Design Process of Three-Dimensional Multi-User Virtual Environments (3D MUVEs) for Teaching Tree Species

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ABSTRACT

This study aims to realize the concept of biodiversity, which is one of the subjects covered by environmental education, with 3D virtual worlds platform and to realize the biological richness of users in their environment and to provide awareness of the species they see in their immediate surroundings. It is aimed to design 3D MUVE to teach tree species to pre-service teachers within framework of Instructional design process in 3D MUVEs based on problem-based learning approach. Four different design groups are third year undergraduate students (N=21) from the Department of Computer Education and Instructional Technology in the Faculty of Education at a large state university. For design process, participants with collaborative work designed 3D environments with a problem-based learning approach. The design process of 3D MUVEs was realized with the participation of researchers as trainers, guides, technical support personnel, and observers during the 16 weeks within the scope of the course. Also, participants were involved in the role of both learner and instructional designer.
INTRODUCTION

The environment can be defined as the space units of living beings that are connected and influenced by vital bonds, as the habitat of the living creatures/creature’s community, and in short, it can be defined as all of the external factors that affect the living creatures (Atasoy, 2006). Based on this context; air, water, soil, vegetation, animals and everything else on or off the Earth is included in the concept of environment (Atik, Öztekin, & Erkoç, 2010).

Individuals in society interfere with their environment to survive and influence their environment through various activities. The following can be given as examples of today’s environmental problems: rapid population growth, uncontrolled urbanization, industrialization, air pollution in cities and pollution in water, global warming and a decrease in biological diversity (Kocataş, 2006). The existence of human beings depends on both acting by the ecosystem they live in as well as helping to protect the balance and biodiversity (Atasoy, 2006). The destruction of biological diversity, a strategic asset that humanity has but cannot fully realize its importance, will be the major cause of worldwide poverty. For this reason, biodiversity constitutes one of the most important parts of the world heritage (Çepni, 2005).

The aim of the biodiversity training in environmental education aims to raise awareness of individuals about the importance of biological diversity and to provide them with the responsibility and competence to protect biological diversity. However, since environmental education in Turkey is made up of biology courses that students take until they graduate from high school, these courses are insufficient for effective environmental education. Since students study by memorizing the information given in the courses for the exam, this information cannot provide the desired behavioral change in the individual (Özcan, 2003). For this reason, it is possible for the students to know about the local species by observing the plants and animals directly through the education of biodiversity, i.e. through an effective training process (Lindemann-Matthies, 2002; Şahin, 2018). At this point, pre-service teachers have great responsibilities as future teachers. In this context, it is very important to determine the perceptions of pre-service teachers in the preparation of the course content that meets the expectations of environmental education (Özmen & Özdemir, 2016).

The convention on biological diversity, which is a vital issue, and the protection of this diversity is under human responsibility, but the future generation is not sufficiently level of direct interaction with nature and its concerns about the future include the reduction of biodiversity (Bergseng & Vatn, 2009; Şenel, 2015). Therefore, biodiversity education, which is a subject of environmental education, is one of the most important issues within the conceptual framework of biology education (Mercan & Köseoğlu, 2019).

Integrating technology into the field of education has increased the use of technological resources in learning environments. One of them is three-dimensional (3D) virtual applications. In the 21st century, 3d technology, which is popular all over the world, affects educational technologies to a great extent. Three-dimensional virtual worlds with a convenient interface are accessible environments where online users log on with the help of a virtual character (avatars). In these environments, users can communicate with each other through audio or instant messaging tools and with authentic content. 3d virtual worlds also provide users with socialization, research and learning environments (Güler, 2014). In particular, three-dimensional multi-user virtual environments (3d Muves) can be used to reveal the effect of spatial perception. In these environments, individuals can move around with avatars that represent themselves in the authentic world. Besides, these environments consist of many places or sub-worlds where users can walk and communicate with each other in 3d Muves (Campbell, Wang, Hsu, Duffy, & Wolf, 2010).
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