Session: Strengthening Pathways to Student Success

• Organizers:
  • **Elizabeth J. Orwin**, Dean, School of Engineering and Computer Science, University of the Pacific
  • **Nancy Warter-Perez**, Dean of the College of Engineering, Computer Science, and Technology (ECST) at California State University, Los Angeles
  • **Sharon Zelmanowitz**, Dean of Engineering and Cyber Systems, US Coast Guard Academy
  • **Durga Suresh-Menon**, Dean, Wentworth Institute of Technology
Overview

• 5-minute “vignettes” on each of four topics

• (4-4:30pm) Table discussions
  • Goal: each person determines one takeaway idea that they will take back and try at their institutions

• (4:30-4:45pm) Share takeaways from tables; summarize key themes
Speakers and Topics

• Metacognition/self awareness in students
  • Nancy K. Lape, Professor and Chair of Engineering, Harvey Mudd College: Increasing Students’ Sense of Agency

• Improving culture in STEM spaces
  • Gustavo Menezes, Professor and Chair of the Department of Civil Engineering at Cal State LA: Eco-STEM Peer Observation Tool and Resource Repository

• Student success and equity
  • Susan M. Lord, Professor and Chair of Integrated Engineering, University of San Diego: Sociotechnical Modules in Required Classes

• Student retention
  • Shelly Gulati, Assistant Dean of Interdisciplinary Programs, Teaching Excellence, and Inclusion, University of the Pacific: First Year Advising Program
Increasing students’ sense of agency via a prototyping mindset

ASEE EDI
April 15, 2024

Nancy Lape
Chair, Engineering
Harvey Mudd College
Why prototype?
What is a prototyping mindset?

Prototyping Mindset:
Willingness to test out a solution that may not be the final or best solution, learn from the trial, and evolve the design.

*Bias towards action!*

Department of Engineering
Prototyping your future self

Prototyping an equitable and inclusive community

Prototyping curricular innovation process

Prototyping Mindset

Department of Engineering
Prototyping Mindset

- Prototyping your future self
- Prototyping an equitable and inclusive community
- Prototyping curricular innovation process

Students approach their academic and professional career with a prototyping mindset.
Prototyping Mindset: Why and How

The main challenge:
Students feel they lack agency in their college experience and future career.

The intervention:
Two courses – one for sophomores and one for seniors – that employ techniques of human-centered design* paired with weekly life-design prototypes

* Significant credit to Stanford’s Life Design Lab
Prototyping Mindset: Why and How

The main challenge:
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What is a Life Design prototype?

Going out and taking action (not research!)

1. **Prototype Experiences, e.g.**
   - Sophomores joined Clinic team meetings to learn more about what it is like to work on certain projects
   - Students went to a Club meeting
   - Students tried out a new schedule

2. **Prototype Conversations, e.g.**
   - Students practiced their “story of me” and getting to a “story of us” with a network connection
   - Students spoke with alumni about their experiences
What is a Life Design prototype?

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Prototyping Your Mudd (sophomores)

- **Modules** include:
  - Purpose of college
  - Exploring technical interests
  - 4 quadrants
  - Networking and Informational interviews

- **Prototypes** include conversations with seniors, faculty, alumni, and a cold network connection

- **Final assignment/prototype**: HMC Wayfinding Map + learnings and unlearnings
Prototyping Your Future Self (*seniors*)

- **Modules** include:
  - Success, Worldview, Workview
  - Elevator conversations
  - Decision making
  - Networking
  - Mentors and community

- **Prototypes** include conversations with alumni and network connections and several design-your-own prototypes

- **Final assignment/prototype**: Odyssey Plan + learnings and unlearnings

Department of Engineering
Prototyping Mindset: Results

Increases in:

- I am confident that I can design my degree to meet my interests and career aspirations.

- I expect that my work/career beyond HMC will align with my values.

- I am confident that I can design a career that fits who I want to be.

- I am confident that I could effectively work on a problem that does not have an obvious solution.
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Department of Engineering
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Department of Engineering
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If you want to know more, email me at lape@hmc.edu!
Improving Equity and Inclusion Culture in STEM Spaces: An ecosystem-based (ECO-STEM) Peer Observation Process

