Virtual 2021 Capstone Design Conference
June 9, 2021 - 1:00-5:30 PM Eastern

[**What to Keep from the COVID Experience**](#)

Capstone Design Conference 2021
Wednesday, June 9, 2021
1:00-5:00 PM Eastern

What to Keep from the COVID Experience

Facilitator: Bridget Smyser (Northeastern University)
Panelists:
1. Rick Berkey (Michigan Tech)
2. Noe Vargas Hernandez (University of Texas at Rio Grande Valley)
3. Bonnie Roberts (Colorado State University)
4. Mitch Wacker (Rose-Hulman - Undergraduate Student)
5. Alexis Gillmore (University of Tennessee, Knoxville - Graduate Student)

Panelist Notes:

- **Rick:** Involving students in the decision, zoom for engaging students on co-op, students checking on one another, signing up to use the machine shop, gatherly.io for design expo
  - [Jay Goldberg, Marquette]: *We used Gatherly for our design expo. We had close to 900 attendees. Many parents attended who would not have been able to do so in person. The most resistance we experienced to learning the new platform was from our faculty, not our students.*
- **Noe:** personal email to students, great idea to do a mental health check-in!, "how are you doing?" - realization that everyone was different - we can't treat students all like they are the same, start class with a "how are you doing--are you OK?", curbside 3D printed parts pick-up, chatted with colleague after class and found that students stuck around - they were interested to see the instructors as real people
  - [Sarah Oman - Northern Arizona University]: *I did similar with my students this past year (connect with them and being human) and I've never felt more connected to them*

- **Bonnie:** most things online in fall semester, managing students in breakout rooms online with MS Teams was challenging, recording lectures but incentivizing students to come to class with clickers and such, hybrid presentations for clients that are remote, work log (spreadsheet) instead of design notebooks, continue to hold office hours hybrid,
  - [B.Smyser, Northeastern]: *We used both Teams and Zoom for the 'Project Selection' event. MS Teams was pretty clunky, but Zoom + Breakout rooms went well.*
  - [Jenn Carlson - University of Michigan MDP]: *We started holding office hours on Zoom and I saw more students than ever for a wide range of topics both curricular and not. We will be keeping this!*
  - [Kyle Cowdrick, Georgia Tech BME]:
    - *We implemented a digital lab-notebook utilizing Microsoft's OneNote platform back in 2019 and it was a HUGE success for collaboration within a team and between teams and sponsors. Online lab notebooks via OneNote also allowed for easy grading/TA-team communications. Integrates seamlessly with Microsoft Teams platform. Highly recommend.*
    - *We were also inspired by CSU's online project showcase and implemented a similar online presence for each semester's cohort. We have found this a very helpful resource for networking with prospective sponsored-project stakeholders. Example viewable here* https://designgarden.bme.gatech.edu/s21-digital-expo/
  - [Mark Easley, TI] - *Worklog is a good requirement. I have seen this effectively implemented at UTD with a capstone team this past year.*
  - [J Klaesner, Washington University in St Louis] *We have been using Lab Archives for a design notebook and it has worked well. I built a class template and the students can follow the template to make sure they have everything in it.*

- ○ [Beth DeBartolo RIT] *Videos are really useful to have later on, after the students have graduated - we share these with prospective clients and alumni*

- **Mitch:** All online lectures and workshops - useful to have that reference in future was very useful, most presentations online - lot more difficult to do Q&A, Microsoft Teams: great program from student side - quickly jump into meetings, record meeting minutes, organize files, grabCAD for sharing CAD files, video presentations - organize everything we wanted to say and deliberately present information.

- **Alexis**: flipped class was awesome (recorded lectures -available ahead of time) and group work during the class time, opened up class with fun breakout activity, student health check-in by anonymously polling people, feedback on posters - used discussion board on canvas (peer feedback without any grades associated),
  - ○

Questions/Discussion:
- **Q: Do you see having live, in-person class, with guest lecturer projected on the classroom screen? Or just have a total online session?**
  - ○ It would be nice to have guest speakers when they are not necessarily able to travel.
  - ○ When you have many sections of a large class, an online session lets you bring a speaker to the whole class without having to find a space or having the visitor give 6 of the same lecture.

