

Incorporating Entrepreneurship in an Introductory Engineering Course by Generating New Ideas

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In the competitive technology markets of the 21st century, it is no longer sufficient to educate engineering students with merely technical skills. An evidence to this claim is the large number of startups with apparently promising futures that have gone out of business early due to lack of entrepreneurial skills of the founders. A recent study by Duke and Harvard university over 500 technology companies revealed that only 37% of their leaders even have engineering backgrounds. If United States wants to remain the world economy leader, educating engineers with entrepreneurial mindsets is more crucial than any other time in history. That is why many federal and private institutions have invested in engineering entrepreneurship programs, including NSF, NCIIA, and KEEN.

In this study funded by KEEN to generate new ideas, first-year engineering students in an introductory programming course with MATLAB were asked to work in groups to find a need on campus or in the market with a business potential and write a standalone application for it. Project deliverables were the application, answers to a questionnaire, and a final report. Prior to the start of project, students were required to study an online module developed by KEEN about generating new ideas in which they learned the definitions and differences between an idea and an opportunity, and different methods of recognizing business opportunities, followed by online quizzes.

This study found that students were interested in learning about entrepreneurship and using the technical skills learned in class to solve real-world problems with potential business opportunities. Pre- and post-assessment of creative thinking skills using standard AACU rubrics also showed a significant increase in the creative thinking of the students due to participation in this project.

Some of the topics worked on by the groups were: 1) a remotely-activated switch for old devices that cannot be turned on/off remotely; 2) a personal security application that allows the student to press a button for sending a help signal as well as the person's GPS coordinates to the campus security office if felt threatened while walking on campus at night in areas with no emergency call box; 3) a hiking application which provides a list of dangerous animals and edible and dangerous plants for a given location as well as pertaining pictures and first-aid actions; 4) a campus navigation map; and 5) starting a research on autonomously detecting failures in a 3d printer using computer vision and sending a warning to the printer operator to stop the print and avoid wasting the filament.

Deploying the application on cellphones was not achieved due to the limited time frame of one semester and the complicated process it needs and has been considered for future work.

In conclusion, this study indicated the need and effectiveness of incorporating entrepreneurship in engineering curriculum by showing that it can encourage students to think creatively, recognize business opportunities in engineering problems, enjoying and appreciating their courses more by observing their applications in real-world, and leading to undergraduate research projects.