

Engineering College Council Meeting

April 8, 2010

423 ILR Conference Center

Members Present: Jim Becker, Ron Black, Joe Bonventre, Sarah Fischell, Sam Fleming, Greg Galvin, Mike Goguen, Frank Huband, Brian Kushner, Lowell McAdam, Jack Neafsey, Chris Ober, Bob Shaw, Bill Shreve, Dan Simpkins, Duane Stiller, John Swanson, Sophie Vanderbroek, Jim Wrightson

Emeriti Members Present: Dick Aubrecht, Jay Carter

The meeting presentations and materials can be found at:

<https://confluence.cornell.edu/display/ECC/2010+Spring+ECC+Meeting>

Username: eccspring@gmail.com

Password: eccspring.10#

Goal and Desired Outcome for the Spring 2010 Meeting

Goal of the meeting: To present evolving technologies used in the classroom.

Desired Outcome: To collect input, as one of several sources, for investing in technologies as we face ongoing constraints.

On April 7th, the Engineering College Council held a reception and dinner at the Statler Hotel. Following the reception, Chris Ober, Interim Dean of Engineering, welcomed the Council and gave an update on the College. After the dean's presentation, AJ Edwards, Senior Investment Officer, gave an overview of the endowment.

Welcome and Introductions – Bob Shaw and Sarah Fischell

On April 8th, Bob Shaw welcomed the Council to the Spring '10 ECC meeting and introduced new members, Dan Simpkins (Cornell B.S. '80 EE, MEng '81), Hillcrest Laboratories Inc., and Ron Black (Cornell B.S. '86 MSE, M.S./Ph.D. '90), UPEK. The ECC members then went around the table briefly introducing themselves.

Chris Ober and Jim Mazza introduced Kathi Warren, the new Assistant Dean for Alumni Affairs and Development, who will start at Cornell on June 1st. Kathi previously served as a major gifts officer at the Johns Hopkins University Krieger School of Arts and Sciences and the Robert H. Smith School of Business at the University of Maryland.

Follow Up to Prior ECC Meetings - Chris Ober

Chris Ober gave a presentation in response to the feedback he received from the previous two meetings.

Revenue growth: Ober indicated that the College has been successful at increasing research funding. It has also focused operationally on growing the MEng Program. Ober indicated that the Provost agreed to approve a new 2-yr. terminal M.S. degree as a mechanism for tuition return. This has been important in softening the blow of the budget cuts.

Project teams: Ober mentioned that, thanks to strong donor support, the student project teams continue to thrive. There are 13 teams with 480 students -- 17% of Engineering's student body. Corporate support for project teams dropped and, while it is returning, it is less than in the past. Ober indicated that the College is very grateful for the support that the CEAA, as well as some ECC members, have provided for the project teams. In addition to this funding, the students also continue to raise funds themselves for their team projects.

Space: Five years ago, the Gates Foundation gave the College a \$25 million gift. Ober indicated that the College intended to invest it in the endowment, that it would grow in size, and then the larger fund would be used for the new building. Unfortunately, due to the economy, the endowment dropped significantly. The Gates Foundation called a few months ago to say that since the College had not built a building, it should send the money back. Cornell wants to move forward with Gates Hall which is important to Computer and Information Sciences (CIS). If they get more space, it will free up space for Engineering. With a modest investment from the College, Gates Hall will move forward. Site drawings have begun and a plan is being put in place to return to the Gates Foundation and let them know that the College still plans to build Gates Hall.

The College will conduct a space audit to evaluate the current and future use of space (10-20 year planning range). This is essential, since the College's new construction goals have been significantly delayed.

Cornell and Engineering's visibility: Ober indicated that when he travels to Asia, alumni ask him why they read in the news about other universities such as Stanford and MIT and not about Cornell. He noted that Engineering has launched a new brand image -- "ENG". The College of Engineering's website has been updated to enhance our visibility and includes faculty profiles. Ober also indicated that the College has an agreement with Tommy Bruce's office (VP of Public Relations) to post interviews with engineers on the Cornell University website. In addition, media training is available to faculty.

IP: Ober mentioned that the topic of Intellectual Property (IP) covers improving industrial relations: 1) startups and 2) research supported by industry. The University has recently hired a new person to run the Office of Sponsored Programs and things are beginning to improve. Each

year, the College receives about \$600,000 in patent revenues, most of which are generated by Engineering faculty.

Industry-University Interactions – Bill Shreve and Sam Fleming

Bill Shreve gave a presentation on Cornell Industrial Relationships. During his presentation, Shreve pointed out that Cornell receives a much smaller percentage of income from partnerships with industrial groups than our peer institutions.

