

Engineering College Council Meeting

October 18-19, 2012

423 ILR Conference Center

Members Present: Ken Arnold, Lance Collins, Bob Cowie, Greg Galvin, Mike Goguen, Frank Huband, Brian Kushner, Ivan Lustig, Jim McCormick, Evelyn Pearson, Bob Shaw, Bill Shreve, Dan Simpkins, Duane Stiller, John Swanson, Dave Welch, Todd Zion

Emeriti Members Present: Dick Aubrecht, Charlie Brown, Jay Carter, Bill Shreve, Roger Strauch

The meeting presentations and materials can be found at:

<https://confluence.cornell.edu/display/ECC/2012+Fall+ECC+Meeting>

Username: eccmeeting@gmail.com

Password: eccmeeting#

Welcome and Introductions of new leadership and members – Lance Collins

Lance Collins, Dean of Engineering, welcomed the Council to the Fall '12 ECC meeting and indicated that the theme would be a “Distinctive Undergraduate Education”. He introduced Duane Stiller, the new ECC chair, and Greg Galvin, the new ECC vice-chair. He also introduced the new ECC members in attendance, Ivan Lustig and Todd Zion.

Lance pointed out that the purpose of the Council is to provide him with a business and industrial perspective on how we are doing as a College. He added that the Council is the primary mechanism by which he gets that perspective. The challenge for him is to define the topics where the Council’s input would be the most valuable. For example, he pointed out that the Council’s input on undergraduate education is important, because they are often in a position to hire our graduates and he would like to know if we are training them in a way that makes them more attractive. He also pointed out that he wanted the Council’s feedback on the CornellNYC Tech culture. Specifically, how do we define its culture? Lance emphasized that the real value of the Council is a result of the conversations, discussions and subsequent actions resulting from that advice. The Council’s ongoing feedback is important to him. He also noted that their input on branding in the College is another example of the valuable input we have received. Individual meetings with alumni have also helped to inform him and provide him with valuable insight on what’s special about Cornell. He requested that Duane Stiller and Greg Galvin lead a discussion on this topic at the executive session and report back to him with recommendations on the format and topics for future ECC meetings.

A Distinctive Undergraduate Education: Lance Collins

Lance pointed out the College of Engineering aspires to “be widely recognized as a top-five engineering college in undergraduate and graduate studies.”

College Strategic Plan: Lance noted that the main topic of this meeting was to discuss our education mission and the College’s four enabling goals:

1. To recruit, retain and enable a diverse community of exceptional faculty, students and staff.
2. To educate undergraduate and graduate students to become global leaders.
3. To be world leaders in important areas of research.

- a) To sustain and expand our leadership role in: advanced materials; and complex systems, network science and computation.
 - b) To be the premier research university in the emerging areas of bioengineering; and energy and the environment.
4. To increase our interactions with industry and create a fertile environment for entrepreneurial activities for faculty and students.

Rigorous core education: Lance indicated that the main focus of this meeting would be the second bullet, “to educate undergraduate and graduate students to become global leaders.” He added that Cornell has a very strong Arts & Sciences program, and that 40% of the education of our students happens in the Arts & Sciences College. He also pointed out that one of the unique aspects of our program is that we are a very strong College of Engineering embedded in an Ivy League university. He noted that Cornell’s College of Engineering has the strongest engineering program among the Ivy Leagues. Virtually all the departments and schools in the College are ranked in the top 10. He emphasized that it’s very important for the college to provide a rigorous core education which focuses on fundamental “engineering science” curricula to continue to have a strong program. Our curriculum is of the highest standards, and one of our strengths is in the design and hands-on training we provide.

Ample opportunities to expand your horizons: Cornell Engineering provides its students numerous opportunities to expand their horizons through activities such as: project teams, business minor (Dyson School), Kessler Fellows Program, Kinzelberg Entrepreneurship in Engineering, Engineering Learning Initiatives and the New Leadership Program. He indicated that Massive Online Open Courses is a topic being widely discussed now and that this may represent a qualitative change in how we go about teaching. He also noted that our understanding of how people learn has increased dramatically over the last 10 years. It’s clear that active learning makes a huge difference in how we learn (including in abstract subjects such as math and physics). When you teach students in ways in which they are actively involved, in breaking away in small groups and working on problems, and then coming back together, the long-term retention is remarkably different and grows in time. There’s a rapid decay in retention with traditional teaching. Engineering is no longer limited to the traditional engineering jobs, but it’s a way of life, a way of critical thinking, that’s very transferable. The engineer is now the leader, the inventor, and the creator.

