

Chapter 46

The Quest for a Massively Multiplayer Online Game that Teaches Physics

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ABSTRACT

The last 10 years have seen explosive growth in the fields of online gaming. The largest of these games are undoubtedly the Massively Multiplayer Online Games (MMOG), such as World of Warcraft or City of Heroes, which attract millions of users throughout the world every day. The last 20 years have also seen the growth of a new field of physics known as Physics Education Research (PER). This field consists of physicists dedicated to improving how we learn and teach the subject of physics. In this chapter, the author discusses his personal quest to combine PER with a MMOG and create an online virtual world dedicated to teaching Newtonian physics.

INTRODUCTION

The last 20 years have seen the growth of a new field of physics research known as Physics Education Research (PER). This field consists of physicists dedicated to improving how we learn and teach the subject of physics. The central problem confronting physicists is the difficulty in teaching the subject and the lack of retention seen in students after they leave the class (McDermott, 2001; OECE, 2008). The last 15 years have also seen an explosive growth in the field of online gaming. The largest of these games are undoubtedly the Massively Multiplayer Online

Games (MMOG) such as *World of Warcraft* or *City of Heroes*, which attract millions of users throughout the world every day. These games are known for their expansive environments and large virtual communities, with thousands of users interacting simultaneously, thus earning the “massively” prefix. These games are a subset of Virtual Worlds (VW’s) which uses the Internet to provide a shared experience among users from geographically separated locations.

Against this background, this chapter will discuss 7 years in the author’s quest to combine PER with a MMOG and create an online VW dedicated to teaching physics, in effect, to create

DOI: 10.4018/978-1-4666-8200-9.ch046

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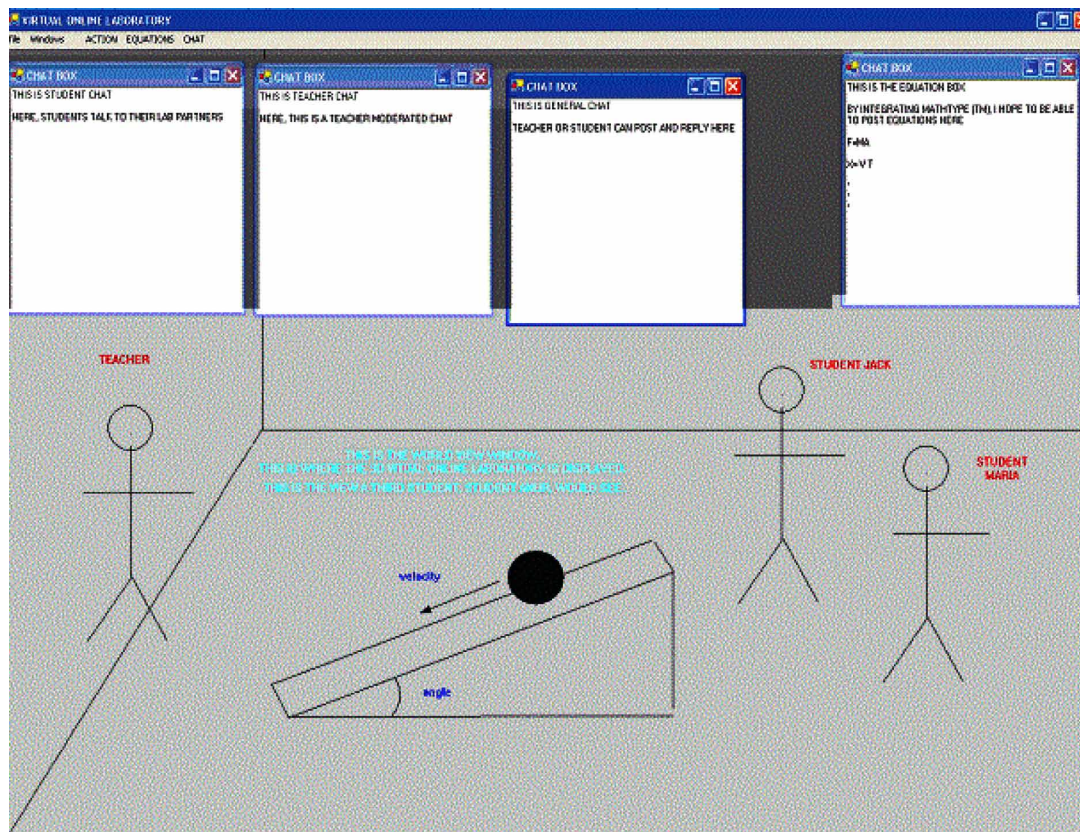
a three-dimensional (3-D) VW to teach physics by virtue of the activities and measurements performed within it. In the years since the author sketched the first outlines of this idea (Figure 1), several applications best described as prototypes have been built. None of these applications are ready for commercial or academic use and yet each represents a significant step in developing the core idea, understanding of Game-Based Learning (GBL), and understanding of game development.

The primary purpose of this chapter is showcasing different implementations of the same idea: to create a 3-D virtual environment that teaches physics. The three implementations presented will also show three different avenues for GBL development ranging from the academic hallways to the corporate board room. All told this will show that even confined within one game genre

and one educational subject there are several different ways to realize a game-based application. The secondary purpose is to demonstrate how educational concepts map into gameplay elements and vice versa. It is important to see how game elements can be leveraged for education and how the educational content can be mined for game elements. The reader should gain insight into how to transform their own educational concepts into games or game concepts into educational tools by seeing examples of how physics concepts were mapped into MMOG concepts in the three cases.

The first case will introduce the *Multiplayer Virtual Online Laboratory* (MVOL) and will define base-line proficiency with VW development. A mapping of VW elements to classroom elements, a theme which will be present throughout this chapter, will also be presented. The second

Figure 1. A physics experiment in a VW; concept sketch from 2002



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