Session: Strengthening Pathways to Student Success

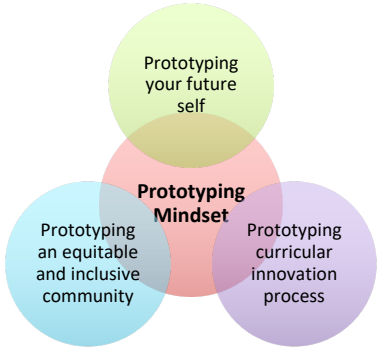
- Organizers:
  - ***Elizabeth J. Orwin***, Dean, School of Engineering and Computer Science, University of the Pacific
  - ***Nancy Warter-Perez***, Dean of the College of Engineering, Computer Science, and Technology (ECST) at California State University, Los Angeles
  - ***Sharon Zelmanowitz,*** Dean 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



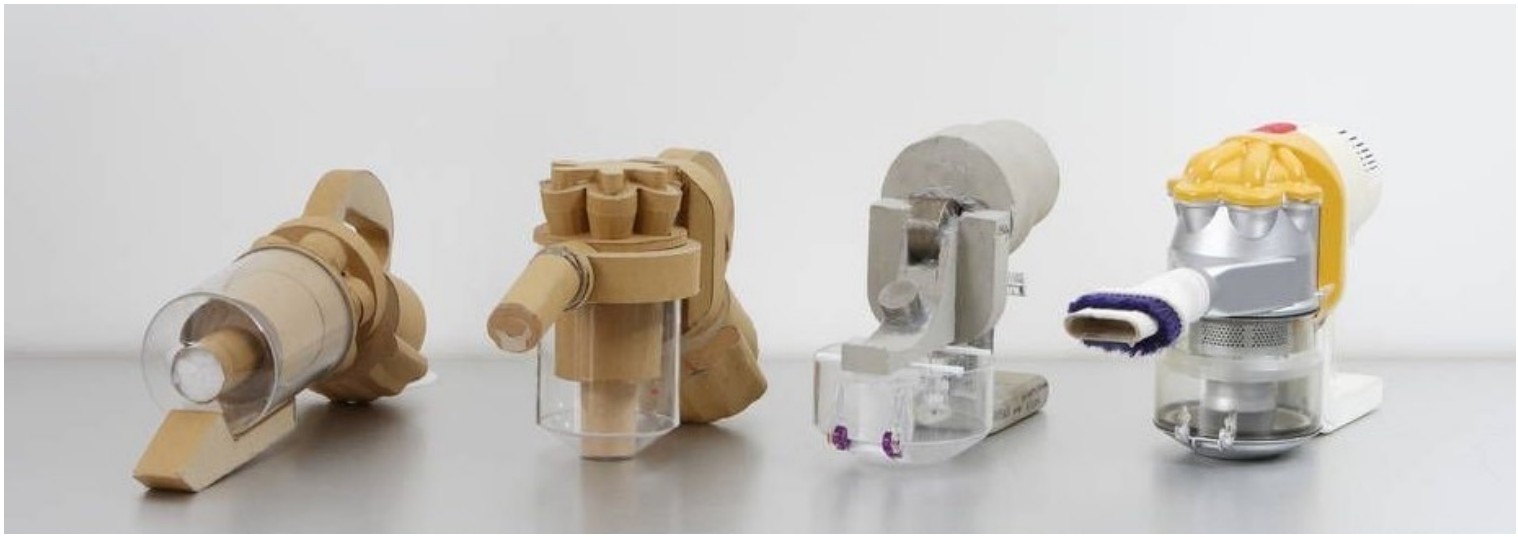
Increasing students' sense of agency via a prototyping mindset

ASEE EDI
April 15, 2024

Nancy Lape
Chair, Engineering
Harvey Mudd College

Department of Engineering

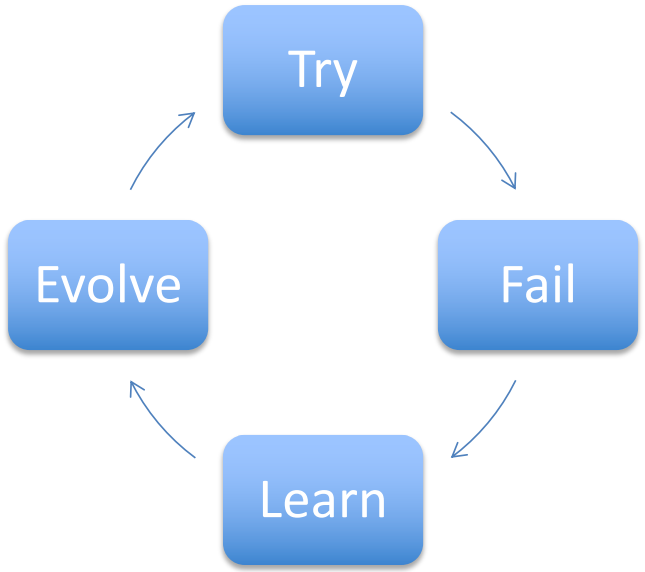
Why prototype?



