to create a learning environment that encourages problem-solving skills by having participants follow the pattern of an historical event and to reflect upon students' understanding. To achieve this goal, digital storytelling was used to implement these ideas. Moreover, the study assesses teachers' knowledge and attitudes toward implementing digital technologies in the context of history didactics. The importance of using digital storytelling and AR as a complement to traditional teaching methods has been emphasized to ensure the appropriate use of existing digital devices available in schools.

**Methods:** The study applied human-centered design, and digital storytelling techniques to develop an easy-to-use and visually interactive product for the target group. The methods used support the product's usability and endorse Human-Centered Design to consider the user's needs and perspectives. Historical content would be discussed and presented through a mobile application combining digital storytelling and AR to explore different ways to interact and experience historical content (Armfield et al., 2018; Bardzell et al., 2018; Trebeleva et al., 2022). The data collection process involved semi-structured interviews with teachers before app design and after workshop implementation. For students, data was gathered through pre-questionnaires, observations, and post-questionnaires conducted after the workshops. Thematic analysis has been employed to interpret and validate the collected data and the outcomes after the analysis (Rattani et al., 2021).

**Settings:** This exploratory study was conducted in the city of Kalmar (Sweden) during the spring of 2022. Several classes were involved including 74 pupils aged 10 to 13 and three teachers from two separate schools. Data from the students interacting with the application was collected over a period of two months. During school time, workshops were held to present the historical story of a massacre that happened in 15th century in the island of Öland, Sweden. This was done by using the Time-travelling app, a mobile application we have developed using the Onspotstory<sup>1</sup> platform. The application has been deployed on an iPad device that had its AR feature activated.

**Outcomes:** According to analysis of the data we gathered, our results indicate that mobile AR application we implemented can be a feasible method for teaching and learning history at schools. The study identified three themes. Firstly, the effects of using AR technology in teaching and learning were found to be feasible and showing some positive effects on students' attitude towards learning history. Students and teachers reported that history lessons were more engaging and interactive when these digital tools were used. Secondly, it was highlighted that the integration of digital technologies, especially AR, should be used in ways that complement traditional teaching methods and the content exposed should be appropriate for students' cognitive levels. Thirdly, the study revealed a need for history teachers to improve their knowledge of digital technologies in order to support new ways of

---

<sup>1</sup> <https://www.onspotstory.com/>

teaching and learning. Throughout the design and implementation process, ethical considerations should be taken into account, both in general and specific to the use of historical information and facts.

**Keywords:** Interactive Digital learning, Interaction Design, Digital storytelling, History, Cultural Heritages

## REFERENCE

- Armfield, D. M., Duin, A. H., & Pedersen, I. (2018, July). Experiencing content: Heuristics for human-centered design for augmented reality. *In 2018 IEEE International Professional Communication Conference (ProComm) (pp. 241-247). IEEE.*
- Bakker, S., Antle, A. N., & Van Den Hoven, E. (2012). Embodied metaphors in tangible interaction design. *Personal and Ubiquitous Computing, 16(4), 433-449.*
- Bardzell, J., Bardzell, S., & Blythe, M. (Eds.). (2018). *Critical theory and interaction design. MIT Press.*
- Boboc, R. G., Băutu, E., Gîrbacia, F., Popovici, N., & Popovici, D. M. (2022). Augmented The reality in Cultural Heritage: *An Overview of the Last Decade of Applications. Applied Sciences, 12(19), 9859.*
- Chin, K. Y., & Wang, C. S. (2021). Effects of augmented reality technology in a mobile touring system on university students' learning performance and interest. *Australasian Journal of Educational Technology, 37(1), 27-42.*
- Low, J. Z., Kamaruddin, A., Hamzah, M. D., Admodisastro, N., & Abdullah, S. (2022, May). AR Mobile Application Evaluation for Learning History: High School Students' Perspective. *In 2022 Applied Informatics International Conference (AiIC) (pp. 77-82). IEEE*
- Münster, S., Utescher, R., & Ulutas Aydogan, S. (2021). Digital topics on cultural heritage investigated: how can data-driven and data-guided methods support to identify current topics and trends in digital heritage?. *Built Heritage, 5, 1-13.*
- Rattani, A., Kaakour, D., Syed, R. H., & Kaakour, A.-H. (2021). Changing the channel on medical ethics education: systematic review and qualitative analysis of didacticicebreakers in medical ethics and professionalism teaching. *Monash Bioethics Review, 39(1), 125-140. <https://doi.org/10.1007/s40592-020-00120-2>*
- Sharpley, M. (2015). Seeding, wonder rooms and curatorial inquiry: New forms of museum communication and learning. *In Proceedings of 'Museum Communication: Practices and Perspectives', Royal Danish Academy of Sciences and Letters, Copenhagen 27-28 August, 2015, pp. 22-26.*

*Designing and Implementing a Mobile Augmented Reality Application to Support Learning History in the Classroom*

Thotse, M. (2021). People, space and time strategy: Teaching History through image analysis at a rural secondary school in Limpopo Province. *Yesterday and Today*, (26), 52-67.

Trebeleva, G., Glazov, K., Kizilov, A., Kizilova, A., Yurkov, V., & Yurkov, G. (2022). Advanced Technologies Used in Digitizing the Cultural Heritage of Northwestern Colchis: The Experience of the Markul Expedition. *Applied Sciences (Switzerland)*, 12(4). <https://doi.org/10.3390/app12042052>