- **Q: For schools that permitted students to choose whether to be fully remote learners or in-person, did you restrict Capstone teams to have all-remote members or all in-person members? And if yes, how did this work out? Was there pushback from the students?**
  - ○ Students understand that we needed to be flexible
  - ○ Sometimes students did not want to be in class so made it available for students wanting to attend remotely
  - ○ Instead of mixing we are choosing to put remote students together and the f2f together.
  - ○ [Courtney Pfluger, Northeastern Uni.] *I offered the option to present remotely or in-person this spring and surprisingly all students selected remote. Unsure if I will continue this option in the Fall.*

- **Q: I'm interested in the idea of hybrid presentations (presenting in person, but having some participants remote. Can you discuss what equipment is needed to do that effectively? In particular, do you need a dedicated audio/video recording setup for the in-person presenters?** [Peter Schuster]
  - ○ [Robert Nagel, JMU] *we had this hybrid presentation format as a learning outcome of our Engineering Management course prior to the pandemic. We have the students move the desks similar to a large conference table. The*

students all bring their laptops, connect to WebEx, and the speaker uses their microphone/audio with others in the room with audio off. Multiple classes and connect together and students/clients can also connect.

- [Kris Jaeger-Helton, Northeastern] *At Northeastern, we have one or more cameras in the room, I had 2 log-ins to the same Zoom (Prof & Attendee) and really only needed to be careful about putting students who are present into breakout rooms. To avoid audio feedback, they needed to use headphones or just not join the rooms and work amongst themselves in the physical room.*
- [Noe] not so pleasant was students had to go to public place to get good wifi signal, pleasant - easy to share
- [Mitch] environment needed to be right for recording, have a powerpoint ready to show and plenty of backup slides
- [Nael Barakat] *Internet availability proved to be a problem even in the US …*
- [Mark Easley] *For simple and straight forward microphone upgrade on your laptop I have used the Saramonic XM-1 which is not too expensive.* https://www.amazon.com/Saramonic-Omnidirectional-Microphone-Camcorders-SmartMixer/dp/B01N6P80OQ/ *Of course you can use a dedicated headset to improve the audio quality a bit more compared to your laptop. I think having your phone as a way to access a secondary camera in Zoom (primary camera is your computer) can be effective if you need to show something on your desk or in the room.*

- **Q: What is current industry practice for notebooks? They would have the same issues with so much more information being electronic.**
  - [Sarah Oman, UMich] - *We've been using timecards in a similar manner as the notebooks with great success. Teams have accountability within each other because they can see each team member's log of what they've been doing each day and how many hours they dedicated to each activity. Provided an honest assessment of how much each person was contributing*
  - [K.Cowdrick, Georgia Tech BME]: *We implemented a digital lab-notebook utilizing Microsoft's OneNote platform back in 2019 and it was a HUGE success for collaboration within a team and between teams and sponsors. Online lab notebooks via OneNote also allowed for easy grading/TA-team communications. Integrates well with Microsoft Teams platform. Highly recommend.*
  - [Mark Easley, TI]
    - *I think many people keep notebook information digitally in industry. Haven't seen too many keep a physical notebook at my company. All project management aspects are also done in the cloud for the most part.*
    - *Archiving projects online is super crucial moving forward. Each project should have a demo or presentation video and a home online for the project description which will make judging the projects and sharing with your community much easier. Can either do this on your campus IT infrastructure or leverage 3rd party tools for project sharing*

- ○ [Dennis Kodimer, ERAU] *The physical notebook is very alive in companies who hold proprietary info close to the breast. Mostly because it works best in from of a jury. We teach it.*
- ○ [Jay Goldberg, Marquette University] *Our industry advisory board suggested that we continue to use paper project notebooks. Keep in mind that these notebooks can be used to support patent applications so they need to meet legal requirements (time stamping with a real signature, and other requirements). I don't know how courts of law treat notebooks as proof of inventorship, but this should be considered even with the current first to file approach to establishing patent rights.*
- ○ [Steve Shooter, GWU]
  - ■ *It would be really helpful to create a master list of tools that were useful. Or tools with pros and cons. There is so much out there.*
    - ● [Jenn Carlson, UMich] *Agree Steven - We largely use Zoom and Google at Michigan. Nice to know what else is working well.*
    - ● [John Estell, Ohio Northern] I agree as well. List of pros are definitely needed for use with getting other faculty members on board.

