

Chapter 4

App Design and Implementation for Learning Human Anatomy Through Virtual and Augmented Reality

Santiago González Izard

 <https://orcid.org/0000-0003-2282-1945>

University of Salamanca, Spain

Juan Antonio Juanes Méndez

University of Salamanca, Spain

ABSTRACT

The influence of augmented reality (RA) and virtual reality (RV) techniques is analyzed in the process of teaching-learning for the human anatomy subject, in particular in health science students. For this purpose, two applications have been designed for mobile devices and virtual reality glasses with the purpose of incorporating these techniques in teaching for the study of human anatomy to facilitate the students with better learning of anatomical body contents through these technological procedures. In this way it is intended to achieve a better transmission of knowledge to students in an effective, visual, interactive, and close way. The authors believe that these technological tools constitute an excellent complementary medium to the traditional atlases, facilitating the learning of the anatomical structures.

INTRODUCTION

The great progress of new Information and Communication Technologies (ICTs) is one of the relevant factors for understanding and being able to explain the changes produced relating with teaching systems in recent years in our current society (*Carneiro, Toscano, & Díaz, 2009*). The role of these new technologies is present in the processes of social and cultural change, gaining great importance in the field of medical training (*Castells, 2004*). Within this field, different reforms of the educational system

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are beginning to be conceived with respect to the introduction of these new technologies as a means of improving the teaching-learning processes of students and teachers in the area of health sciences (*Junta de Extremadura, 2001*)(*Litwin, 1998*). This incorporation of ICT leads to a transformation both in the way in which teachers develop their academic sessions with their students, and in the learning processes of students (*Carneiro et al, 2009*)(*Juanes 2013*). These technologies give us the possibility to develop cognitively and sensorially, although it should be noted that these advances sometimes diminish the demands of work and effort of the person who uses them, because they allow us to perform certain actions reducing mental and physical work (*Moreira, 2004*) (*Marquès Graells, 2005*). ICTs do not alter the structures of society by themselves, but are integrated into them (*Carneiro et al, 2009*). New technologies modify the tasks of those who use them, but they do not change roles (*Castells, 2004*), therefore, a teacher who uses new technologies in his classroom does not cease to be a teacher, but it is true that the way in which he carries out his tasks with his students is modified, assuming a change in his teaching methodology (*Junta de Extremadura, 2001*). On the other hand, educational centres must prepare the new generations for their future incorporation into the world of work in which they will move, where the use of devices and technological means will undoubtedly play a leading role in their future professional task (*Litwin, 1998*)(*Carneiro et al, 2009*). New technologies modify the tasks of the individuals who use them, but they do not change roles. *Castells (2004)*, therefore, a teacher who uses new technologies in his classroom does not cease to be a teacher, but it is true that the way in which he carries out his tasks with his students is modified, assuming a change in his teaching methodology (*Junta de Extremadura, 2001*). On the other hand, educational centres must prepare the new generations for their future incorporation into the world of work in which they will move, where the use of devices and technological means will undoubtedly play a leading role in their future professional task (*Litwin, 1998*)(*Carneiro et al, 2009*).

It is evident that the progress that the Information and Communication Technologies have suffered in the last years, has impacted on teaching and raised new requirements in the study plans in general and in the teaching processes in particular (*Moreira, 2004*) (*Coll, 2008*)(*Briz Ponce et al., 2017*).

Taking into account the above-mentioned considerations, and considering that the use of technologies in the classroom is a great tool to promote motivation, learning and participation of students, we present two applications, own generation, through two innovative technologies such as Augmented Reality and Virtual Reality.

Augmented Reality allows teaching professionals to introduce into the classroom the visualization of concepts that would be impossible to visualize with any other technique, such as the visualization of the internal functioning of an atom or place on the student's table a brain with all its tracts and even animations representing the result of a brain tractography. On the other hand, Virtual Reality allows the teacher to transport students anywhere, such as the inside of a human skull or even a cell, thanks to its full virtual immersion capability (*González Izard et al., 2017*)(*González Izard et al., 2018*)(*González Izard et al., 2020*). However, the potential of these technologies for medical application goes far beyond their use in teaching. In fact, the authors of this article are already working on a project that aims to bring these technologies to the work of medical professionals, taking advantage of their capacity for better spatial perception and understanding for the visualization of results in the field of radiology (*González Izard et al., 2019*).

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