Nifty Ideas
and
Surprising Flops
<table>
<thead>
<tr>
<th>Nifty/Flopper</th>
<th>Institution</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sid Deliwala</td>
<td>UPenn</td>
<td>Micro Design Course Sequences before Senior Year</td>
</tr>
<tr>
<td>Robert Hart</td>
<td>UT Dallas</td>
<td>Getting to Know Each Other</td>
</tr>
<tr>
<td>Shraddha Sangelkar</td>
<td>Rose-Hulman</td>
<td>Cancelling Kick-Off Project in Hybrid Mode</td>
</tr>
<tr>
<td>Edward Latorre</td>
<td>U Florida</td>
<td>MS Teams Course</td>
</tr>
<tr>
<td>Beth DeBartolo</td>
<td>RIT</td>
<td>Let's Sort of Do Agile Stuff</td>
</tr>
<tr>
<td>Rachana Gupta</td>
<td>NCSU</td>
<td>Good Poster, Bad Poster Workshop</td>
</tr>
<tr>
<td>Charles Radovich</td>
<td>USC</td>
<td>Conducting Experiments over Zoom</td>
</tr>
<tr>
<td>Kris Jaeger-Helton</td>
<td>Northeastern</td>
<td>Evolution of the Design Review</td>
</tr>
<tr>
<td>Jamie Canino</td>
<td>Trine</td>
<td>Action Items after Critical Design</td>
</tr>
<tr>
<td>Todd Polk</td>
<td>UT Dallas</td>
<td>Expo Preview</td>
</tr>
<tr>
<td>Susannah Howe</td>
<td>Smith</td>
<td>Scavenger Hunt for Reflection and Transfer</td>
</tr>
</tbody>
</table>
Micro Design Course Sequences before Senior Year

- Average enrollment of 90 students and 20 teams • co-instructor, Jan van der Spiegel • Majors offered: Electrical Engineering, Computer Engineering, Systems Engineering • "systems" is major that focuses on data science / ML / DL / AI
- Capstone Course offers a chance to make teams with students from different majors

**freshmen**
- ESE 111, circuits, arduino, python, IoT
- ESE 150, FPGA, networks, digital audio

**sophomore**
- ESE 215, circuits, design of an analog plotter
- ESE 319, advanced circuits, design of a metal detector

**junior**
- ESE 350, embedded design, intense final project experience
- ESE 305, data mining and analytics, design of data systems

**senior**
- ESE 421, design of autonomous systems with a final project
- ESE 505, design of control systems with a final project
- ESE 516, DFM IoT Systems
- ESE 546, Principles of Deep Learning

- Challenges ahead for improving communication and team building skills
- Can the blended experience improve capstone design?
- It would be great to have 5 person teams in other courses

Sid Deliwal, UPenn
Getting to Know Each Other

**Purpose:** Encourage development of strong teams through an early team-building activity

**Guidelines**
1. Fun activity that involves all team members
2. Must take at least one hour
3. Do before selecting team leader
4. Talking and interaction is a must (e.g., no movies)
5. No project work allowed

**Deliverable**
A document containing:
- 1-2 paragraph description
- Minimum of 3 pictures showing all team members participating

**Other Ideas:** Homemade meal, knitting, sporting events, escape room, go-cart racing, Netflix Party app, games, ….

**An Early Flop:** On-campus scavenger hunt plus a quick hands-on activity done during class time

Robert Hart, UT Dallas
Cancelling Kick-Off Project in Hybrid Mode

What is Kick-off Project?
➢ At the beginning of ME capstone
➢ Short 2-week project
➢ End artifact - a prototype

Why cancel it?
➢ Eats up time from main project
➢ Too fast (breadth over depth)
➢ Students are overwhelmed

Why keep it?
➢ Recap of the design process
➢ Keeps over-ambition in check
➢ Helps with team formation

Cancel? Gain 2 weeks for covid-related delays

How did it go?
➢ Course evals: Student didn’t miss it
➢ 2 out of 10 teams re-arranged mid year
➢ Going forward?

Shraddha Sangelkar, Rose-Hulman
MS Teams Course

General ch has
- Apps
- Weekly lectures
- Announcements
- Q&A
- Reactions
- Coaches included

Each team private ch has
- Files & apps
- Chat & video

Edward Latorre-Navarro, U Florida
Let's Sort of Do Agile Stuff

In a meeting with a team trying to embrace Agile, and advisor says “you can’t do that with a hardware project”

Ignoring words of wisdom from colleague: “Don’t sort of do Agile”

Realizing that most teams aren’t doing Agile at all, see it as additional overhead

“Hope springs eternal” or “Groundhog Day”?

Agile pilot: 2021-22
Stay tuned...

Beth DeBartolo, RIT
Good Poster, Bad Poster Workshop
Teach project teams how to design a poster to communicate their project to a broader audience.

