Research for the Improvement of the Foundations of Engineering Lab Course

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Kelsy is a Pre-Cybersecurity major at the University of South Florida- Tampa. She grew up in Jacksonville, Florida with her two older sisters. Kelsy's hobbies include competitive figure skating, and language learning. She hopes to become fluent in 10 languages and eventually start an international business.

Mr. Robert Hogan Jr, University of South Florida

Robert Hogan is a second year student pursuing a degree in Electrical Engineering at the University of South Florida. He attended DeLand High School for the Engineering Academy where he was introduced to different fields of engineering, which built his interest in the power field. Currently he is assisting the faculty of the Foundations of Engineering Lab course at the University of South Florida.

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Background

Most Engineering students are not able to acquire significant experience relevant to their major until their third or fourth semester in college due to College of Engineering prerequisites. The Foundations of Engineering Lab course is designed to introduce new students to the technical and design process aspects of their major through the use of group design projects. These group projects simulate the relationships between business partners, consumers, and design engineers. This course was implemented at the start of the 2017 Fall Semester and data collection for this research document was initiated during the 2018 Fall Semester.

Projects

Currently, the Foundations of Engineering Lab course houses several different project types: Robotics, Fuel Cell, Remote Sensing, Microscope, Speaker, App and Garden projects. Most engineering disciplines are loosely reflected by at least one of these projects, with the exception of medical-related engineering majors. Students choose a project similar to their intended engineering discipline and have a semester to work in a group to complete a finished and working product by the end of the semester. Students have free reign on how to complete their project, celebrating their creativity- as long as their projects adhere to the overall intention of their specific project.

Design Process'

Throughout the semester, the class is designed to go through the design process essential to creating larger scale projects. This 8-step process is a step up from the scientific process taught to students in grade school, for this process integrates a consumer's needs as well as the technical and engineering needs required to produce a product. Armed with the knowledge of the Engineering Design Process, creations in a professional business setting, or inventing something completely new will have much more of a guided approach.

Along with following the design process, each project is required to have at least one 3D-printed component. Students are taught how to use a specific online software- TinkerCAD to complete their first prototype, but then were allowed to use any kind of 3D printing software to complete their designs going forward.

Community Partners

This course is a service-learning intensive course. This class is intended not only to enable students to have hands-on experience in their respective fields, but to also positively impact the community around us. The Foundations of Engineering Lab currently partners with 2 public schools, and the local Girl Scouts in the area. Students in the class make contact with these partners at least 2 times a semester, with an end-of-semester showcase to display the finished product. The community partners not only partake in creating a 'consumer' that satisfies the design process, but the children are also involved with a hands-on STEM-related project that they have had a large impact on its development. The hope is to create a growing interest in STEM in the minds of children and upcoming teens in the area, as well as creating lasting relationships and growing positive impacts on organizations in and around the city vicinity.

Research

Research is being conducted on how to improve the course.

Unfortunately, there is no way to calculate the retention rate of Engineering undergrads impacted by this course with a high confidence rate. There are too many factors to be able to get a precise and accurate evidence such as: student financial problems, lack of interest in any undergraduate study, illness, personal issues, or sway from guardians to follow a specific career path. However, feedback from students will be able to improve the transition into the University's College of Engineering, as well as providing useful information to make the Foundations of Engineering course an experience they greatly appreciate.