Chapter 1
Contributions of Collaborative and Immersive Environments in Development a Remote Access Laboratory: From Point of View of Effectiveness in Learning

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ABSTRACT

The implementation of remote access laboratories by universities is a growing tendency. Worldwide its implementation has been carried out in different disciplines using different technologies, interfaces and protocols. In this sense, it is logical to conclude that there is no fixed methodology or standard for its implementation, which leads researchers to question its effectiveness and differentiation for learning purposes during lab work. It is equally necessary to mention the importance of using collaborative and immersive environment tools to perform lab exercises with remote access since they complement its use and application. In this chapter, is presented the contributions by the implementation of collaborative and immersive environments in the development of laboratory with remote access from the point of view of its effectiveness and differentiation in learning.

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INTRODUCTION

Different learning models and the new learning applications have produced great impact, deriving in an inevitable education revolution. Additionally, the new generation of students trained with digital tools has led to the creation of new learning approaches and methods, where pedagogy and technology have come together and assembled.

ICTs, especially internet and high-speed and advanced academic networks, are tools that make possible the mobilization of knowledge, documents, images, and didactic units. This allows teachers and students to create an educational relationship that surpasses space-time limits. These tools provide universities with the opportunity to offer a better service to the educational community, as well as a betterment of the educational process. For this reason, the inclusion of technological tools in lab practices make up for the lack of space or resource availability in any educational institution.

Nowadays, as knowledge is almost ubiquitous and educational scenarios have increased ICTs use, universities have incorporated into their projects and institutional strategies the usage of 3D immersive environments, hence, contributing with flexible schedules and entries since people can log on from any place and at any moment to perform academic activities (U-learning).

On the other hand, when in any area a novel technology, approach, or paradigm is being executed, its efficacy is questioned. Due to this, it is necessary to assess learning outcomes in a remote access laboratory.

There are some studies about the efficiency in the use of these labs, mainly for a single user; however, more research regarding the use of 3D virtual immersive environments is needed, particularly, those of collaborative nature.

Some of the results of the abovementioned studies demonstrate that 90% of the students using a remote access laboratory manifest a comparable efficacy and impact from that obtained in a conventional lab (Nickerson, Corter, Esche, & Chassapis, 2007). In other case, students who used the tools of a remote access lab achieved better results and were better prepared (Fabregas, Farias, Dormido-Canto, Dormido, & Esquembre, 2011; Stefanovic, 2013). Likewise, students who used a hybrid learning methodology acquired greater knowledge and skills than those who just used the classic e-learning method (Jara, Candelas, Puente, & Torres, 2011).

To enhance teamwork skills, new tools fostering collaboration are required; this means, multiple users accessing and working at the same time in the remote access lab through 3D virtual environments. Also, immersive features are needed to provide the “feeling” of being present in a 3D virtual learning environment. Consequently, collaborative and immersive features, as well as efficacy and learning differentiation contributions, have to be developed.

This chapter focuses in the new paradigm for teaching in association with 3D virtual environments using collaborative and immersive features, and assessing contributions from an efficacy and learning differentiation stance. To expand the aforementioned topics, this chapter is organized in the following way: section 2 provides the context and background of collaborative and immersive environments, where several aspects are exposed, like: general guidelines to grant an effective learning in a remote access laboratory using 3D virtual environments, associated features to target audience and user profiles.

Next section describes solutions and recommendations, like: use of platforms for collaborative and immersive virtual environment and assessment criteria and strategies; and finally, the last section outlines future research directions and conclusion.
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