A task group was formed to look at ways to improve our industrial relationships. Cornell's industrial interactions are beneficial to both Cornell and its industrial partners. The benefits include increased revenues for Engineering, opportunities for faculty to interact with peer industrial partners, and to demonstrate Engineering's leadership in technology. These interactions also provide industrial partners with access to Engineering's technology and expertise. Simplifying the process of creating industrial partnerships will benefit both Cornell and its industrial partners.

Shreve pointed out that the partnership process could be improved by creating engineering pilot projects independent of the Cornell Provost's Office, or by creating model partnership agreements as templates. Shreve mentioned that he would get the names of ECC members interested in working on this topic offline and would report back to Chris before the Fall '10 meeting.

Sam Fleming stated that for the last five years he has participated in every level of committee on research and technology at Cornell. Fleming indicated that a research university such as Cornell must be recognized for leadership in creating and disseminating technology. This will help to attract and retain outstanding faculty; for students, it provides a window for unmet basic research needs. For the professional community, it would entail financial benefits from tech transfer, economic venture development, and strategic alliances. He mentioned that the Council would like to get involved and help the College. Fleming asked that the Council discuss the annual fund at the Executive Session.

To conclude, Bill Shreve indicated that he would prepare a work plan that might include a number of interviews. At lunch, members were asked to indicate if they were interested in serving on the Shreve working group to discuss IP and identify a pilot project before the Fall meeting. Shreve also mentioned that Abby Westervelt, Director of Corporate and Foundation Relations, could be involved in helping with the master agreements.

University Strategic Planning Process – Lance Collins

Lance Collins, Director of the School of Mechanical Engineering, gave a presentation on the University Strategic Planning Process. Collins is a member of the Strategic Planning Advisory

Council. In October 2009, Provost Kent Fuchs convened the Strategic Advisory Council to determine how Cornell could enhance its academic stature with constrained resources.

The Strategic Planning Advisory Council convened the following four working groups, consisting of faculty, staff and students:

- Education
- Research, Scholarship and Creativity
- Public Engagement
- Organizational Stewardship

Collins indicated that the University aspires to be “widely recognized as a top-ten research university in the nation and world and a model university for the interweaving of liberal education and fundamental knowledge with practical education, and an impact on societal and world problems.”

The five strategic objectives are:

- Promoting Faculty Excellence
- Promoting Education Excellence
- Excellence in Research, Scholarship and Creativity
- Promoting Excellence in Public Engagement
- Promoting Staff Excellence

The theme of the Strategic Plan is part of Cornell’s goal to become a single entity with a shared vision. The University plans to put into place metrics to measure its progress. The final strategic plan will be completed in May 2010.

In closing, Collins summarized by saying that the Strategic Plan is ambitious and some of the objectives for 2010-2015 have been prioritized taking into consideration costs.

Overview of Teaching Innovation in the College – David Gries

David Gries, Associate Dean for Undergraduate Programs, gave a presentation on teaching innovations in the College of Engineering. He discussed the pros and cons of past and present pedagogies.

Gries indicated that professors can no longer simply lecture to students. They want to see PowerPoint presentations, e-mail, wikis, and keeping up to date with the constant changes in supporting software and hardware. Our challenge is to keep up with new technologies while improving the quality of the students’ education.

Gries showed examples of alternative and complementary modes of instruction: problem-based learning, active learning, cooperative learning and experiential learning (team-based

projects). He indicated that students involved in student teams feel much less stress than those who work alone, although they work twice as hard. The instructor needs to cultivate a classroom environment that promotes an excellent learning experience, in-depth learning, long-term retention of knowledge, and provides a basis for success in future classes and careers.

Gries summarized by emphasizing that this new age requires new pedagogies. He noted that many of our faculty members are employing innovative teaching methods and that the Teaching Excellence Institute has also been very supportive of this effort.

Master of Engineering in Systems Engineering via Distance Learning: Our Experience – Linda Nozick

Linda Nozick, Director of Systems Engineering and Professor of Civil and Environmental Engineering, discussed the Systems Engineering Program via Distance Learning at Cornell. This is Cornell's first degree offered via Distance Learning. Systems Engineering is the "discipline of applying mathematical, behavioral and scientific principles to the definition, design, development, and operational evaluation of total systems solutions to a wide variety of engineering problems, including the integration of human, physical, energy, communications, cost, logistics, management, and information requirements." Systems Engineering has enormous breadth as well as depth and industry helped to develop this program. She indicated that the goal of the Systems Engineering Program is to create good "T-shaped" engineers with focus on a Masters of Engineering degree. In 2008, the College was allowed to offer a full Systems Engineering degree via Distance Learning. Nozick emphasized that there is no difference between the on campus and distance learning programs.

The technologies of distance learning include: synchronous transmission (two-way audio and video); asynchronous transmission; on-line content management systems; and proctored exams. Some professors allow their on campus students to use the distance learning tools as well.

