



Panel 3C: Capstone 201 - Tweaking an existing course & rolling out changes

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Panelists: Kris Jaeger-Helton (Northeastern), Vito Moreno (University of Connecticut), Robin Ott (Virginia Tech), John Parmigiani (Oregon State)

Description: Maybe you have a few years of Capstone under your belt and you'd like to make some tweaks and roll out some changes. This panel will facilitate a discussion on strategies for improving existing courses.

Quick and Easy Changes to Capstone Programs

- Kris - Collected advice from Students. What Worked, What Didn't
- Vito - Show examples of "good project," to provide a baseline.
- Robin - Use ChatGPT to draft peer feedback letters from peer review software (teammates). Quality of letters is quite amazing. (Essentially synthesizing student feedback through ChatGPT)
- John - 3rd conference paper - @Oregon State - One course designated as writing intensive. Made the decision to meet requirements and not circumvent them.
- Capstone in a day - Give a short project at the beginning of course. Provided with parts kit students must make a car that is attracted to light. Teaches students they need to organize and work together.
- Pre-Capstone orientation - Incoming students come to meet with students from current capstone students to get advice before starting their project.

How do you incentivize faculty to commit to serve as capstone advisors?

- Robin - Don't think we are great at this. Varies, course credit, services credit, as high as \$6500. Looking to get local engineers, will pay as adjuncts
- Vito - Agrees that it is a weaker point. Small stipend for travel, let faculty select projects. Hired some retirees and paid them as contractors.. Students liked the attentiveness and the industry experience.
- Kris - Faculty advisors want to get involved. They bring their projects. Counts as one course in pay or credit if you do three over the year. Takes less time and is more active than traditional course.
- John - Originally capstone was distributed among faculty. Tried several different models. Now, there is a dedicated capstone instructor along with faculty advisors.
- Todd - Course credit comes and goes, has moved to just paying.
- Can facilitate faculty developing relationships with industry



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Are there conflict of interest issues with practicing engineers advising groups working on a different company's project?

- Robin - Had a company that was challenging to work with. They had promised a faculty member a machine that would be used in capstone. Late delivery caused conflict. No longer use that sponsor.
- Industry advisors may be disqualified by the NDA process.
- Look for FA (Faculty advisors) who will mentor students without taking over the project.

What kind of mentoring do you give to potential FAs?

- Kris - Have a set of guidelines and expectations. Also, we have a meeting with the FA to explain the ins and out
- Vito - Put together a roles and responsibilities sheet for the FA, students, and sponsor.
- Robin - I echo the expectations document. First time FAs are required to complete a 90 min training session. Tried sending out weekly emails to tell FAs what to talk about that week. Faculty asked to stop receiving emails. Cultivate a whitelist and a blacklist for FAs
- John - Filter projects based on expectations
- Todd - Coaches coach while players play
- Robin - FAs are reluctant to advise projects because they are not a subject matter expert. This should not disqualify faculty
- Vito - All faculty have a phd, they completed projects in the past. They know how to complete a project

Our university has a loose definition of subject matter expert vs professor, vs advisor. How to deal with gatekeeping.

- Advisors don't need to know all the answers, just the right questions to ask.
- Robin - Need to be careful about who owns the sponsor relationship. During the course of the project the capstone instructor should own the relationship.
- Vito - FAs need to meet with the students along with the sponsor at least once in the semester. Good for new faculty to start building relationships with the local industry.
- Having the project mentor speak directly to the sponsor could be a disaster. The students should be the intermediary
- Vito - Some sponsors want to speak with the faculty for comfort. Students should be the main contact.

What about sports analogies, are there good ones to use?

- Robin - Many students don't have sports experience and it can be exclusionary. Some people consider it a gendered approach.
- Kris - I use "halftime adjustments" as an example to pivot, rethink and adjust as necessary.

New faculty and older ones who have never been in industry don't know what they are doing when guiding students. After many years in industry I learned how to use a whip. They don't know what a schedule is and to be nice to a customer. I believe it is my job to teach them.