Entrepreneurship@Cornell: Lance noted that Entrepreneurship@Cornell is an innovative university-wide program that organizes numerous entrepreneurial activities across the university. The program enables Cornell students and the wider community to develop the knowledge they need for business startup planning, management, execution and business analytics.

How do we improve?: Lance pointed that it was important to have a conversation at this meeting about “how do we improve?” He noted that technology provides opportunities for improvements, as well as a better understanding of pedagogy and growing awareness of the intrinsic value of an engineering education.

Engineering Teaching Excellence Institute (ETEI): Lance emphasized that the College is focused on having quality teachers. Teaching is highly evaluated in the tenure and promotion process. There’s a real commitment to quality teaching and to providing excellent help to improve it.

Lance indicated that faculty are hired based on their research promise, but not on their teaching skills, which are difficult to evaluate. His experience is that a new faculty member won’t know how well

they will teach until they are assigned a class and step in front of their first group of students. Either you're a natural at teaching or you're not.

Comments: perhaps as part of the interviewing process, faculty candidates could be guest lecturers and participate in a Q&A that could be evaluated. Another possibility could be to see a videotape of a candidate's lecture. Lance responded that we hire many people who are recent postdocs or TAs who have not yet given lectures. He added that the Engineering Teaching Excellence Institute provides support on course design, syllabi, exams, lecture delivery, innovative technology (clickers), with a focus on young faculty.

Engineering Learning Initiatives: Lance highlighted some of the Engineering Learning Initiatives in the College, including: Academic Excellence Workshops, Undergraduate Research support and tutoring.

Comments: Betsy East, Assistant Dean for Student Services, pointed out that there are more students who apply for our grants for these Undergraduate Research support than we have funds available. She added that if any of the Council members were interested in participating, they should be able to find a project to support.

New Engineering Leadership Program: Lance announced that thanks to an anonymous donor, a new Engineering Leadership Program has been established to provide systematic leadership training. This is being led by Dr. Erica Dawson, Director of Engineering Leadership Programs, and Werner Zorman, Associate Director of Engineering Leadership Programs. This is the inaugural year and the focus will be on modules for Freshman Advising classes and project team leadership. He added that our efforts in this area will help differentiate us from our competitors.

Cost/Benefit analysis: Lance noted that the continued rise in tuition is unsustainable. There has been a steady decline in state funding and costs resulting from our state-of-the-art facilities. Cornell's response has been to increase financial aid and to tighten its belt. However, he added, it's worth it. Our students benefit from the problem solving and critical thinking skills, as well as the entrepreneurial and networking opportunities they acquire.

Engineering Teaching Excellence: Kathy Dimiduk, Sr. Lecturer, Engineering Teaching Excellence Institute, and Linda Tompkins, Associate Director, Engineering Learning Initiatives, gave a presentation on Engineering Teaching Excellence in the College.

Engineering Teaching Excellence Institute: Kathy pointed out that the ETEI is a faculty-centered program which promotes the pedagogy of active learning (versus the traditional "sage on stage" method of teaching). The advantages of active learning include the ability to stay focused on the content of the materials due to fewer distractions. It scales to large classes and is more cost effective than traditional teaching. She added that the disadvantages of traditional teaching include limited effectiveness due to short-term memory. The brain is unable to focus on more than 5-7 ideas at a time and is unable to sustain solid attention for more than 15 minutes, which increases distractions. However, in active learning, if you add something, the attention span goes up and everyone improves. Also, multi-tasking while learning disrupts deep learning, which is the ability to apply and connect learning, analyze new ideas and for critical thinking.

Kathy indicated that active learning can be obtained through the use of technology such as clickers, simulations, collaborative learning, peer instruction, online homework, activities in the classroom, teams, and virtual fieldtrips. She led the Council members in a "clicker" experiment to experience the effect of active learning and the members responded favorably.

