

STEM Course Enhancement – Dakeev, Engineering Technology

1. This proposal is to affect ETDD 1361: Engineering Graphics class, offered in the Spring 2020 semester, with approximately 15-25 student enrollment. The faculty will develop an Augmented Reality tool to represent the three-dimensional projections of a 2D drawing to visualize the 3D model parts. Current research indicates that the most challenging part of learning 3D modeling is understanding the 3D environment. This is especially true when the undergraduate students are enrolled in 3D modeling course as freshmen.

Methodology:

Although, the assessment is not mandatory, the instructor would like to conduct a survey to develop conference/journal papers for publication as well as presentations. The students will be exposed to a 3D modeling software as a first day of class with basic concepts and tools of the software. The students will analyze a pre-defined part to comment on various views such as Front, Right Side View, Top, Bottom etc views. Once the comments are recorded, the students will visualize the prototype with an Augmented Reality tool. The students will be asked to repeat the survey to record the progress of their spatial orientation understandings. As a last step, students will develop the same part in 3D modeling software and 3D print the object. The final product will be compared to the pre-defined (original) part for accuracy. Pre and Posttest data analysis outputs will be reported for significance with SPSS's t-Test.

2. Some of the student learning outcomes from the project:
 - a. Students will be able to understand the 3D model prior to modeling via Augmented Reality (AR) tool
 - b. Learn 3D modeling (with the product in mind)
 - c. Students will be exposed to an Augmented Reality app development, which may be offered later in their program as an elective class

The outcomes are required skills every engineer must possess. Engineering Technology students may hold positions such as Quality Engineers, Manufacturing Engineers, Plant or Workshop Supervisors, Design Engineers, Continuous Improvement Coordinators etc. All of which require explicit understanding of 3D models and their blueprints prior to manufacturing. Therefore, the redesigned course may prepare our students to their future professional life and have a better competitive advantage.

3. In order to enhance ETDD 1361, the following equipment is needed:
 - a. Curved Monitor for AR development
 - b. Dell XPS Tower

Although the proposed equipment exceeds the grant funding, the faculty may upgrade current desktop computer, as well as request supplemental funding by May 15th, that will be used to develop the AR tool for class use. Additionally, the faculty is developing external proposals to enhance lab equipment for Virtual and Augmented Reality education.