Chapter 9
Using 3D Virtual Worlds Integrated to Remote Experimentation in Sciences Teaching

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ABSTRACT

Considering the need to stimulate the interest of students, it is essential to create more attractive environments for teaching, and laboratory activities are indicated as essential to correlate theory and practice. The use of remote labs allows students access remotely at anytime and anywhere, a real lab equipment. The integration of remote experiments with 3D virtual worlds allows the creation of a rich environment for contextualization of laboratory activity, providing the user with additional information about the experiment. Thus, this article aims to understand and relate existing jobs currently about virtual 3D worlds using the integrated Remote Experiments.

INTRODUCTION

In the last decades Information and Communication Technologies (ICT) have been assuming an important role in academic reality. Transformations that gave rise to a new culture were made possible by the advance of technology, making it a key factor in the quality improvement process in education. Though we live in a society where information and knowledge are continually growing, we have seen a persistent and growing lack of interest among young people by scientific and technological professions.

One of the challenges faced by teachers is encouraging students and meeting the diversity of their forms of learning, being essential to use methodologies that enable everyone learn at their own pace. It is essential to create more attractive environments for students matching their reality. In this context, the practical activities are indicated as essential to approach students of scientific knowledge, correlating theory and practice. According to Maiato (2013), practical activities not only arouse students' curiosity, but also generate the construction of knowledge based on interest. There are several ways for the teacher to make students to actively participate in science classes, including the use of experiments and laboratories.

However the maintenance of laboratories by the educational institutions can be very expensive, especially for public schools. As an alternative to meet the needs of implementation of practical activities, many institutions have adopted the use of remote experimentation laboratories. According to Machete and Lowe (2013), laboratory work in education is recognized for bringing real benefits to students and, in this sense, remote labs have been used in science and engineering courses, allowing students to remotely access real equipment and providing additional benefits to the institutions.

Much has been discussed about how remote laboratories can improve learning outcomes, and a factor that can enhance these results turns out to be the interface used to contextualize the lab activity. 3D virtual worlds allow the creation of a rich environment for contextualization of activity, providing the user with additional information about the lab (Machet & Lowe, 2013).

Considering this scenario, this work presents the development and results of a project conducted in order to investigate the acceptance and feasibility of the use of 3D Virtual Worlds integrated to remote experimentation laboratories, in science classes at Brazilian public schools. Therefore, this initiative includes the development of a 3D virtual environment entitled Virtual World of Plants, integrated to a microscope remote lab, focused on the teaching of science in basic education. This environment was contextualized with the content on the morphology of angiosperms, with a trail where students, through their avatars, can transit through the environment that presents several theoretical concepts that will be viewed dynamically, such as videos, quizzes or other learning objects. After transiting the environment and interact with learning objects students can access the remote experiment to consolidate the concepts learned.

Conceptualization

This section is intended to provide a conceptual basis about the researched topics, seeking a better understanding of results. The following will present some definitions of Remote Experimentation, 3D Virtual Worlds and how they can be applied in an integrated manner.

Remote Experimentation

In the literature we find three types of laboratories for scientific and technological studies: hands-on labs, virtual labs and remote labs. In hands-on laboratories students deal directly with the experiment and appliances in the same physical space in the presence of colleagues an thed teacher, the latter being commonly used in traditional courses. Virtual labs are based on simulations, students interact with a computational representation of instruments and devices, with no interaction with the real experiment. Finally, in a remote lab, the laboratory is physically apart from the student, but the student can interact and control instruments and real devices through interfaces that mediate the connection (Marcelino et.al, 2011).

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