Chapter 16
Virtual Worlds for Science Learning

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ABSTRACT

This chapter proposes that the use of virtual worlds for science education is warranted and fits well with contemporary learning theory in the context of constructivist instructional approaches being desirable and that learners learn best when they are engaged in active mental processing. Over recent years, games have become increasingly social, supporting massively multi-player online game experiences and then evolving into virtual worlds, such as Second Life, which show significant promise for educational uses. This chapter introduces the field of virtual worlds, and then discusses relevant theory and research. The authors describe the potential of virtual worlds for education by emphasizing how they can be leveraged as an effective tool for constructivist teaching techniques. In addition, the authors present some of the literature that supports their use for science education. This chapter concludes with practical concerns and some possible solutions in the context of future research directions.

INTRODUCTION

When personal computer games began to appear in the mid 1980s, both teachers and game develop-ers began to struggle to find ways to apply them to education. Despite isolated successes, however, games have not significantly affected the educational landscape, particularly in the sciences. Various reasons may be cited for this:

Firstly, games have chiefly been applied as drill exercises for rote learning designed to complement in-class activities. As such, they are a marginal activity, and their greatest advantage is ignored - that of creating experience.

Secondly, science oriented games typically utilize models of real systems. These exist in a tension between fun and game balance, and realism, accuracy, and rigor. Experiences tend to be inaccurate but meaningful, or accurate but meaningless.

Finally, games are generally perceived to isolate learners from one another.

Over recent years, games have become increasingly social, supporting first multi-player, then massively multi-player online game (MMOG) experiences. Along similar lines, general purpose platforms now exist that share many of the attributes of games, but without the focus on simple fun. These platforms are known as virtual worlds, and though new, show significant promise for education in both the sciences and other fields. This chapter introduces the field of virtual worlds, then discusses relevant theory and research, and finally presents practical concerns and some possible solutions in the context of future research directions.

BACKGROUND

The term 'virtual world' is very broad; colloquially, it can cover anything from shared text based adventure games, to large scale 3D computer games such as *World of Warcraft* (Blizzard Entertainment, 2004) and to user constructed worlds such as Second Life. In this chapter, we are chiefly concerned with worlds of the latter sort. For clarity's sake, however, we first address the breadth of virtual worlds in order to arrive at a working definition by briefly examining three example virtual worlds, then identifying the key attributes they share. Finally, we contrast these

examples with one another to see the different ways in which they can be applied.

The first games with any claim to the name 'virtual worlds' were text based multi-user dungeon games, or MUDs, for short. The first was MUD1, written by Richard Bartle (Bartle 1983) in 1979. Throughout the 1980s and early 1990s, MUDs developed further, finding a home on university networks, dial-in bulletin board systems and, eventually, the internet. In them, multiple players could explore a fantasy world together, killing monsters (known as mobiles, or mobs for short), collecting treasure, and so forth. In this way, they were largely inspired by table top role-playing games such as Dungeons and Dragons.

Unlike modern games, however, MUDs were entirely text based – players saw the world through written descriptions instead of graphics and, to interact with it, they would enter short text commands, much as in regular text adventure games. For example, the game might tell a player that they are in a room with green curtains, a sword on the floor, a goblin cowering in the corner, and Antonius (a character belonging to Tony, another player) standing by the door. From here, they might type 'leave room', 'pick up sword', 'attack goblin', or 'wave at Antonius'. As commands are received the MUD would react to them and then propagate messages describing any changes in the world to all players. So, in our example, if the original player chose the latter action, Tony might read on his screen 'Albion waves at you'.

Though text based MUDS lack immersive content such as graphics and sound, players can find them highly engaging. They incorporate social interaction through text, shared narrative, goal based game play and generally a level-based progression - these are effectively the same core features that make modern massively multi-player online role-playing games (MMORPGs) so addictive. Unfortunately, however, text based interfaces require effort to learn, and are unappealing or inaccessible to many players. Consequently, MUDs were popular primarily with people with

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