- **Discussion of IP/NDA regarding cloud storage and virtual presentations:**
  - ○ *[Steve Shooter, GWU]I would think that some projects will need to be more careful about public presentations or slides. I have had many projects under NDA to protect IP.*
  - ○ [Beth DeBartolo RIT] *we require our students to review everything with their clients before sharing publicly when there is an NDA in place or IP concerns. Our contract puts a 10-14 day window on this so it doesn't hold the students up at the end of the year.*
  - ○ [Rachael Brown, Seattle U] *We have the sponsors approve the presentations that are meant for the public to avoid conflicts with NDAs and IP issues.*
  - ○ [Neal Skinner, UTD] *We have private (University personnel only) team presentations for sponsored projects that require confidentiality.*
  - ○ [Chris Neils, UW Seattle] *Re: public presentations - Our industry-sponsored students typically give an abbreviated public presentation then a full private presentation for the company and instructors. The latter is pretty easy now with Zoom.*
    - ■ [Jenn Carlson, UMich MDP] *that is what we do in our program as well. (clarifying - we do a private presentation only in many cases)*
  - ○ [Noe Hernandez, UTRGV] *With respect to IP and NDAs, one solution is to have a "public" website (example https://student.utrgv.edu/miguel.martinez09/Index1.htm) and one "private" (sorry can't share it).*
  - ○ [Mark Easley, TI] *I think it begs the question, what is the right mix of NDA and public open projects? If the majority of your project mix is IP sensitive doesn't that*

make your job as an instructor much harder? Might be worth some internal examination if that ends up being a headache in the new hybrid environment.

- [Neal Skinner, UTD] *Mark, we typically have only a small percentage of sponsors who require confidentiality. To date, this has not been a big problem for us.*
- [Rachael Brown, Seattle U] *@Mark Easley we view it as a learning opportunity for our students to learn how to convey information about their project without violating the NDA and IP restrictions. As they go into industry, this is a valuable skill to have. It also helps them develop their communication skills in negotiating what can and cannot be said in their public presentations.*
- (Bonnie)Getting pre-approval of the information they are going to present
- [Todd Polk, UTD] *Mark - on the BMNE/MECH side at UTD most of our projects are corporate sponsored and NDA/IP is always an issue. Most are OK with public disclosure, but occasionally we have to keep those presentations private*
- [Robert Nagel, JMU] *For public release/presentation/news release, etc., I always make sure that process is explicit in the MOU at the start of the project.*
  - [Peter Schuster] *@Robert. I like the idea of an MOU for sponsors, but I haven't implemented one before. Any chance you could share a sample?*
    - [Kris Jaeger-Helton, Northeastern] *I can also share sponsor commitment letters we instituted*
    - [Steve Beyerlein, UIdaho] *There is a paper from a previous capstone conference that might provide some guidance on sponsor paperwork. This was also published in a more extended version as an IJEE article after the conference. TITLE: Processes to formalize sponsored educational activity agreements between industry and universities related to capstone design projects, D Alexander, S Beyerlein, S Metlen - Capstone Design Conference, Columbus, Ohio, 2014*
    - [Robert Nagel, JMU] s*ure I have general starter MOU that I use and can share*

- **Q: How were your student evaluations after so much work that you put into the courses this last year? How many of these strategies are received positively by them?** [Sindia Rivera-Jimenez, UFlorida]
  - [Keith Stanfill, UTK] got some positive feedback on the amount of genuine care exhibited by the instructional team, but still bitterly complained about the work load!

- ○ [Rick] in general positive feedback in capstone, we did not see any negative impact, resounding students voice saying they didn't want it all online
- ○ [Bonnie] generally student evaluations very positive, things moved slower but the passion and work ethic was still there, students are not really into learning online
- ○ [Helen Markewich?, Northeastern] *We (Bioengineering at Northeastern) chose computational/programming design projects, but students felt that they were underprepared skills-wise for these types*

- ● **Q: Was there something(s) the panelists were pleasantly surprised by during the past year? What went better than you expected?** [Beth DeBartolo RIT]
  - ○ [Noe] some of the best projects seen,
  - ○ [Bonnie] Industry sponsors were supportive despite of the delays in the previous year
    - ■ [Shraddha] I totally second that
    - ■ [Rick] forecasted poor financial performance, but sponsors came through
    - ■ [Beth DeBartolo, RIT] Same - it was a good reminder that most are in this to support the educational missi*on of our program, rather than just to get some sort of widget designed and built.*
  - ○ [Tim Guggisberg, Clemson] *We now have several sponsors who are equipped to provide virtual visits to their plant or facility. This will be a plus for the future.*
  - ○ [Mitch] the social aspect was not killed. Everyone was trying to reach out and communicate
  - ○ [Alexis] teams came closer and leaned on each other,
    - ■ [Keith Stanfill, UTK] some teams met in person for the first time when building or testing prototypes
  - ○ [Mark Easley, TI] *Capstone student collaboration seemed to do much better than other classes. Being assigned to a small group is a huge help for the students and working closely over an extended period in the isolated environment made the team dynamics extra tight. Definitely a silver lining for this audience.*
    - ■ Peter Schuster, Cal Poly SLO] *yes I observed the same things with my teams!*
    - ■ [Jenn Carlson, UMich MDP] - *agree, we had great feedback from our students*
  - ○

- ● **Q: @Alexis, would you be willing to talk more about the class you flipped? Was it the capstone project course itself, or a upper class design course? What topics were the video lectures focused on?** [Eli Patten, UWashington]
  - ○ [Alexis] Design theory in lectures, in parallel with capstone projects for the whole year, video topics wouldn't always be relevant to each team for where they are at the same time.

