

STEM Course Enhancement – Dakeev, Engineering Technology

1. Previously, engineering laboratories, with hands-on activities, required physical presence to perform lab related activities. In contrast we are proposing to develop a virtual and augmented reality enabled laboratory setting that provides similar hands-on experience remotely within the safe environment. The development of such VR enhanced educational tools are crucial than ever before since the globe has experienced significant impact during the COVID 19 pandemic. This mini proposal will impact Engineering Technology's electronics lab and all the courses that require the use of it.

Methodology:

The goal of this project is to involve underrepresented undergraduate engineering students to develop a virtual training laboratory with virtual reality interactive activities for freshmen to senior level engineering students to provide an injury free learning environment.

To achieve this goal, the project targets the following two objectives:

- a) A virtual reality (VR) laboratory environment will be developed in Autodesk's Revit, Creo Parametric, Solidworks and Unity, consisting pre-defined three-dimensional parts to illustrate various orthogonal views of objects such as saws, safety harnesses, CNC equipment and other infrastructure.
- b) Using the developed CAD environment in the first step, course specific laboratory equipment will be modeled and placed in the VR lab. The participant will put on the VR headset and will be teleported into the virtual laboratory to interact with the experimental objects or the tools, that are needed to master, via the interactive virtual training.

Justification:

Recent COVID 19 pandemic and earlier disasters such as hurricane Harvey required the students to continue their education remotely. Using VR technology, the students can engage in a safe interactive lab activity that could help them become strong engineers. College students will experience a hands-on approach to learning about and developing VR technology and understand the applications of the technology in different situations, not limited to the technology and engineering world. Students will also be able to engage in a project that exposes them to getting out into the community to educate others on the benefits of VR technology.

During the summer and fall semester period, the research team will develop required equipment for manufacturing laboratory, where 3D printers, CNC equipment, assembly lines, and robotic arms are present. During the following spring semester, the VR Lab will be deployed for a pilot test to ETDD 3310 Product Design and Development course, where the course student volunteers will wear the virtual reality headset and teleport to the laboratory that represents the identical virtual version of the existing physical lab.

2. To enhance the ETEC courses with VR Lab, the following equipment is needed:

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| 2 Student Assistants | \$1,600 |
| 2x Oculus Quest 2 | \$600 |
| Android Tablet | 149 |
| Total | \$2,349 |

This proposal was submitted to NSF's CAREER with the request of \$599,958. Therefore, this pilot study would significantly assist the researchers with the necessary data collection.