Eco-STEM Peer Observation - https://t.ly/0BHCN
### Observable Behaviors

#### Principles | Observable Behaviors
---|---
**Climate**: supportive, inclusive and recognizing cultural assets  
C1: Knows students as individuals  
C1.1: Used students’ names  
C1.2: Talked with students informally before or after class  
C1.3: Showed knowledge of students’ interests beyond the class  
C2: Encourages questions  
C2.1: Promoted a classroom environment where questions are valued  
C2.2: Expressed curiosity about student thought process  
C2.3: Emphasized to students that making mistakes is a normal and healthy part of the learning process  
C3: Expresses belief in students’ capacity and potential  
C3.1: Encouraged students to continue to try when stuck  
C3.2: Affirmed students that they are capable to do the work  
C3.3: Projected a successful future for students (career, graduation)  
C3.4: Promoted a growth mindset in students  
C4: Creates an inclusive environment  
C4.1: Presented divergent viewpoints where appropriate  
C4.2: Did not embarrass or belittle students  
C4.3: Showed respect and sensitivity to diverse learners, including different ways of knowing  
C4.4: Adequately addressed student concerns  
C5: Recognizes Cultural Assets  
C5.1: Acknowledged students’ past experiences  
C5.2: Valued and celebrated different ways of problem solving  
C5.3: Acknowledged and supported student resilience in the face of difficulties  
**Structure**: facilitate the learning process  
S1: Provides clear goals/outcomes  
S1.1: Provided purpose and learning outcomes of the lesson  
S1.2: Placed the lesson into the overall arc of the course  
S1.3: Gave clear instructions on activities and assignments and tied them to student learning outcomes  

#### Focus: Faculty Assets

<table>
<thead>
<tr>
<th>S4: Structures activities to develop effective learners</th>
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</table>
| S4.1: Used a variety of instructional activities  
S4.2: Used scaffolded activities  
S4.3: Used activities that requires students to explain their approach to the solutions, recognize structure, etc. (metacognitive components)  
S4.4: Asked students to generate their own explanations and justify their thinking  
S4.5: Included reflection activities (e.g., muddiest point, one-minute paper, exam corrections) |

<table>
<thead>
<tr>
<th>Vibrancy: activity and level of engagement</th>
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</table>
| V1: Communicates passion for the discipline  
V1.1: Shared current developments in the discipline  
V1.2: Projected genuine enthusiasm about the discipline  
V1.3: Provided opportunities for students to share new developments in the field  |
| V2: Uses active learning properly  
V2.1: Addressed student questions and comments  
V2.2: Provided group tasks that promoted knowledge construction in community and higher-level thinking  
V2.3: Synthesized group work at conclusion of collaborative activity  
V2.4: Developed student learning through active participation in lesson activities  |
| V3: Promotes healthy and productive dynamics between students  
V3.1: Encouraged students to answer each other’s questions  
V3.2: Encouraged groups to ensure that all students have an opportunity to speak and are listened to  
V3.3: Enforced respectful behavior and kindness between students  
V3.4: Facilitated effective group work through assignment of roles and group selection  
V3.5: Intervened as necessary to hold class to pre-agreed-upon community norms  |
| V4: Stimulates a high level of student engagement  
V4.1: Provided varied opportunities for students to apply newly learned content  
V4.2: Adopted strategies and activities that captivate disengaged students  
V4.3: Students readily participated in in-class activities  
V4.4: Gave students recurring opportunities to engage with other students in small groups or as a whole class |
Observee Selects 10-15 behaviors they want to be observed on

Discuss overarching goals for the observation. Narrow list to 8-10 behaviors and generate Tailored Observation Tools

Peer observation takes place

Meet to Debrief
Sociotechnical Modules in Required Classes

Susan M. Lord
Professor and Chair of Integrated Engineering
University of San Diego

IEEE Fellow
American Society for Engineering Education
National Science Foundation
Guidelines for Sociotechnical Integration

- Identify a course topic that ties to something broader and a learning objective that this fits with
- Craft learning objectives for your activity
  - Design homework, exam questions, and activities for class
- Help students connect topic issues to everyday lives
- Connect social context and technical content so students see this as “real world engineering” not “add-on”
“Conflict Minerals” Module (Circuits)

- 2nd year students
- Connect capacitors to Tantalum to Conflict Minerals

By the end of this course, students will be able to
- Explain two examples of how electrical circuits relate to their everyday lives.

By the end of this module, students will be able to
- Describe potential options for engineers concerned with the use of conflict minerals

What are “Conflict Minerals”?

- Minerals that are mined in the Democratic Republic of the Congo (DRC) and surrounding areas where income from mining used to finance armed conflict.

- Commonly known as “3TGs”: Tungsten, Tin, Tantalum, and Gold

- Common in consumer electronics
“Conflict Minerals” Module (Circuits)

- Homework 1: How much Tantalum (Ta) used globally in capacitors (a course topic) within smart phones? Where is Ta mined?

