

EUCEET 2018

4th International Conference on
Civil Engineering Education

CHALLENGES FOR THE THIRD MILLENNIUM

VR-based Teaching and Learning Tool for Building Design and Construction

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ABSTRACT

A Virtual Reality (VR) based teaching and learning tool is proposed in the present paper. A virtual 3D environment is built for students to conceive their design ideas, plan the layout, design the structure, construct the products (buildings, communities, infrastructures, etc.), and to directly interact with the products they designed.

The aim of the research is to strengthen the learning-by-doing approach. The objectives are: (1) to build a VR design environment for students to experience corresponding impact from different scenarios, which will help the student understand and investigate different design theories and schemes; (2) to build a VR construction environment for students to investigate how the building is built and what are the safety issues should be noted when visiting a construction site; and (3) to provide an collaborative environment for students in the Built Environment domain for better communication through a complete building project featuring active and experiential learning. Students with different majors in the cluster can work together in a design project using the VR platform so as to enable collaboration work, which is a common working situation in reality.

A game was developed to guide the students to explore a virtual construction site by answering technical questions and carrying on tasks resolving safety hazards on site. Unity 5 is used as the game engine to develop the package. VR software package, VIVE, is used to realize the interaction between the virtual environment and the user interactively and immersively. Students from the Civil Engineering were invited to play the game and give feedbacks using a questionnaire. Positive comments were given by the students showing that they were very interested in playing such a technical game. Most of the students were willing to spend more time in finding answers after playing that game.

In this way, the benefits of the research could be: (1) Enhancing the understanding of conceptual design ideas and how to make better designs in urban planning, architecture, and civil engineering domains; (2) Better accessibility to more realistic structural products in a large scale; and (3) Improving professional skills such as teamwork and communication in the VR-aided learning-by-doing process.