

Chapter 9

3D Virtual Learning Environments: An Avatar-Based Virtual Classes Platform

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ABSTRACT

Heated debates involving reforms in the educational system are becoming more and more frequent in recent years, mostly due to the increasingly evident shortcomings in the educational system and its difficulties to evolve at the same pace as technological development. Since nowadays people spend much of their time interacting directly or indirectly with technological devices, one can think of using this involvement with educational purposes. Through this interaction people have easy and inexpensive access to a vast amount of information. In this sense, one can think of methodologies to improve education by focusing on the foundations of knowledge rather than the emphasis on the memorization of contents. Therefore, the aim of this work is to propose and validate an interactive content authoring system as well as a virtual classroom where lessons are taught by avatars in an attempt to make learning experience richer and more motivating to students.

DOI: 10.4018/978-1-5225-8179-6.ch009

INTRODUCTION

The increasing development of new technologies has influenced and transformed all aspects of everyday life. Education, however, is one of the social structures still reluctant to employ technological devices within the educational process, regardless of how attractive they might be. Educators struggle to accept that students' general lack of interest in school activities could be directly associated with prevailing traditional teaching methods. This has raised great research interest in what concerns new methodologies proposing significant educational reform based on DICT (Digital Information and Communication Technologies).

A growing disaffection of high school students with applied sciences has been observed, as they are not considered innovative enough, leading to consequences already perceived by industrial leaders, especially in emerging countries. Brazil, for instance, has a low ratio of 6 engineers per 1,000 of economically active people. In developed countries, such as U.S. and Japan, this ratio increases to about 25 engineers per 1,000 workers (Nascimento, 2012).

Thus, to overcome the above-mentioned issues, researchers have been proposing new methodologies and tools (Moreira, Cinto, Leite, & Arantes, 2013), aimed at making the school a more welcoming place for the students, mainly the youngest ones. Some of the approaches are based on the CDIO (Conceive, Design, Implement and Operate) (Crawley, 2002) and on PBL (Problem-Based Learning) (Miao et al., 2015) paradigms, while some others focus on the use of Virtual Labs (Huang, 2004), Simulation Tools and WebLabs (Sendova, Nikolova, Gachev, & Moneva, 2004). Employing any of these methods in teaching environments, however, requires:

1. High-quality audio and video devices in the classroom and at home;
2. Improved classroom acoustics and environments;
3. Flipped Classroom methodology;
4. User-friendly computers;
5. Real-life challenges.

It is possible today for millions of students to simultaneously attend online courses in different areas of knowledge. Universities like Stanford, MIT, and Harvard have successfully embraced distance learning, yielding good results along with their Massive Online Open Courses – MOOCs (Kop, 2011; Rodriguez, 2012).

Besides, the concept of Flipped Classroom has proved to be an efficient solution for more dynamic and attractive classes (Tucker, 2012). Reversing a classroom means to change substantially the traditional pedagogical model based on classes consisting of oral concepts exposition and homework assignment, in the so-called Lecture/Homework Paradigm. This flipped model encourages students to learn by themselves, by reading books and articles, watching videos and doing other learning activities outside of the classroom. In other words, students should learn at home and practice in the classroom. On the other hand, Peer Instruction (Crouch & Mazur, 2001) can also be employed in a similar way, as it comprises home task solving and in-class content discussions involving students and their peers, assisted by instructors. Watkins and Mazur (2013) have found a significant increase of effective concept building among STEM (Science, Technology, Engineering, and Mathematics) students when such technique was applied in an introductory Physics course. Giving students the chance to think, respond and actively interact in the classroom led to an evident greater building of STEM course concepts by the learners.

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