Chapter 31
Systems Engineering Concepts with Aid of Virtual Worlds and Open Source Software:
Using Technology to Develop Learning Objects and Simulation Environments

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ABSTRACT

Technology is changing the landscape of learning and teaching in America. The use of virtual worlds enable engineering and technology programs to implement software programs such as Second Life and Open Simulator to enhance what they may currently already have. Additionally, virtual worlds can add a more dynamic environment in the online classroom for multiple platforms such as the Personal Computer (PC), wearables, and mobile devices. The purpose of this chapter is to provide a review of these programs to include how to implement these items into an engineering course. Further detailed in this submission is how to incorporate Institute of Electrical and Electronics Engineers (IEEE) documentation and other engineering guidelines into the projects. Included in this chapter is a detailed layout of a simulated environment as well as various approaches of structuring and organization for classroom activities.

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SIMULATION

Simulation allows for the imitation of a real world scenario or systems. This can be accomplished using software technology such as virtual worlds. Simulation can come in the form of training, education, video games, modeling, low fidelity prototypes, and usability. Simulation can use learning objects and incorporate other modern day technologies such as Google Glass for increasing teaching effectiveness.

UBIQUITOUS LEARNING

Ubiquitous Learning (U-Learning), supported by the revolutionary and abundant digital resources, is viewed as an effective learning approach for situating students in real-life and relevant learning environments that supports and promotes a variety of learning needs. U-Learning involves applying ubiquitous technologies in the enhancement of education strategies and models. Embedded Internet-based devices that we use in our daily live can present a supportive environment for U-Learning. The rise in Internet availability and accessibility has truly made a significant number of learning resources and options available to today's students at all levels of education. U-Learning has the unique power of providing educational resources in a manner that is flexible, calm, and seamless due to its pervasive and persistent model (Martinez-Maldonado, Clayphan, Muñoz-Cristóbal, Prieto, Rodríguez-Triana, & Kay, 2013); U-Learning aims at removing educational and learning physical barriers by utilizing the advancements in technology The ubiquitous learning has become more than a technology phenomenon and a prominent vision that strives to revolutionize the educational landscape and present technology-driven educational settings, because it thrives on the concept and idea of making a variety of educational and learning assets available to students, creates new and varied learning environments, customized learning and enables the realization of a series of training activities from anywhere, anytime and from any device (Durán, Álvarez & Únzaga, 2014).

Ubiquitous and pervasive learning environments offer students unique possibilities for team work and collaboration both face-to-face and remotely. These environments include an array of modern and innovative technologies at different stages of adoption: interactive whiteboards are already available in many classrooms; interactive tabletops are just starting to be introduced in schools (Kharrufa et al, 2013), and handheld devices are already used by students and teachers in the form of smart-phones or tablets.

U-Learning Space and Design

Many studies in the past have investigated the effectiveness of deploying different learning and teaching styles with different U-Learning environments to determine which strategy produces the best learning outcomes for students with different learning needs. It's important to note that developing a u-Learning space has to take into consideration the outcome of the existing learning theories in terms of best practices, such as a structured relationship between information and learners' understanding in educational settings. This helps to prevent learning isolated from a meaningful context. For example, if a student understands *why* and *how* something happens rather than just being told that it is true, then the information is more relevant and, therefore, is more meaningful to the student. The rationale for this is that *how* is the inclusion of the pedagogical information; and *why* is the inclusion of interactive learning, allowing students to create knowledge from what they perceive (Ogata & Yano, 2012).