Chapter 4
The Impact of Augmented Reality and Virtual Reality Study Material in the Future of Learning:
A Teamwork Experience

Giuliana Guazzaroni
Università Politecnica delle Marche, Italy

ABSTRACT

Mobile augmented reality offers important opportunities for learning. Moreover, it may represent new challenges for teachers and researchers. Implementing an augmented reality (AR) or a virtual reality (VR) learning experience involves the exploration of unusual pedagogical and technological boundaries. According to recent studies, it would be more productive to consider the augmented reality as a concept rather than an educational technology (Guazzaroni, 2015; Wu et al., 2013). This chapter is devoted to analyze a high school class of 23 students invited to use AR and VR tools to create their own study material. They are about 16-year-old attending Istituto Tecnico Tecnologico "Eustachio Divini" in San Severino Marche, Italy. The basic idea of the trial is to create a short printed document augmented with the technologies of AR and VR. The experience is evaluated using tests and direct observation. The aim is to observe the impact of augmented mobile learning and to demonstrate that AR and VR study material may represent a new communication object adequate to teach future students.

INTRODUCTION

Augmented reality (AR) technology has been increasingly applied to various subjects. AR allows offering additional information using physical operation as a medium, so that users can visually see the integration of the real world and virtual images (Chang et al., 2014). Consequently, AR preserves its users' connection with the real world. AR is generally considered an educational medium progressively

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used by students and educators. Previous research has shown that AR technology has the potential to improve learning. Educational content can be available through different media. Digital learning experiences have been available in classrooms equipped with computers, interactive whiteboards, and more recently, learning experiences are increasingly reachable through pupils' personal devices such as smartphones or tablets. Consequently, the interaction with learning experiences is changing: people do not only use keyboards and mice to interact with screen content, but they can use their whole body to interact with educational study material that appears to exist in the physical world. This is possible through augmented reality technology (Radu, 2014). On the other hand, virtual reality (VR) technology is immersive. Users need headsets to block out the external world and literally "immerse" themselves in a digital realm. In VR, the concept of immersion is referred to user's involvement in the virtual environment. It causes a lack of awareness of time and of the real world, as well as a sense of "immersion". The "spatial immersion" in the virtual reality is a perception of being physically present in a non-physical world that provides a very absorbing environment (Freina & Ott, 2015). AR and VR are two closely related but very different technologies become widely popular. AR and VR rely on similar technology. The essential difference is that VR is immersive. In fact, the headsets block out the exterior world. VR main applications, therefore, are in video games and films, where users will lock themselves into computer-generated worlds. On the other hand, AR maintains its users' connection with the real world and a headset is not necessary. Students, using AR or VR, face a massive number of information and are immersed in a complex learning environment. AR and VR do not suggest a mechanical learning methodology. According to Manzelli (2013), AR and VR technologies offer a quantum correlation. They imply, in fact, the presence of correlations, as indeterminate sequences, chosen among the possible visions of the systems involved in the representation of images. These determine the non-local nature of perception using AR and VR. The quantum entanglement, or quantum correlation, is a metaphor that can be applied to the process of experiencing AR and VR objects. Mixing, in a real environment (e.g. The city, the school, the library etc.), physical elements with synthetic ones it is possible to observe, as in a quantum correlation, separate and, at the same time, interconnected systems. Moreover, using AR and VR technology in education means opening to informal learning environments. Furthermore, these technologies can favorite the transition from the "Learning Work" to the "Learning Adventure". In other words, a positive class atmosphere where students' activities are aimed to satisfy a personal desire of acquiring Knowledge (Leo et al., 2010). AR is an ideal bridge between the virtual world and the real one, offering an amplified perception (Bronack, 2011; Klopfer & Squire, 2008; Wu et al., 2013), visible to the user through mobile personal tools (e.g. smartphones, tablets etc.). The coexistence of virtual and real objects allows learners to visualize complex spatial relationships, quantum correlations or other abstract concepts. The student is allowed, for example, to experience and interact with three-dimensional synthetic objects to improve specific skills that could not be developed in traditional learning environments. These educational benefits are useful to see AR as an emerging educational technology (Squire & Klopfer, 2007; Wu et al., 2013, Guazzaroni, 2015).

This chapter is devoted to analyze a high school class of 23 students invited to use AR and VR to create their own learning content. They are about 16-year-old, mainly male, attending Istituto Tecnico Tecnologico "Eustachio Divini" in San Severino Marche, Italy. They generally use their smartphones to connect to the Internet, search information, communicate and play games. Nevertheless, when these students have to study a subject matter (e.g. History, Geography etc.) they chiefly use traditional paper books or school desktop computers. They need a clear model to improve their study method and to use new learning augmented and virtual medias. The basic idea of this learning experience is to create few

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