Panel Summaries

as reported in the closing session
1 June 2012
Session 1A:

**Intellectual Property for Industrial Projects**

1. Separate invention/patents and NDA.
2. While sourcing projects, keep IP in mind.
3. IP issues vs. students’ education, ownership vs. inventorship.
4. Patents cost money, University can help.
Session 1B:

**Competition Projects for Capstone Design**

1. **Fit:** Not all competitions make good capstone projects; conversely some make great projects.
2. **Funding:** Financing competition projects is very different from financing industry-sponsored projects, but there is great diversity in funding.
3. **Deliverables:** Competitions may require different deliverables than what capstone courses require. Somehow these need to be reconciled.
Session 1C:

Student Reflections on Capstone Design, I

1. Lessons learned: Start earlier, especially with prototyping, and do not get too attached to your first idea(s).
2. Team formation: students should be able to bid for what project they want to do.
3. Leadership: Team leaders can emerge and do not always need to be assigned.
4. Content: Project planning was considered a particularly important topic in the capstone course.
Session 2A:
The Value of Capstone Design to Industry

1. You get a new look at old problems.
2. You get to see possible employees and get your name onto campus.
3. You get a chance to influence education.
4. You give your people a chance to do project management.
5. If you are 100% successful, you aren’t pushing the envelope.
1. The movement is nationwide but nascent with a few exceptions.
2. Most think it is too hard. Many wish to do it but current practice is mainly within disciplines.
3. How do we even define it? Just engineering or also business and other disciplines?
4. Much of the shifting around of students is an under-the-table activity given institutional bureaucracy.
5. Boundaries between programs are sometimes too big.
Session 2C:

What I Wished I Had Learned in Capstone Design: An Industry Perspective

1. Content: Industry representatives wished they had learned more about soft skills - frameworks for building teams and selling ideas, decision making, etc.
2. Scope: Projects should not be limited to design but should include prototyping and testing.
3. Ownership: Students should understand their role on the project, and be able to quantify and articulate their effort on the project.
Session 3A: The Art and Science of Problem Definition

1. Help customers to be open-minded
2. Students must play a role in defining the problem and developing requirements
3. Students, companies, and faculty offer resistance to defining the problem
Session 3B:

Strategies for Attracting Industry Projects

1. Need contacts at two levels within the university and two levels within the industry: one to authorize and the other to set the specific needs. The capstone director should work directly with the industry mentor to finalize the statement of needs.

2. Must decide whether project is single or multi-disciplinary. More disciplines means more complication in the budget.

3. Funding levels vary immensely: $0-$20k+. Capstone community needs models for what elements go into funding at the various levels so we can negotiate with our faculty and departments different ways to work.

4. Humanitarian projects are becoming more common.
Assessing Capstone Design

1. Assessment should start with definition of the outcomes and establishment of rubrics for those outcomes. Critical outcomes = solution + impacts, communication, professional skills, experimentation, and teamwork.
2. The complexity of capstone courses provides a rich environment for authentic assessment and a good measure of what students can actually do.
3. Best practices exist for separating individual and team accomplishments, using formative and summative assessment to enhance learning, and gathering data for multiple outcomes from a single assessment.
Session 4A:

The Importance of Technical Standards: An Industry Perspective

1. Don’t let engineering students graduate without learning about standards. Standards are a crucial tool for all engineers and teaching them is an ABET requirement.
2. Incorporate standards education into design projects throughout undergraduate education and teach by doing. Make students use standards.
3. There is more low-cost access to standards than you may think. Contact standards bodies for information. See capstone conference web site for URLs.
Session 4B:

Best Practices for Industry-Sponsored Projects

1. Funding: different fund models include gifts, endowments, contracts, and *pro bono* projects, particularly for government agencies.
2. IP issues: Student ownership vs. institutional ownership vs. company ownership.
3. Student experience: capstone design is an invaluable experience.
Session 4C:

**Required Resources for Capstone Design**

1. Teaching design is inefficient because there are no economies of scale; all the projects are different.
2. Human capital is one of the most valuable resources at the institution but sometimes not considered. Technicians must be rewarded and acknowledged.
3. Space and storage space for design materials is important. You have to have a stockpile of stuff for students to start with.
Session 5A:

Effective Collaboration with Company Mentors

1. Prepare mentors with a guide: FAQs, expectations, schedule, performance agreement, plus things to never do.
2. Use codes of ethics for various disciplines. Students should use these as a guide to predict the ethical situations that might arise with the project and mentor.
3. Employ early identification and intervention when mentor problems occur.
4. Prepare students to work with the mentors. Use case studies of things that have gone wrong and things that could have been done differently.
Session 5B:

Global Projects in Capstone Design

1. To begin with international projects, don’t start with the Dean’s level. Instructors should start the conversation, then add Deans later.
2. Seek out companies that support exchange such as NGOs (UNICEF, etc.).
3. Assess the impact of international design projects on student experience before and after each project.
1. Working on a team is not necessarily intuitive. Students want more direction on team dynamics and process.
2. Communicating with industry is new for students. Students want more direction on the formalities of how to communicate with industry. (e.g. who gets cc’d on messages?)
3. Students desire a framework or guidelines for industry sponsors: a road map about expectations.
4. More design experiences are needed earlier in the curriculum. The senior year should not be the first design experience.