- ○ [David, UMN] I teach other fully online courses so online capstone worked well. Any capstone teaching was done asynchronous recorded lectures with quizzes or short writing with due dates prior to the formal class. Classes were mostly student work time in groups or asking lecture related questions (live zoom). We will keep the flipped lectures.

- **Q: At least one biomedical engineering capstone program seems to advertise nationwide for project mentors (their ad went out today). Has any of you tried that, and would you be more/less likely to try it with online vs in-person capstone participation?** [Chris Neils, UW Seattle]
  - ○ [Cassie Bowman, ASU, Psyche mission project office - psyche.asu.edu/capstone-projects] @chis Neils, We (NASA Psyche mission) sponsor (and mentor) capstone projects nationally and have worked with students remotely for the past 3 years. It made it easier for us with our local teams when COVID hit because we had a lot of systems in place for our all-remote teams already.
  - ○ [Helen Markewich, Northeastern] Process works really well, found some interesting new projects of interest to students
  - ○ [Bonnie] All teams have mentors within CSU, sometimes outside university
  - ○ [Beth, RIT] We've engaged industrial clients as mentors when they want the exposure to graduating seniors (hiring preview) but don't have a specific project they want to undertake. Those folks provide subject matter expertise from their company site, working on a project driven by RIT faculty members.

- **Q: Any new type of project that you want to keep?**
  - ○ [Bonnie] a few remote projects, competition projects are usually popular but students were hesitant to sign up for those,
  - ○ [Shraddha Sangelkar, Rose Hulman] in-house projects were more popular than the industry projects in the past year
  - ○ [Keith] we lowered our price point and get project from smaller companies; will implement a tiered pricing; the UT Center for Industrial Services provided matching funds through the Manufacturing Extension Program (MEP) via the CARES Act
  - ○ [Shraddha Joshi, JMU] *At JMU, we required the project proposals to include a COVID plan to make sure that they had measures in place if the projects needed to be virtual throughout the course. Note that Capstone at JMU is a 2 year long program.*
  - ○

- **Q: Did seniors handle the online team format better than younger students since they knew each other from previous in-person days?**
  - ○ [Alexis] project charter to establish communication since we have students who don't know each other
  - ○ [Rick] onboarding practices to bring in new team member on the same page

- ○ [Chris Neils, UW settle] I also found the seniors to be better able to handle the online team format than younger students could because the seniors knew each other from previous in-person days.
  - ○ [Keith] we had the students post a short introduction video on the course discussion board and then comment on each other's video

- **What other technical support is provided to the biomedical teams beyond the mentor? Is there an assigned instructor or graduate student support available as well?**
  - ○ [Jay Goldberg, Marquette University] We have several teams that have clinical advisors (MD's, nursing faculty, physical therapists, dentists) in addition to biomedical engineering faculty advisors. They are from the Medical College of Wisconsin and Marquette University (PT, dentistry, nursing).

- **Re: Challenges during COVID**
  - ○ [Jeffrey Yiin, Kennesaw State] *Ordering parts online and manufacturing PCB boards got delayed because of Covid for some of my students.*

- **Re: Team Formation**
  - ○ [Jenn Carlson UMich MDP] *We are also Multidisciplinary so our students often don't know each other. We put our teams in an online teambuilding murder mystery escape room type activity. Teams competed against each other to solve the mystery. It was an expense we felt was really worth it to get them to know each other! (We also had them provide a picture and answer some get to know you questions and made team intro books as well - this was free!)*

Closing Remarks
- **Rick**: Involve and trust students, flipped classroom leverage that time in the classroom
- **Noe**: Connect with your students and tell them the awesome they are doing, recognize their efforts. Senior design project free style haiku (see example below)
  - ○ Online instruction
  - ○ I can handle it
  - ○ Miss everyone
- **Bonnie**:ability to work with sponsors that are located far away opens up so many opportunities,
- **Mitch**: some of the virtuals components have worked well, apply that in future will be very helpful to student with project organization and productivity
- **Alexis**: remembering to bring those creative approaches even past this