Chapter 12

Evaluating Augmented and Virtual Reality in Education Through a User–Centered Comparative Study:
SmartMarca Project

Roberto Pierdicca
Università Politecnica delle Marche, Italy

Emanuele Frontoni
Università Politecnica delle Marche, Italy

Maria Paola Puggioni
Università Politecnica delle Marche, Italy

Eva Savina Malinverni
 https://orcid.org/0000-0001-6582-2943
Università Politecnica delle Marche, Italy

Marina Paolanti
Università Politecnica delle Marche, Italy

ABSTRACT

Augmented and virtual reality proved to be valuable solutions to convey contents in a more appealing and interactive way. Given the improvement of mobile and smart devices in terms of both usability and computational power, contents can be easily conveyed with a realism level never reached in the past. Despite the tremendous number of researches related with the presentation of new fascinating applications of ancient goods and artifacts augmentation, few papers are focusing on the real effect these tools have on learning. Within the framework of SmartMarca project, this chapter focuses on assessing the potential of AR/VR applications specifically designed for cultural heritage. Tests have been conducted on classrooms of teenagers to whom different learning approaches served as an evaluation method about the effectiveness of using these technologies for the education process. The chapter argues on the necessity of developing new tools to enable users to become producers of contents of AR/VR experiences.

INTRODUCTION

In classical education systems imperfections and challenges induce teachers to use new methods to improve the level of learning (Teferra & Altbachl, 2004; Luna Scott, 2005; Frey & Osborne, 2017). For this purpose, technology is a helpful aid in education, which allows to ease the learning methods, increasing the performances by introducing suitable technological materials (Richey, Silber, & Ely, 2008). Mainly, in the Primary school thanks to the didactic paths that are closer to the learning transmitted through the game, the preferential model of Virtual Reality (VR) and Augmented Reality (AR) applications, a great development of this disciplines has taken place. Some disciplines are more suitable for using these novel didactic forms, as for example sciences (Chen, Liu, Cheng, & Huang, 2017). The scientific disciplines have a major field of application in this innovative learning methodology and moreover, since these mobile devices are easily used by the younger generations, is established a greater familiarity and confidence during the learning process (Pierdicca, Frontoni, Pollini, Trani, & Verdini, 2017), and they take on the form of play or enjoyable quiz. Novel terms are coined as "learning by searching" and "Inquiry based science education" (Yin, Han-Yu, Hwang, Hirokawa, Hui-Chun, Flanagan, & Tabata, 2013), that are able to translate the different implemented processes through the creation of a knowledge based on researches, surveys and modelling construction. Taking into account different disciplines, the possibility of being completely immersed in monuments, or deepening in real time the contents of paintings or sculptures, without losing contact with the surrounding environment, is essential to enjoy an immersive and interactive experience of the work itself (Di Serio, Ibáñez, & Kloos, 2013; Naspetti, Pierdicca, Mandolesi, Paolanti, Frontoni & Zanoli, 2016).

For the students the process of learning requires, beyond the immediate response to the content proposal, even their permanence in time. The competences must generate an ability to understand and re-elaborate the information acquired to produce transversal and multidisciplinary skills. So an essential aspect is to use the technologies without weakening the ability of the students to create their own heritage of skills, refining cognitive techniques through their study and personal reworking. During the didactic activity, modulated on the class and on the single students, the use of technologies could lead to a method of work that is not flexible and can be modelled on the variable context of the students. The learning experience is modified with technological means (Dede, 1996) so it is important to study the effects of these technologies on learning, in particular on the student's ability to reuse the learned lessons in different fields. A certain effect is that the students, through their technological skills, can build paths that are more familiar to them. A real learning requires a more careful path to the relapse over time of the educational activities carried out by AR/VR technologies.

The aim of this work is to evaluate the real performances of AR/VR technologies for didactic purposes, considering their effect on the cultural and personal training of the students through the use of digital tools that involve all the aspects related to teaching and learning. The evaluation must also consider the ability to re-elaborate the learned knowledge. The work carried out with this research intends to be a contribution to the studies on the AR and VR applications in the educational field, evaluating as the contents and methods of these new educational paths can improve the real learning and how through a long-term educational path it is possible to direct the student towards a cognitive process and re-elaborate the learned knowledge. The test was executed inside the SmartMarca project, briefly described in Section 3. The platform underlying the project was specially created to handle AR/VR contents for cultural heritage located in the south part of the Marche region, in Italy. Since the students are oriented towards this kind of technologies, several experiments were produced exploiting and testing these users, with

31 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/evaluating-augmented-and-virtual-reality-in-education-through-a-user-centered-comparative-study/241603

Related Content

An Exploratory Study Examining Group Dynamics in a Hackathon
Alana Pulayand Tutaleni I. Asino (2019). *International Journal of Virtual and Augmented Reality (pp. 1-10).*
www.irma-international.org/article/an-exploratory-study-examining-group-dynamics-in-a-hackathon/239894

Using a Design Science Research Approach in Human-Computer Interaction (HCI) Project: Experiences, Lessons and Future Directions
Muhammad Nazrul Islam (2017). *International Journal of Virtual and Augmented Reality (pp. 42-59).*
www.irma-international.org/article/using-a-design-science-research-approach-in-human-computer-interaction-hci-project/188480

Lessons Learned from the Design and Development of Vehicle Simulators: A Case Study with Three Different Simulators
Sergio Casasand Silvia Rueda (2018). *International Journal of Virtual and Augmented Reality (pp. 59-80).*
www.irma-international.org/article/lessons-learned-from-the-design-and-development-of-vehicle-simulators/203068

What Lecturers Say Helps and Hinders Their Use of a Virtual Learning Environment to Support Face-to-Face Teaching
Sue Moron-Garcia (2008). *Virtual Technologies: Concepts, Methodologies, Tools, and Applications (pp. 222-237).*
www.irma-international.org/chapter/lecturers-say-helps-hinders-their/30921

Levelling (Up) the Playing Field: How Feminist Gamers Self-Identify and Learn in Online Communities
Sarmista Das (2014). *Educational, Psychological, and Behavioral Considerations in Niche Online Communities (pp. 81-100).*
www.irma-international.org/chapter/levelling-up-the-playing-field/99295