Chapter 5.13
Effects of Virtual World Environments in Student Satisfaction:
An Examination of the Role of Architecture in 3D Education

Noha Saleeb
Middlesex University, UK

Georgios Dafoulas
Middlesex University, UK

ABSTRACT

Universities and educational institutions are currently becoming more dependent on delivering courses within online virtual worlds, such as 3D Virtual Learning Environments (3D VLES). There is insufficient research on how environmental and architectural design elements of 3D virtual educational spaces and buildings inside these virtual worlds can affect the e-learning process of the students and their satisfaction and contentment. This study investigates students' satisfaction from different architectural features used in 3D educational facilities by recording, from surveys, students' degree of agreeability toward varied design characteristics in different learning spaces within 3D VLES. Defining best perceived design traits can improve 3D educational space design to augment a student's overall e-learning experience, and lead to general design guidelines for future creation of 3D virtual educational facilities.

1. INTRODUCTION

The innovation in e-learning techniques provided by 3D Virtual Learning Environments, such as Second Life, has encouraged many universities, such as Harvard, Princeton, Oxford, and over 400 more, to erect 3D virtual campuses for delivering e-learning to multiple diversities of students (Joseph, 2007). Such opportunities include experimentation, teleporting between sites (Joseph, 2007), flying, game-based activities, role-play (Calongne, 2008), modeling and co-creation,

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immersion, critical incident involvement, medical training (Scopes & Lesley, 2009) and many other practices.

Along with this trend emerged creative opportunities for constructing buildings that cross the boundaries of reality and delve into the realms of imagination of the designer. This is because of the essential disparity between the physical and the virtual world where there are (i) no constraints on budgets, (ii) no engineering natural forces and material strength limitations, (iii) no infrastructure requirements (e.g. sound, ventilation regulations or even gravity). For instance, gravity can be defied to have 3D virtual buildings floating in midair or immersed under the deepest ocean. Such novel construction techniques have also been used to erect virtual university campuses in 3D VLES to produce a wide variety of designs that range between realistic depictions or replicas of physically existing campuses, and completely imaginative embodiments (Alarifi, 2009).

However there is no academically conducted research that directly correlates between the new e-learning techniques explained above sprouting within 3D VLEs, and the design specifications of the 3D virtual spaces within which this e-learning is taking place. Therefore there is lack of supporting work on whether these design specifications have an impact on the effectiveness of e-learning on student users of 3D VLEs.

2. RESEARCH RATIONALE

One of the factors that have been proven to affect learning in the physical world, the degree of assimilation of knowledge, achievement and enjoyment of students from education, is the architectural design and physical building characteristics of the space in which students learn in. Such design features include color, texture, dimensions of space, lighting, and ventilation amongst others (Fink, 2002). On the other hand, sparse study explores the effect of 3D architecture in virtual worlds in general on any genre of users, not just students in 3D VLEs, and their satisfaction and contentment from it. For example a previous study examines systems for supplementing real-time 3D virtual environments to sustain the creation of their architectural designs (Reffat, Khaeruzzaman, El-Sebakhy, & Raharja, 2008). Another study explores a collaborative learning approach to digital architectural design within a 3D real-time virtual environment (Reffat, 2005). Moreover, existing tutorials illustrating how to use building tools to construct within 3D VLEs only express how to create and edit these buildings (Nesson, 2007), but do not offer any guidelines as to the specifications to take into consideration to make them functional, usable and acceptable by users. An individual market research, within Second Life, depicting users' reactions to preferences between realistic buildings and imaginative style buildings, only shows that users prefer realistic style buildings with a percentage of 60% more than their preference to using imaginative style 3D buildings (Market Truths Limited, 2009). Further evidence by Pursel (2010) indicates that virtual usability criteria of 3D buildings in general can differ to usability criteria required in the physical world. He includes an example of the virtual Ohio University campus, that while being an exact replica of reality, the presence of so many storeys and internal corridors is extremely inconvenient to travel through in virtual worlds (too narrow, difficult to navigate, falling off stairs, difficult exits). He also recommends that museum exhibits be placed on outer glass windows of a building, instead of on internal walls, and avatars can fly up and admire them from the outside of the building. He also comments that lecture halls in virtual worlds that are created with the same dimensions and chairs as in the physical world are very crowded and provide bad circulation. Hence it can be seen that students' contentment and satisfaction from design elements of learning spaces in 3D virtual worlds can be different from those in the physical world.

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