FIE 2014 Report

Matthew Shuman

November 2, 2014

Introduction

The LL Stewart funds awarded on February 19th, 2014 were used to attend the Frontiers in Education (FIE) 2014 Conference. This event had participants from US Engineering Universities (Purdue, Penn State, Texas A&M, and others) and from International Engineering Universities (Spain, India, China, Germany, and Finland, to name a few). The keynote speaker of the conference, Carlos Kloos, opened the conference with a speech about the challenge of connecting with students. The two main approaches that he brought up for holding a lecture were face to face (F2F) presentations and technology mediated approaches. Commonly the F2F method is considered the personal method, leaving the technology mediated option as impersonal. Carlos' argument was that a well made video or interactive conference over Skype can be more personal than sitting in a lecture hall with 250 other students. Carlos challenged the audience to search for methods to find a balance of F2F and technology mediated approaches to improve the educational experience of engineering students. The following quote was the exiting thought from his keynote speech.

> "Books," declared the inventor with decision, "will soon be obsolete in the public schools. Scholars will be instructed through the eye. It is possible to teach every branch of human knowledge with the motion picture. Our school system will be completely changed inside of ten years.

It might seem that this quote was from a modern revolutionary at Google or Apple, but this quote was taken from Thomas Edison in 1913, 101 years ago. The challenge of creating a blended classroom of F2F and technology mediated techniques is not a new concept. Tools have existed for a long time to help deliver information, but many lectures in the university setting are still taught with chalk and textbooks. The centerpoint of this conference was to create an effective blending of F2F and technology that achieve educational results.

Blended Techniques for Lectures

The sessions on creating blended courses focused on using technology to supplement the traditional textbook approach to a course. These methods included using simulators,

instructional videos, and studios to improve the educational outcomes of student learning. These following three presenters talked about how to create a blended course. Their approaches were intersting, but all of their assessment involved qualitative data gathered from interviews with the participants after the program completed. It's impossible to make conclusions about the program's effectiveness without quantitative data that is statistically significant.

A graduate student in Chicago created a simulator that could help students visualize electron flow through simple electronic devices, such as a resistor or light bulb. This simulator showed electrons flowing through the device. Her goal was to use a visual approach to help instruct fundamental electrical concepts.

A professor from PES University in Bangalore, India created a method for students to create annotations for videos that other students could choose as an overlay while watching a course video. These overlays could be made in any language, which is useful because India has many regional languages. Annotators would gain reputation for quality comments, and this rating system could seperate high quality commentors from low quality commentors.

A graduate student from Chemical Biological and Environmental Engineering from OSU presented on the usage of graduate students leading groups of 25-30 students in studios once a week. Traditionally a recitation is used to completement a lecture. A studio is similar to a recitation, but the studio focuses on using the GTA to lead group activities. This helps students identify their deficiencies within a group setting, and then pull information from the GTA if the entire group is stuck on a specific topic.

Labs

Presentations about labs focused mainly on a new technology or piece of hardware that is used to help develop applicable skills in the lab. Several of the sessions dealt with hardware used in the first year, to help motivate and inspire new students. A professor from Spain presented his course that used an Alterra FPGA as a hardware platform to teach a Hardware Description Language during the first year. Lastly a professor from Spain presented his robotic kit that is used for highschool outreach programs and to instruct first year students.

Miguel Rubio, from the University of Granada in Spain, used an Arduino platform during the first year to help instruct programming concepts. The pilot course used the Arduino, while the control course did the prior lab using Matlab exercises. The result of this program is that 25% of the Matlab section failed their lab, but the Arduino section only had a 5% failure rate.

Sadot Alexandres, from the Universidad Pontificia Comillas in Spain, introduced a first year course that used VHDL to program a Xilinx Alterra FPGA Development Kit. His students used a pre-wired lab kit that was set up by the professor or TAs to implement their digitial logic projects. It provided their first year students with a valuable introduction to digital logic design, and gave them an opportunity to validate the theories learned in lecture.

Julio Pastor, from the University of Alcala in Spain has developed a $115 robot kit to help motivate high school and first year engineering students to learn electrical prototyping and computer programming. This program used a custom robot kit called, 'Depecabot', and began in 2002. It has gone through 3 design revisions over the past 12 years, but the designs focused on hardware assembly and computer programming. Understanding of electrical circuits within the robot have been omitted to allow them to fit this robot into a single course.

Special Events

There was one specific event that was not on the program, that needs to be mentioned. The organizers of this conference didn't allow of the lunch to be a time of decompression and conversation that shared ideas between conference attendees. They gave us 3 hours of listening to sessions (9-12), and immediately after the sessions they scheduled a lunch. During lunch they attempted to serve us soup and have the guest of honor speak while we ate. People talked, because they wanted to discuss ideas developed during the seminars. People ate soup with noisey spoons, and nobody could hear the guest speaker. It was disrespectful to the speaker, and frustrating for the attendees. The leaders of the conference verbally repremanded the audience, but people in the audience felt trapped with their noisey soup spoons and unstoppable ideas. It was an unfortunate situation that should have been avoided by scheduling the conference intelligently.

Conclusion

The ideas presented at the conference were not novel. The labs that we have developed in EECS are already polished versions of the novel labs presented at the conference. For example my digital logic course has been using an HDL and an FPGA for the past 4 years, and some students take this course during their first year. OSU students in this digital logic course also wire their own FPGA boards to other circuits and have a much more complete skill set than the Spanish course presented at the conference. The TekBot we developed in 2001 focuses on educational objectives relating to electrical engineering that are neglected by the Spanish Depecabot, but the Depecabot focuses on programming concepts.

While the ideas were not new the conference did help focus my vision for the courses into a clearer plan for the next several years. The courses of mine that have over 200 students need to have some video content developed to give a more personal touch to the current F2F course structure. This will give students an opportunity to replay some of the example problems and catch up if they miss a class. This next challenge will require a new toolset, of capturing video data, polishing captured video into a professional format, and then restructring the courses to use the new technology mediated solutions.

Overall this conference validated the efforts put forth in improving the educational environment within EECS at OSU and provided a clearer path for what goals to pursue in the next few years.