<table>
<thead>
<tr>
<th>Poster template and elements</th>
<th>Show past poster examples</th>
<th>In-class discussion and tips</th>
<th>Feedback for each poster</th>
</tr>
</thead>
</table>

**Not thinking from audience perspective..  Don't understand “why”**

<table>
<thead>
<tr>
<th>In-class Good Poster, Bad Poster workshop (30-45 min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Show past posters of all quality and types.</td>
</tr>
<tr>
<td>● Let them evaluate each quickly (2-3 min)</td>
</tr>
<tr>
<td>● Provide a simple form to submit ratings</td>
</tr>
<tr>
<td>● Share the results</td>
</tr>
<tr>
<td>● In-class discussion with tips and guidelines</td>
</tr>
<tr>
<td>-Evaluation of someone else’s poster is easy</td>
</tr>
<tr>
<td>-Form helped in making guided observation</td>
</tr>
<tr>
<td>-Made quick, good and unique observations</td>
</tr>
<tr>
<td>-Formed their own “Don’ts”</td>
</tr>
<tr>
<td>-Understood the purpose</td>
</tr>
</tbody>
</table>

Rachana Gupta, NCSU
Conducting Experiments over Zoom

Remote Desktop connection to on-campus lab stations
- Students connect to lab PCs via AnyDesk (Remote Desktop; free version)
  - Have full control of NI VB-8012 (Virtual Bench) hardware
    - Function generator, oscilloscope, DMM, power supply
    - Drive circuits and conduct experiments
  - Circuit construction
    - Students assembled “practice” circuits at home; sent photos for verification
    - On-campus staff assembled the “real” circuits at each on-campus lab station
- Lab started with a group Zoom session
  - Zoom breakout rooms assigned for each lab station for Staff-Student guidance
  - Lab staff could view lab stations in real-time; initiate breakout rooms when needed
  - Some experiments were conducted solo; most paired two students together

Conclusion: It worked!

Hardware Kits mailed to 170 students
- Experimental engineering starter kit
  - Digital Calipers, Handheld DMM, 9V battery “power supply”, breadboard, resistors, capacitors
- Allowed for instruction on
  - Measurement and uncertainty
  - Circuit construction
- Voltage divider experiment at home
- Additional circuits constructed (filters, op-amp) but experiments were conducted using Remote Desktop

Links
- AnyDesk
- NI VB-8012
- USC Viterbi News

Email
radovich@usc.edu

Charles Radovich, USC
Evolution of the Design Review

You’ll need to present your work to outside experts for their constructive critique(s)...

You’ll need to report on all the ways they told you you were doing it wrong.

Alright, hang on: The experts will certainly recognize all the things you’re doing well...

You can then write up all the compliments they gave you, your team, and your project.

What we said … vs What they heard

OK, Let’s get this right: First, mindfully seek out experts related to (sub)problem(s) …

Next, develop a PLAN for a balanced Design Review …

Finally, reflect on how it went, and what you learned.

Kris Jaeger-Helton, Northeastern
## Action Items after Critical Design

**Goal:** Maintain motivation while addressing issues found during a review

### Impacts
- Maintains motivation (Students actually like it!)
- Design issues get resolved quickly and systematically
- Reduces student stress during the critical design review

<table>
<thead>
<tr>
<th>Action Item #</th>
<th>Priority</th>
<th>Description</th>
<th>Date Closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>What is your predicted trim and elevator angles for mission 1?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Will the wheels contact the shell of the car? Provide a CAD image.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>PVC is probably the wrong choice for that pipe, explore alternatives</td>
<td></td>
</tr>
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</table>

Determine together

- Improve their grade as items are closed
  - Up to 1 point out of 5
  - More points for closing sooner

Jamie Canino, Trine
Expo Preview

**Problem:** Teams say they never get a chance to see the other team’s projects

**Solution:** Give them a chance to visit each other!

**OK, but when and how?**

**When:**
- Our Expo is an afternoon event
- In the morning, for two hours, the teams have a chance to visit each other

**How:**
- Each team splits in half
- One half visits other teams
- Other half stays to greet other teams and **practice their Expo pitch**
- Switch halves after an hour
Scavenger Hunt for Reflection and Transfer

Goals: wrap up capstone course by looking back and forward, encourage teamwork and class fun

Activities:
- Relate to specific projects/teams
- Connect with overall class
- Include silly and serious
- Award points based on difficulty
- Plan more items than time allows

Logistics:
- Teams document on slide deck
- Instructors score in real-time
- Bonus points awarded at end
- Winning team announced

"To passively engage in your project is to fail before even starting"

I'll be honest, I first was afraid
With Covid, my plans were delayed
But DC was the best
Compared to the rest
Because of the friends that I made

Susannah Howe, Smith College
Nifty Ideas

and

Surprising Flops

Virtual Capstone Design Conference 2021

9 June 2021
Facilitator: Susannah Howe