Nozick pointed out that twenty companies have enrolled students in the Systems Engineering Program via Distance Learning, which is also open to individuals. She concluded by asking for the Council's advice on how to publicize this program and it was suggested that she contact the Johnson School or ILR School for advice on how to market this program.

Swanson Simulation Program – Rajesh Bhaskaran, Anne-Raphaelle Aubry and John Swanson

Rajesh Bhaskaran, Swanson Director of Engineering Simulation, gave an overview of the Swanson Program, which was established through an endowment by John Swanson in 2000. The program strives "to facilitate the introduction and use of computer simulation in the Mechanical Engineering undergraduate and graduate curricula at Cornell, with input from the

Advisory Committee, and to provide support and leadership to the community on integrating simulation into the engineering curricula.”

The Swanson Program has developed effective strategies for integrating simulation into curricula from cross-curriculum efforts through the use of scale-up mechanisms such as SimCafe (Wiki-based open platform which allows community collaboration) and the Integration of Simulation Technology into the Engineering Curriculum (ISTEC) workshops. The use of simulations is applicable to most physics-based engineering disciplines. This technology helps the students be better prepared for professional careers, facilitates the teaching of engineering fundamentals, supports projects and research, and gets students excited about engineering. Examples of the use of simulations in projects and research include: AguaClara (CEE), CuSat Team (MAE), FSAE Race Car (MAE), Blood Flow (Butcher group, BME).

In conclusion, Rajesh stated that simulation is a key technology that can greatly contribute to the College's teaching and research missions. The Swanson Program is an exciting opportunity for Cornell to become a leader in simulation technology.

Computational Science in Engineering – Anne-Raphaelle Aubry

Anne-Raphaelle Aubry, BS Mechanical Engineering '10, gave a presentation on Computational Science in Engineering. She discussed the integration of simulation into the undergraduate curricula. Experimentally-based courses using simulation include: MAE 3272 (Mechanical Properties & Performance Lab); MAE 4270 (Fluids-Heat Transfer Lab); MAE 4700 (Finite Element Analysis); and MAE 4230 (Intermediate Fluids). She also explained how she used simulation for her undergraduate research to study the instabilities of aircraft wake vortices in ground effect by modeling the process as two vortices.

Anne spoke about her summer internship at Pratt & Whitney where there was a concrete need for simulation. She indicated the difficulties in accurately modeling turbulent fluid mixing inside a cavity, and that there is a growing need for accurate and reliable prediction methods in complex aerospace systems.

John Swanson pointed out how simulations have made engineering education more relevant. He also stated that the verification and validation of simulations are key.

Teaching Excellence Institute (TEI) – David Gries

David Gries gave a presentation on the Teaching Excellence Institute (TEI), which was created to support the College's effort to improve teaching. The TEI provides support for new faculty, research in new pedagogies and technologies that allow different kinds of interaction. This effort is also in alignment with the Strategic Plan which specifies creating a Teaching Institute that enhances teaching excellence through seminars, workshops, and consulting opportunities.

Kathryn Dimiduk was hired as Director of the Teaching Excellence Institute in August 2008. Gries noted that this Institute would not have been possible without the generous support of Mike Goguen and Jim McCormick. Kathryn is the daughter of Professor Emeritus Dick Conway. Her most important task in the past two years has been helping individual faculty (40 faculty members in 13 departments -- 20% of the faculty). She is having a great impact on faculty who need to improve their teaching. Faculty are recommending the TEI to other faculty, and the chairs and undergraduate coordinators are requesting help for courses with significant mid-semester complaints. Intensive work with courses in distress has also been done. The resulting impact was noticeable in course evaluation comments.

TEI Goals and Progress include:

- Workshops for new faculty (October '08 and January '09).
- Workshops for faculty on aspects of teaching (e.g. learning styles, active learning strategies, informal classroom assessment, technology, January '09 and January '10).
- Lecture/seminar series on teaching (6 seminars so far).
- Work with Cornell's Center for Teaching and Learning.
- Provide assistance to faculty on request.
- Intensive work with courses "in distress."

Gries concluded by saying that the College needs a greater support group than it has. One person is not enough to do what needs to be done. The ideal support group would be about 3 people (1 for every 60-70 faculty). This would allow the College to have more seminars and to conduct research on teaching.

Faculty/Staff Panel on Innovation in the Classroom – Chris Schaffer, Susan Daniel and Linda Tompkins

Chris Schaffer, Assistant Professor of Biomedical Engineering, gave an overview of a new course he has been working on: BME 4110: Science and Technology Approaches to Problems in Human Health, *An Innovative New Course in Biomedical Engineering*. He is co-director of this course with Mike Kaplitt (Neurological Surgery, Weill). This new course, organized by BME and Neurological Surgery since Fall 2007, is being team taught by faculty from both Weill Medical College and Cornell.