- Robin - I agree, I worked in industry for 20 years. I teach students how to interact with industry but not teaching faculty. It is an issue though. Remind students to speak professionally and dress appropriately
- Vito - I see my role as not just getting the product but also managing the relationship. We have faculty that don't have industry experience. I help the faculty to keep the program going. Spend time managing



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- John - This is a phenomenon with young faculty members. Goes back to owning the relationship with the faculty.
- There is a book about growth mindset: Carol Dweck. Can play her TED
- Grit: The Power of Passion and Perseverance, effort counts twice
- Kris: Co-authored a paper for ASEE - Successful student smart or tough
- CDC produced a youtube video with students in 2022 will do so again in 2024

How do you actually roll out [course] changes?

- Robin - Talk to people that teach capstone very differently Marie Peritti VA TECH? Grades by portfolio and performance. Daria Kotys-Schwartz - UC boulder. These approaches are closer to work. Also check with the governing body. If the change is substantial enough you may need to go through an official change process.
- John - Make sure you have buy-in from the supervisor.
- Vito - Couple of rules: 1) Students don't read anything. 2) You don't do engineering on phones. Most companies use email as their primary mode of communication. 3) The world runs on perception. Everything you do affects my perception of you and as a result your grade. Hammer in the difference between results and perception. Man
- Todd - Perception is reality whether you like it or not.
- Kris - Get out in front of concerns like "writing is getting in the way of the project". Convey that it does not get in the way; it is part of the process.

We have to use an electronic roll taking system due to the large number of students. One semester we tried not taking roll. Did not go well. They did not show up to class or meetings. Was a cascading problem because the expectations were not set.

- Vito - We are not allowed to use attendance as part of the grade. We start each class with a simple factoid, a one question engineering quiz.
- Todd - Tell them you wouldn't be late to a meeting with your boss's boss.

Students do not prototype soon enough. How do you deal with this?

- Kris - Set a prototype delivery day - or a deadline for a deliverable. By the end of the capstone I require my teams to deliver SOMETHING meaningful.
- John - Halfway through the second term teams have to have a testable prototype. Quality of deliverables went up.
- Robin - In early Oct teams have to submit a video or pictures of their prototype. Faculty made a 10 minute video about three levels of prototype. Have kept photos of previous projects. Level 1 uses stuff around you like paper tubes, they move on to scrap material
- In one comp sci project, the sponsor continued to add value-add ideas. Working on cutting off the minimum value specification early in the first semester. Will then require them to show the "bad" version of the software.
- Vito - Poster session around Thanksgiving where they have to show something working. Next date is 3/1. After that you are done when I say you're done. Gave students incomplete, they ended up working
- Todd - Four weeks before showcase must have a minimally functioning prototype
- Must have materials available for students to make prototype in lab



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- John - They don't need to 3D print everything
- Robin - First prototype, 3D printing should not be allowed.

Something that took you a while to figure out that you don't want others to have to struggle with. Best practices?

- Kris - Meet with each team separately. It changed my relationship with the students and they desire to be there. Gave them all 20 mins and set aside 25
- Vito - get some recognition for working across departments.
- Robin - 1) No one is a better champion for your capstone class than you. Be an advocate. If the university does a story, forward it to everyone. 2) You have to be able to say no when you are given too much responsibility. Figure out what workload is appropriate. Don't end up working more than you should
- John - Agree with meeting with teams separately. Manage expectations. Be selective about which projects go to capstone teams and which don't.
- Kris - Tell students that they'd be able to vote for the most dedicated team at the end of the year. Change the culture to be more helpful
- Get faculty within your own college to speak and build community about capstone.
- Todd - Go find the other capstone faculty at your school and speak with them
- Vito - When I meet with a sponsor, I make clear that this isn't a design services activity. It's more of a feasibility task. I get contacted by a lot of single inventors looking for cheap engineering work. Don't take those projects. There is an expectation management problem.

I am considering increasing the interaction between teams. Any suggestions?

- Kris - Clients and consultants session. Teams meet and question each other
- Robin - 1) when you have presentations we make each student watch another team's presentation. 2) Peer review on some assignment.
- Many do peer-to-peer feedback
- Vito - Do presentation in Oct. group together the projects with similar themes. Students have to be required to view another team's projects. In November there is a poster session. Students will be able view other team posters after theirs is graded

How do you roll out changes?

- Kris - Model adaptation and agility for the students. Be transparent and communicate.
- Vito - If we make changes due to student feedback we let them know.
- Robin - I agree, I keep a page of lessons learned. Don't change too much too fast.
- John - Accept making changes is the nature of capstone.
- Todd - Keep notes about things you want to change, try not to do too much too soon.