Comment: it would be interesting to create a classroom agenda with a mind map to show how the concepts relate to each other. Kathy added that about 25% of the classes use active learning (3/4 of which are taught by young faculty).

Supporting Teaching Excellence at all levels: Linda Tompkins pointed out that the Engineering Learning Initiatives are student centered and teaching is supported by trained graduate and undergraduate student instructors. She added that 150 new TAs were trained in Fall 2012. The main components (teaching workshops, large group presentations, Select-A-Session) grew out of feedback from previous TA training. They can customize training as needed. Microteaching (5-7 min. teaching practice) is videotaped and played back. Their peers give them feedback, which is very helpful. Graders must also take this training, because many go on to become teachers and these skills are also very helpful in their future pursuits.

Mid-Semester Feedback: Linda indicated that the TA trainers include 8 graduate teaching specialists who also work on program development. She noted that they read all TA evaluations and are constantly tweaking what they do based on that feedback. Many TAs are interested in becoming faculty, and being a TA often prepares them for becoming strong educators. In Spring 2012, almost 300 TAs were evaluated. The mean score for the TA mid-semester evaluation was over 4 (out of 5) which means that the undergraduate students recognize and appreciate the TAs. Betsy East added that this data is supported by the results of a recent student experience survey. TAs received the highest evaluations on the survey (even higher than the faculty).

Academic Excellence Workshops (AEWs): Linda thanked John Swanson for his support of the AEWs which will ensure their continuation. These two-hour weekly small group sessions (in chemistry, computer science, math and statistics) allow students to enhance their education through structured peer interactions, and the Engineering Learning Initiatives program. In Fall 2012, there were 26 workshops with 400 students enrolled.

Tsunami in Education? Massive Open Online Courses, What Should Cornell do? Eva Tardos Eva Tardos, Professor and Sr. Associate Dean, Faculty of Computing & Information Science, gave a presentation on Massive Open Online Courses (MOOCS). She noted that online courses are not new (i.e., some early efforts included online universities, such as Phoenix, and online courses through universities, i.e., eCornell.). She added that evolving technology and pedagogy led to MOOCS efforts. She pointed out that Stanford was one of the early movers in this arena. No credit is given, but a certificate is awarded with the successful completion of the course. There are a variety of platforms (on-campus and some external, Coursera). Open Courses is a newer concept. Eva indicated that the successes of open online courses have been mixed. Open online courses were originally championed by MIT and many of us benefitted from them (i.e., MIT's OpenCourseWare, Kahn Academy, TED talks). The delivery of the content, questions and answers by students and faculty are all done online. It involves a mix of for-profit and non-profit efforts with free access and (sometimes) fee-fo- certificates.

She added that the new part of this is the "M". The people who are driving this are not the administrators, but the faculty in CS. She added that this effort is being led by the faculty of top universities to reach more students, using more sophisticated technology (i.e., some faculty at Cornell are participating in an online forum called "Piazza"). People are also experimenting with the use of flipped classrooms (getting the students to answer the questions from home and using the classroom for learning), which has been successful. She noted that we need to experiment with this in a controlled manner. Stanford is the leader in this arena and is running this on 3 platforms: Coursera, Class2Go, Venture Lab. Google is also getting involved with this through Google Course Builder.

Eva pointed out that Coursera is a for-profit platform founded in 2012 by Daphne Koller and Andrew Ng (Stanford CS) with venture capital funding and 33 participating universities from the U.S. and abroad, offering 195 courses, in 18 categories, with over one-million students. She added that a new committee to advise Cornell on MOOCs has been established.

Eva outlined four reasons for participating in this effort:

- The educational mission of the university – to educate the world for free? This will let students take advantage of these opportunities for continuing education, disadvantaged students, older students, and self-education.
- Its positive impact on on-campus courses.
- A revolution in education is happening and if we're not a part of it, we'll be left behind.
- Its impact on secondary students and recruiting students.

Eva indicated that EdX is a non-profit online platform founded in 2012 which offers free courses designed specifically for interactive study via the web provided by MIT, Harvard and Berkeley. She added that Udacity is another platform that offers beginning, intermediate and advanced computer science, physics and statistics. The main draw for participating in these platforms is for collaboration purposes.