Unlike other universities, our medical school is far away. Understanding the clinical environment is key for students interested in medicine. The goal was to bring a course from the medical school to Ithaca.

The principal goals of BME 4110 are to:

- "Provide an in-depth look at selected diseases as well as current research efforts focused on curing them, through lectures and assignments.

- Give Cornell undergraduates interested in health-related careers a better understanding of how medicine works, by meeting with Weill faculty in lectures and informal settings.
- Encourage students to think about how important research problems are identified and honed into potential projects, through a team-based term project.”

Schaffer mentioned that this course has been offered three times and will be offered again next year. So far, over 300 students have taken this course. These students come from diverse backgrounds (~ 1/3 from Engineering, ~ 1/3 from Biology and a little less than 1/3 from other disciplines from across the university). Speakers are grouped into modules, with modules centered on a disease topic.

Schaffer described how once a week, students are asked on web quizzes to indicate what they found confusing about the topics discussed. Those responses are summarized and given to the faculty member before the next lecture. This gives the faculty member a sense of what the students find confusing about the material relevant to the following lecture the faculty member will give.

For half of the students, this is the first time they have ever read scientific papers. For the vast majority of the students, this is the first course where they are required to find research papers on their own. In conclusion, Schaffer pointed out that the students gave very positive feedback about the course, and a few said that it was the best course they had ever taken at Cornell.

Development Program for New Teaching Assistants – Linda Tompkins

Linda Tompkins, Associate Director of Engineering Learning Initiatives, gave a presentation on the Development Program for New Teaching Assistants. TA training is mandated in the College of Engineering for all first-time TAs, and begins shortly before the start of each semester. There are 8 TA trainers.

TAs are highly valued by Engineering undergraduates as a resource for guidance and assistance, and they play a significant role in the College. Their responsibilities include: writing test questions, grading homework and tests fairly and accurately, occasionally leading sections and filling in for lecturers, and having office hours to explain concepts that the students are learning.

The program consists of 4 teaching preparation sessions that run concurrently, led by pairs of TA trainers:

- Assessment & academic integrity
- Creating a classroom presence
- Facilitating active learning
- Modes of learning (learning styles)

To meet their individual needs and interests, Select-A-Sessions are also offered. They have the option of picking two sessions from the following topics:

- Effective Power Point presentations
- Successful Public Speaking
- Time Management
- Stress Management
- Q&A with Experienced TA Panel

In an effort to continuously improve TA training, evaluations are given at the end of each training session and research is conducted to find ways to improve future training. No two TA training sessions are exactly alike.

There are also Guest Speaker Sessions which include a Dean's Welcome, Diversity in the Classroom (Director of Diversity Programs), and Students in Distress (notice and response video).

In conclusion, Tompkins noted that some students decide to become TAs because they are interested in becoming professors. This may be the only training they get before they become professors. Being a TA strengthens their interpersonal, communication and presentation skills. TA skills are highly transferable to industry and academia.

Engaging (and teaching) the Internet Generation – Susan Daniel

Susan Daniel, Assistant Professor of Biomedical Engineering, gave a presentation on Engaging (and teaching) the Internet Generation, ENGRD 2190: Mass and Energy Balances. Professor Daniel was awarded a Faculty Innovation in Teaching grant: *Balancing Mass, Energy, and Student Interest* (in collaboration with Kathryn Dimiduk, Director TEI). She was concerned about the following questions: How do I engage my students and how do I teach this to the Internet Generation? How do I keep their attention for 50 min. and show them that what I am teaching is really important?

The project goals are to:

- Expand the focus of the class from industrial chemical processes to current topics in biotechnology, energy, & environment.
- Embrace new teaching technologies to: engage students, support student's learning, promote interaction in the classroom and encourage connections to the major.
- Transfer the class from a competitive model to a collaborative one.

Susan pointed out that she has added the following technologies to her course:

- The Wacom Tablet
- i-Clicker polling
- Computer animations

Susan also gave a demonstration on the Wacom tablet which is basically a computer screen with a stylus. She indicated that she projects the skeleton slide onto the tablet and then she uses the stylus, in real time, to go through the problems. This has been very effective in pacing her classes because it is like writing on transparencies. The use of the Wacom Tablet and subsequent posting of presentations to the web affords students the opportunity to listen to what is being presented instead of constantly rushing to write notes.

The Wacom tablet also integrates with other dynamic technologies, e.g., the i-clicker, videos and computer animations. Diagrams, pictures, tables and charts can also be included for easy markup, saving time during the lecture for teaching. It also captures an entire annotated lecture for review later online. Susan finds it to be very easy to use and fun. The i-clicker keeps the students engaged and gives them an incentive to come to class and to review the slides. Student feedback has been very positive about the use of these technologies.

After Susan Daniel's presentation, Bob Shaw adjourned the ECC into Executive Session.