Executive Summary, May 2013 Engineering National Advisory Council

[Please reserve Friday, November 1 as the tentative date for the fall 2013 ENAC meeting which will be held at the Adobe facility in Lehi, Utah.]

The May 2013 ENAC meeting focused on the revolution in the electronic delivery of college course, with profound implications for the traditional “professor and classroom” model. While most are familiar with distance learning and online courses, a new model is emerging in the form of “Massive Open Online Courses” called MOOCs. The rapid dissemination of free course material by primarily top tier universities like MIT and Stanford represents a critical inflection point for education, and colleges and universities are re-thinking the business model as they attempt to provide access to more students while controlling cost.

Within this environment, the goal of the ENAC discussion was to identify opportunities for the College of Engineering to show leadership by thinking and planning strategically. By employing alternative delivery methods where appropriate, the College of Engineering aims to enhance the quality of the educational experience for students and faculty, while increasing access and reducing costs.

Among the types of alternative course delivery considered are:

- Remote live delivery in which students interact via internet conferencing
- Telecourses which include pre-recorded classes that are streamed
- Hybrid courses (some face-to-face interaction)
- Flipped classroom in which students watch pre-recorded lectures before coming to class
- Massive Open On-line Courses (MOOCs) – free and non-credit (educate the masses)

Eric Denna, the University’s Chief Information Office, presented the university-level perspective in which he felt technology should be supportive of, but secondary to, an effective teaching and learning process in which assessment plays a critical role. He felt that institutions fare better when the teaching and learning objectives guide the IT delivery. In developing a business model for the U, Dr. Denna is hoping to answer the following questions:

- Whom do we serve and what do we want to help them (those we serve) do?
- What services do we provide so they (those we serve) can do what we want to help them do?
- How do we know we are doing a great job?
- How do we provide the services?
- How do we organize?

College faculty members next presented their perspectives base on three different types of experiences:
• Don Bloswick, Professor of Mechanical Engineering, discussed specialized certificate programs developed for industry for continuing/enhanced education in specialty areas
• Cynthia Furse, Professor of Electrical and Computer Engineering, Associate Vice President for Research, discussed her experiences working with the flipped classroom model.
• John Regehr, Associate Professor of Computer Science, described his experiences teaching for Coursera

Following lunch, small group discussions were organized around three different questions:

**Group One:** In which of the forms of computer/distance education should the College of Engineering participate?

Group one considered options for alternative delivery that might become part of the College of Engineering educational model such as:

• Specialty programs or degrees for companies seeking ongoing or advanced education for employees
  - Petroleum Engineering
  - Big Data
  - Data Center Engineering
• A high school engineering course developed for juniors and seniors to fulfill science requirement
• Engineering courses delivered to other Utah universities
• Flipped and hybrid courses
• MOOCs
  - Produce high quality courses for broad distribution
  - Use MOOCs for remedial study
  - Use MOOCs to enrich the curriculum (give credit)
  - Use MOOCs to save money

**Group One Conclusions:**

Models for alternative delivery, including MOOCs, are still evolving and changing, and as a university, we ought to be experimenting with different options to determine best practices. Both the development of online courses and the acceptance of courses developed elsewhere should be considered as part of the mix, as long as the quality is high and the assessment of course content is rigorous. There should be limits on the number of online courses an undergraduate engineering student can take to fulfill the degree requirements, and the evaluation of content mastery needs to be done on site before credit is awarded.

Specialty programs at the master’s level, such as the petroleum engineering degree, and data management certificate, should be part of the college’s academic offerings. We should also
consider delivering specialty courses to other Utah campuses, to improve student access while avoiding duplication of resources. There is no “one-size-fits-all” approach that will be successful for meeting all of the needs. Faculty members should be encouraged to try approaches that are best suited to their own strengths and skills. Course delivery should also fit the course content.

Group Two: How can technology-assisted teaching improve the quality of instruction? How should the College support faculty in instructional design of courses. How will the revolution in teaching affect faculty?

How Can Technology Assisted Teaching Improve Instruction (General)
- Smart boards
- Use of Flipped Classroom
  - Use both new and existing technology
- Students like ability to review difficult concepts in pre-recorded lectures
- Instructor responsibility for content mastery remains
- Need to facilitate assessment
- Cross-university collaboration (share material)
  - Does this affect student credit hours and funding to the University?

How to support faculty in Instructional Design
a. “Technical”
- UU provides production and editing assistance
- Use existing flipped/on-line/other material

b. Retention/Promotion/Tenure
- If distance learning is embraced, the promotion and tenure process needs to account for the time needed to develop online courses
- The College of Engineering provides a course on effective teaching
- The Department of Civil and Environmental Engineering sends faculty to an intensive teaching seminar

Impact on Faculty Careers
- Research vs. teaching
  - Criteria to accommodate each
- Must have positive effect on career
  - Must improve professor’s efficiency
  - Must enhance learning experience
  - Must maintain quality of outcome
    - Student
    - ABET
- Faculty also need face time with students (interactive process)
Group Three: What are the financial implications of new teaching styles? Should the U give credit for MOOCs? If so, how should we assess student mastery of the material?

Clearly, the financial partners behind the existing MOOCs have made a significant upfront investment in the development and distribution of courses, and are now looking for ways to monetize the model. Group Three members felt the College and the U should not watch from the sidelines, but “grab a space” in the emerging model and figure out the financials as we go along. If we wait for the fog to clear, it may be too late to take advantage of emerging opportunities. We should view this as educational research vs. immediate return on investment.

The group felt MOOCs could be useful if they meet our standards of excellence. They could help to shift the teaching burden and allow a redistribution of vital resources, especially if the courses provide and incremental benefit from an increased number of students.

There was recognition that retention among first-year engineering students goes up in proportion to the amount of face time with faculty, so using online courses at the stage could be counter-productive. The flipped course/hybrid course seems to be an optimal model because it allows students more time to master difficult concepts at their own pace, but still allows for faculty/student interaction.

Industry acceptance of the fully online degrees will determine the ultimate success of the movement. At the moment, industry preference is clearly with the traditional degree at the undergraduate level; specialty programs at the master’s level for established professionals is much more widely accepted for ongoing education. The greatest concern about online programs is the quality of the education and the assessment of course mastery.

Universities need to consider the value proposition of all that they offer including: face time with outstanding faculty, engaged learning opportunities including research and capstone projects; hands-on laboratory experiences.

The group felt that the college should identify its strongest faculty in the area of online learning and move forward in using new trends and technologies to improve instruction, increase access and ultimately, generate needed revenue to support course development and delivery.