Comment: Who owns the intellectual property of the MOOCs? Eva pointed out that there are no answers yet about who owns the intellectual property for these platforms. Audacity, says they own the intellectual property. EdX leaves it up to Cornell to determine the intellectual property.

Comment: What's the purpose of the physical university? Eva noted that the physical university offers not only the intellectual content but also the experience and hands-on learning. Lance added that the most exciting feature of this is flipping the classroom, by delivering the material in another way and using the time to engage the students in a unique way.

Comments: one of the most important parts of being at the university is the opportunity to interact one-on-one with a professor which is different than interactions in the classroom. The social aspect is very important, and is the part that the student is most likely to remember. Some Council members suggested that we not rush into this while others stressed that we should take advantage of these opportunities. Eva added that Cornell is considering charging a small fee for the certificate (\$100-200).

Comments: Someone should be doing a scenario analysis. A scenario is a radical change. Is a personal experience necessary? What are the kinds of experiences that are going to be most efficient? Overcapacity at universities is going to be an issue. From a branding standpoint we need to embrace this. We need to start off with the basic courses, such as AP classes. We need to think about this strategically and define our goals. We need to think of these initial courses as sieves, not reject them. It's easy to think that the brick and mortar universities will be extinct. How do you stimulate the faculty? You have to have some small opportunities.

Comment: How does branding play a role in this? Lance indicated that he has discussed this with the Directors and Chairs and the faculty are on board with this effort. Cornell also needs to endorse this.

Comment: The word Tsunami accurately describes the MOOCs efforts. We must be reminded that at first many people dismissed the importance of the internet. It's a filter and recruiting tool. All of us

will need to embrace this when we're hiring. Lance pointed out that you can retake the courses until you succeed.

Comment: Stay engaged. Look at software on the internet. We have to watch all the permutations of this which may take a few more years but, in the meantime, the College needs to have a presence. Eva agreed with this and added that it's not hard to imagine that this will mean more undergraduate courses will be taken online. Content knowledge is important, but experience is more valuable.

Engineering Leadership at Cornell: Erica Dawson, Director of Leadership Programs

Erica Dawson PhD '04 gave an overview of the Engineering Leadership Program at Cornell and introduced Werner Zorman, Associate Director of Leadership Programs. Previously, Erica was assistant professor at the Yale School of Management and was a visiting faculty member at Cornell's Johnson Graduate School of Management. She is charged with creating and implementing a program to enhance the education of engineering students. The goal is to provide opportunities for students to develop the knowledge and skills that will accelerate their growth as creative leaders and mentors. She noted that this is an exciting and powerful opportunity to impact future leaders of industry, technology and academia. Erica thanked Charlie Brown for his generous gift to this program which made it possible to create the position of Associate Director of Engineering Leadership Programs.

Erica outlined three areas to address: why we're doing it; where we're going; and what we're doing now.

Why we're doing it: Erica pointed out that we've made great strides, but there are certain approaches and skills that we need to encourage in our students. A lot of the work can be and is done alone. Most of our students work locally. They are getting a very good technical education, but it's also important for them to be able to convey information. Much of what they do is through their own efforts. However, she added, when we look at the marketplace, there are some stark contrasts that emerge in the practice of engineering. It's no longer just competitive. It's competitive and collaborative. The leaders are purpose driven. They communicate to inform and inspire. Leveraging other resources is also important. She noted that "the U.S.A. is dominant in technological development, but behind in applying technology because of a lack of engineers in decision-making positions in industry and government." We need to change our students to change the world.

Where we're going: Erica explained that this new program needs to include the following themes:

Four pillars of Courageous Leadership

1. **Knowledge**
Technical knowledge (including areas of human interaction, listening skills, delegate, run meetings, manage projects).
2. **Experience**
The difference between knowing how to do something and doing it (ability to actually implement comes with experience). The Leadership development program will develop leaders sooner than they otherwise would be (i.e., Agua Clara).
3. **Insight**
Ability to reflect on one's own values, purpose, passion and take a look at one's ethics.
Insight on situational forces on behavior (ethics). Understanding what makes other people

tick.