- Class 1:
  - Multidisciplinary instructor team introduced students to definition of conflict minerals & conflicts in the DRC
  - How could we minimize use of conflict minerals as engineers?
DRC
Student feedback

• “Obviously we looked at a lot of stuff that wasn’t engineering including the conflict minerals … which I thought was really cool. And that was very clearly … engineering but at the same time it was very clearly like looking at it from different angles.”

• “The conflict minerals thing was huge … one thing I had never realized was how much one little electric component that’s so important can affect like everyone … or can affect those people in underdeveloped nations”

• “How could I be 20 years old and have never heard of this?”
Current Research: Helping Others Integrate

• Why don’t most engineering instructors integrate sociotechnical issues in the classroom?

• Solution: Make it as easy as possible. Provide resources!
Sociotechnical Modules in Circuits

- Develop modules with lesson plans, slides, script, homework and exam problems, and assessment materials

- Selected 8 graduate students to help develop modules -- “Sociotechnical Electrical Engineering Stars” (SEES) cohort

- Interested in testing our modules in *Intro to Circuits*?

  [tinyurl.com/circuits-modules](tinyurl.com/circuits-modules)
Student Retention - First Year Advising Program

April 15, 2024
First Year Advising Program

Aims

• Highly engaged and supportive developmental advising

• Develop student-advisor relationship to promote student success, persistence, and satisfaction with the college experience

• Support achievement of advising learning outcomes:
  • Assess your learning strategies
  • Design a curricular plan
  • Prepare a future plan

Program Structure

• 1:1 faculty advising meetings

• Self-efficacy and metacognition learning modules on in First Year Experience course

• Career advising programming (optional career management badge)
Program components and timeline

- **Week of Welcome**
  - Summer: 1:1 GM
  - Fall: 1:1 1:1 1:1

- **Orientation**
  - LS CP LS LS

- **Dean’s Seminar**

- **Career Advising**
  - RW RR CF

- **Transition to new advisor**
  - Summer: 1:1 1:1 1:1
  - Fall: TR

Actions:
- 1:1 Advising Meeting
- Group Advising Meeting
- Transition Meeting
- Assess Your Learning Strategies Module
- Design a Curricular Plan Module
- Resume Workshop
- Resume Review
- Career Fair
Assessment

- Participation data (% of attendance at 6 meetings)
- Achievement of learning outcomes
  - Resume completion
  - Express how major aligns with skills, abilities, interests (% met expectation)
- Academic performance (GPA)
- Persistence
- Student survey
- Advisor feedback

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<td>AY 22-23</td>
<td>AY 23-24</td>
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<td>second year)</td>
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Persistence

- 10 year high for students entering AY 22-23 -- 92%
- Ave of ~87% from AY13-14 to AY19-20
- Dip to ~82% in AY 20-21 and 21-22 likely influenced by the pandemic

Complimentary Structures

- First Year Advising Program began
- Academic Coaches introduced

Fall 21

- 52-week retention calendar
- Early Grade (at week 5) – reach outs by faculty advisors and academic coach to students with D and F
- Persistence Team – Academic and Student Life

Fall 22

- Advise CRM launch

Spring 23

- Student Outreach Dashboards

Fall 23
Student Survey

• Voluntary participation
  • 26% in Sp22; 35% in Sp 23

• Feelings of community
  • School Community Inventory (SCI)* results of agree to strongly agree
    • 68% in Sp22
    • 70% in Sp23

• Satisfaction with advising experience and meeting frequency

* Rovai et al. (2004)
Student Survey

- Academic confidence

I am confident that I can do well in my classes.
I know different learning strategies that I can use to do well in my classes.
My academic learning goals are challenging but attainable.
I am confident in my ability to handle unexpected challenges or obstacles.

- Feedback on Advisor

My advisor is approachable.
My advisor is available/accessible.
My advisor is prepared for our meetings.
My advisor is knowledgeable on the requirements for my degree.
My advisor is understanding of my challenges in adjusting to college.
My advisor provides helpful guidance.
Other Comments

• Faculty Advisor considerations
  • Workshop on self-efficacy and metacognition
  • Summer 1:1 compensated with stipend
  • Academic year efforts counted in teaching workload

• Faculty advisor comments:
  • Valued frequent meetings in first year in getting to know their advisee
  • Connection with metacognitive assignments led to richer discussions
  • Students asked for support earlier in the semester

• Too many meetings? Consider 4 instead?

• Students tend not to do things that are not required especially if they are scary, e.g. go to a career fair

• Advisor commitment to the program is essential
Discussion Questions

• What are the first ideas that pop into your mind after hearing the presentations?
• Is your institution doing something similar to anything you heard?
• How might you modify something you heard from one of the speakers to implement at your institution?
• Do you have new ideas to share?

• **GOAL:** write down/email to yourself one takeaway idea that you will take back and try at your institution