Designing Engineering Education: Scenarios, Entrepreneurship, and Research
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Designing Education Lab

Introduction
My name is Anna Breed and I am a junior in Mechanical Engineering. I grew up with three half-brothers. Because of this, I ended up being exposed to "boy" toys, i.e. train sets, Kinen, Lincoln Logs, and Legos. I think this exposure was the reason why I was drawn to engineering, because I loved to build things with my hands. My interest in engineering education comes from the idea that traditional textbook/lecture education may not be the best way to discover engineering. This summer, I have enjoyed working with DEL on projects that address this thinking, and hope to see some of my work affect students in the future.

APPLES and PEARLS and FIGS, Oh My!
The Designing Education Lab has done several surveys in the past relating to engineering education. The Pathways of Engineering Alumni Research Survey (PEARS) was focused at people who had recently graduated and was used to try to design course load better based on these individual's experiences. The Academic Pathways of People Learning Engineering Survey (APPLES) was more focused on the student experience while still in undergrad, and was not specific to Stanford. Now, we are working on FIGS: the Fostering Innovative Generations Survey. Primarily, the focus is going to be on entrepreneurship activity in engineering students. The survey will be sent out to about 30 different schools, targeting undergrads of all schools of engineering. My involvement this summer has been discussing potential incentives, researching the relevant survey vendors that we are thinking of using, and generating feedback. The survey is not scheduled to launch until February, with two different phases, so I will be continuing work on this during the year.

Overview of Projects
In the Designing Education Lab this summer, I worked on a variety of projects involving engineering education and entrepreneurship in engineering education, ranging from course development to running a conference.

Redesigning E-14
Much of my SURI experience was spent working on a few course changes for ENGR 14, the Introduction to Solid Mechanics class. Professor Sheri Sheppard, who heads the Designing Education Lab, has been doing research based off the performance of students in E 14 from past quarters, especially surrounding the introduction of the SBL, or scenario-based learning, labs. My involvement consisted of helping develop the online homework assignments, and creating a SBL lab involving breaking chalk that examines shear force and bending moments. The online homework assignments were primarily developed by Peggy Boylan-Ashraf, and I worked on testing, photo and question development, and evaluation through all the drafts of the process. These assignments are focused on free body diagrams and support types, and are designed to evaluate student's understanding, providing the professor(s) feedback. The new online homework assignments will be ready for this coming fall quarter. The chalk lab examines shear forces and bending moments in chalk when the pieces have different loadings. Students will be testing out the chalk and calculating when it will break, and then actually break each piece to see the differences in their own calculations.

It has been a great experience seeing how much work goes into any curriculum, and I'm excited to know that work that I have done will affect future E 14 students.

Epicenter Summit
The National Center for Engineering Pathways to Innovation (Epicenter) is a research group that promotes entrepreneurship and innovation in engineering education. We hosted the first ever Epicenter Summit in August where attendees presented and shared their research on student performance, faculty involvement, and programs related to entrepreneurial thinking in the classroom and beyond. An ASEE paper is the next step for us now.

Online Homework Example

Chalk Lab worksheet