4. Courage

To do something with faith, to take intelligent risks, to take a stand, embrace ambiguity, challenge the status quo, conquer fears, do it anyway.

Erica explained that the program is currently in the planning phase to develop a vision and roadmap by listening to and convening various stakeholders, including ECC members, alumni, current students, industry representatives, leadership consultants, faculty, and staff, as well as listening to their ideas about what the program should strive to accomplish. She indicated that in January 2013, the program would be moving into the next stage of practice, to design actual content, create some prototypes, and then test and revise them as needed to have a firm sense of what they'd like to accomplish. And finally, their goal is to implement, by the end of the next term, a full load program that will include some combination of classes, international experience, and speakers' series, culminating in a leadership certificate. There will also be the opportunity to research and measure the program's impact on our students. TSS, "try some stuff", will also be a theme throughout the program's existence.

What we're doing now: Erica noted that we are leveraging the instruction of the 1050 classes. She gave the example of the "Marshmallow Challenge", which emphasizes that operating on assumptions creates failure. It's better to fail early and get that feedback to minimize failures later. It is a fun and instructive design exercise that encourages teams to experience simple but profound lessons in collaboration, innovation and creativity. The task is simple: in a short amount of time, teams must build the tallest free-standing structure out of 20 sticks of spaghetti, one yard of tape, one yard of string, and one marshmallow and the marshmallow needs to be on top.

Erica indicated that they are recruiting students to form a student advisory group. They will be guinea pigs as they develop new programs by providing the feedback they need. She noted that one of their strategies is to leverage opportunities by building coalitions across campus (i.e., the Johnson School has opportunities that would appeal to MBA and engineering students.)

Comment: Consider administering Myers-Briggs tests (which measure psychological preferences in how people perceive the world and make decisions.) Erica pointed out that Linda Tompkins does some work with the MBTI. This could be helpful when working with project teams and coaching.

Comment: Visionaries can anticipate change and paint numerous scenarios. Teach vision by using multiple scenarios. Determine what dynamic is going to change, such as chess moves, where they postulate an outcome. Erica pointed out that the biggest challenge is how to organize people when it is nonlinear.

Comment: It's good to compare leadership vs. management. Often younger people equate hierarchy with leadership. Suggested reading: *Cultural Intelligence: Living and Working Globally* and *Working with Emotional Intelligence*. Erica noted that you need to know how to manage to be a good leader.

Comment: Some are very good leaders, but poor managers. There are parallel ladders: technical leaders and administrative leaders. Leaders have an innate ability of knowing where the trends are going. How can we take entry level engineers and prepare them to run a multimillion dollar operation?

Comment: A lot of leadership is experiential. How can you make it available to everyone? Erica pointed out that you need a project, a week of learning, then to design a project based on the personal vision for change (some are successful and some are failure). The learning happens while participating in the project. Knowledge is key before you can become a good leader.

Branding: Alan Siegel and Claude Singer, Siegel+Gale

Alan Siegel and Claude Singer of Siegel+Gale discussed branding in the College of Engineering. They indicated that this would be a kick-off meeting with a focus on “Why Cornell College of Engineering?” He added that the purpose of their presentation was to get the Council’s feedback on branding. Alan pointed out that all audiences should have a clear answer to that question. He continued with an overview of the project goals, which are to:

- Identify and frame your value proposition. Who are you, what you do and why people should care -- given the excitement over Cornell NYC Tech.
- Capture and express who you are in fresh, distinctive and compelling messages—i.e. the story.
- Help the College develop communications that reflect and reinforce your story across all media to all key audiences.
- Ultimately, to help you raise your rankings to top 5.

Claude indicated they are working with the dean and staff in the College to set up a program, by looking at the competition, studying our research, reviewing our strategic plans, interviewing faculty, students, alumni, donors, and influencers in the marketplace, to have a context for the overall program. They plan to talk to virtually every audience that affects the College to find out what makes it tick. The key to this program is coming up with “the big idea” -- one that separates and distinguishes us from other institutions. He added that they have worked with the Cornell NYC Tech people, including Lance Collins and Cathy Dove. They have studied our peer competitors and are aware of our rankings over recent years. They would like to close that gap between how we are perceived and how we want to be perceived. Each of our peer competitors has their own strengths and unique twist on their mission. Claude gave examples of the mission statements of some of our peers such as Stanford, Cal Tech, MIT, Carnegie Mellon, UC Berkeley, Georgia Tech and Technion, which often use clichés and make similar statements. He added that they will talk to us to find out the threads of our uniqueness. In summary, he pointed out that the top schools have a strong track record in creating partnerships with industry to foster entrepreneurship. They all use similar wording and make the same claims. The challenging question is “What makes Cornell NYC Tech and Cornell Engineering different?”

They tried to distill the Cornell NYC Tech positioning into one sentence which is: “Cornell Tech is a new center of higher learning that leverages New York City’s exhilarating spirit and global interconnectedness to inspire and nurture the next generation of tech leaders who will make a lasting, positive difference to humanity.” He added that they want to ensure that’s there’s an integrated story and that the Ithaca campus, known for academic research, also becomes integrated into the story of the entrepreneurial spirit of the Cornell NYC Tech campus.

Comments: What is our budget for this branding program? Alan responded that it’s not a question of cost, but of execution. The people of the university are the brand ambassadors, and the people of contact. He added that we try to get as much publicity as we can and that’s not expensive, and is very

cost efficient. He also noted that we try to run symposia and events that will attract attention and publicity and create materials that reinforce how we are distinctive and memorable and excite students. Money is not the issue, it's about taking advantage of the money you have and is a matter of execution. He emphasized that when you have a big message and when everybody who works here is a brand ambassador and not only speaks the language, but lives it, the programs drive a lot of visibility. The bigger issue is finding the idea, cultivating it in the institution and living it.

Comments: Some of our peer schools are doing quite well with their branding. Are there things that we can learn from them? They might have a lot of generalities in the mission statements, but it works. Alan responded that Stanford is an incredible organization. They were in the right place at the right time. Cornell has very little presence in many parts of this country, and it's also a complicated school that's not totally understood. There are some basic things that the College has never done that are at the foundation of what we have to do. But on top of that, we need our own story which will not only help to be compared to these institutions, but will allow us to create a unique personality.

Comments: Many people don't realize that Cornell is an Ivy League university. Alan responded that Cornell is the perfect intersection of technology and innovation. Cornell, unfortunately, is a very complex institution and hasn't been very effective in defining itself and leveraging its excellence. Cornell has a great entrepreneurial spirit. Cornell is the entrepreneurial innovator of the Ivy League schools. Our uniqueness is the depth of what we offer and that we are a land grant institution.

Alan indicated the branding program will cover the Cornell Tech campus and the College of Engineering. He noted that the Tech campus is a powerful force and gives Cornell an opportunity to tell their story.

Comments: Lance added that the College not only educates our students, but prepares them for leadership positions. There are a disproportionate number of Cornell engineering graduates who become leaders. Perhaps we could include in our mission statement that Cornell Engineering generates leaders.

Duane Stiller asked Alan and Claude if they had any questions that they wanted to ask the Council. Alan suggested that they go around the room and have everybody say spontaneously their points of view on what makes Cornell's College of Engineering unique.

Comments:

- Top notch school, location, doors that are open upon graduation.
- Cornell is an environment where game changing technologies have evolved and game-changing trained tech leaders are created.
- The opportunity of getting that simultaneous experience of being located in both a city and rural environment can be an aspiration for us.
- The College provide experiences, interactions, innovations and is the entrepreneurial leader of the Ivy Leagues schools.
- First-rate technical education in the midst of an Ivy League school. Ivy League piece is truly unique.
- Cornell is the broadest of the Ivy League schools. Employers consistently give high praise to our graduates.
- Renaissance thinkers, multidimensional.
- Technology leader of the Ivy Leagues.

- World-class engineering education, with exposure to top leaders in other areas and disciplines.
- Liberal arts underpinning together with engineering education. Emotional IQ is as important as technical IQ. Take advantage of multi-disciplinary opportunities.
- Development of solutions to the world's problem, combining the depth and breadth of an Ivy League education.

Meeting adjourned at 3:00 pm.