dyson.com

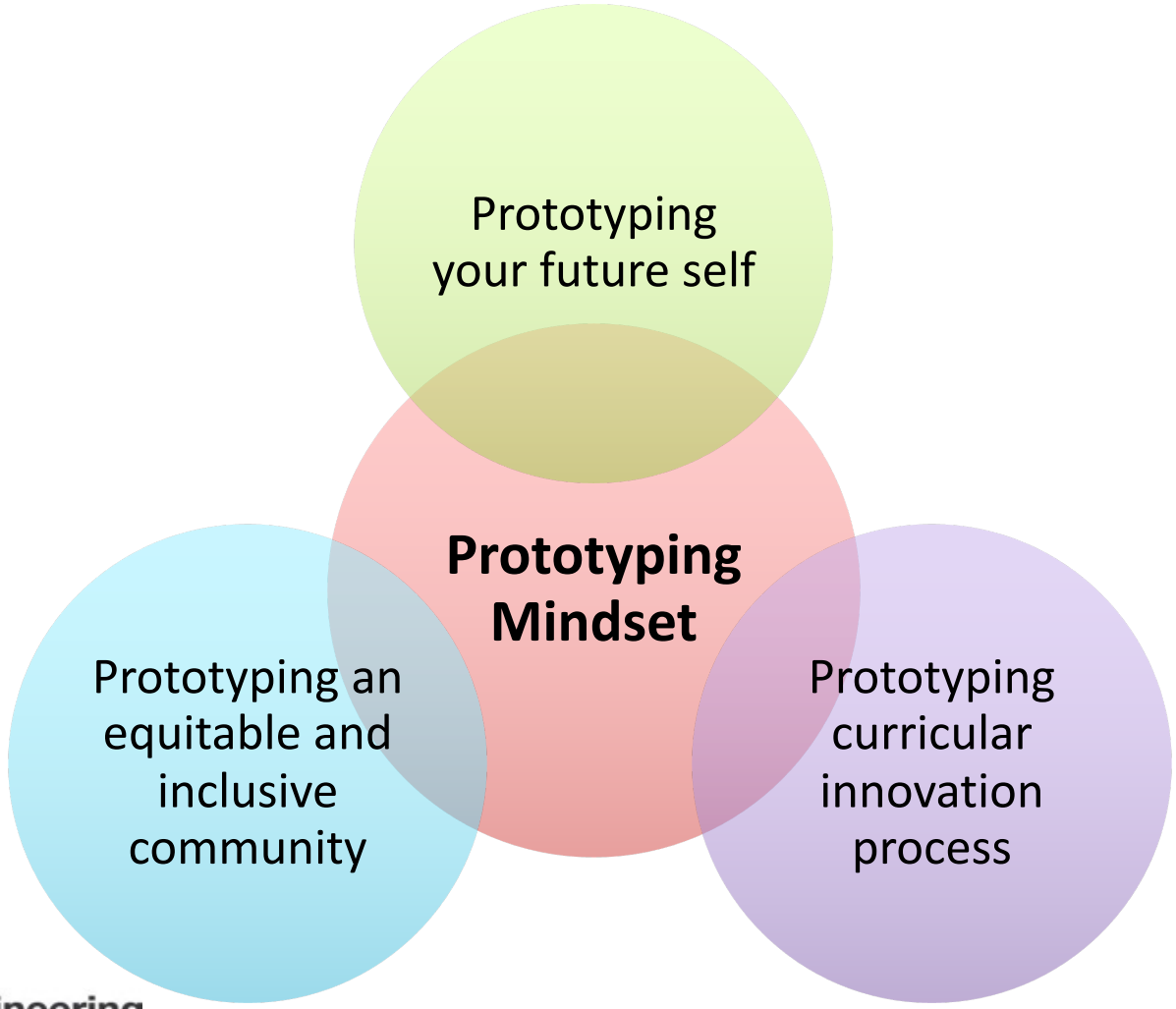
What is a prototyping mindset?

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!

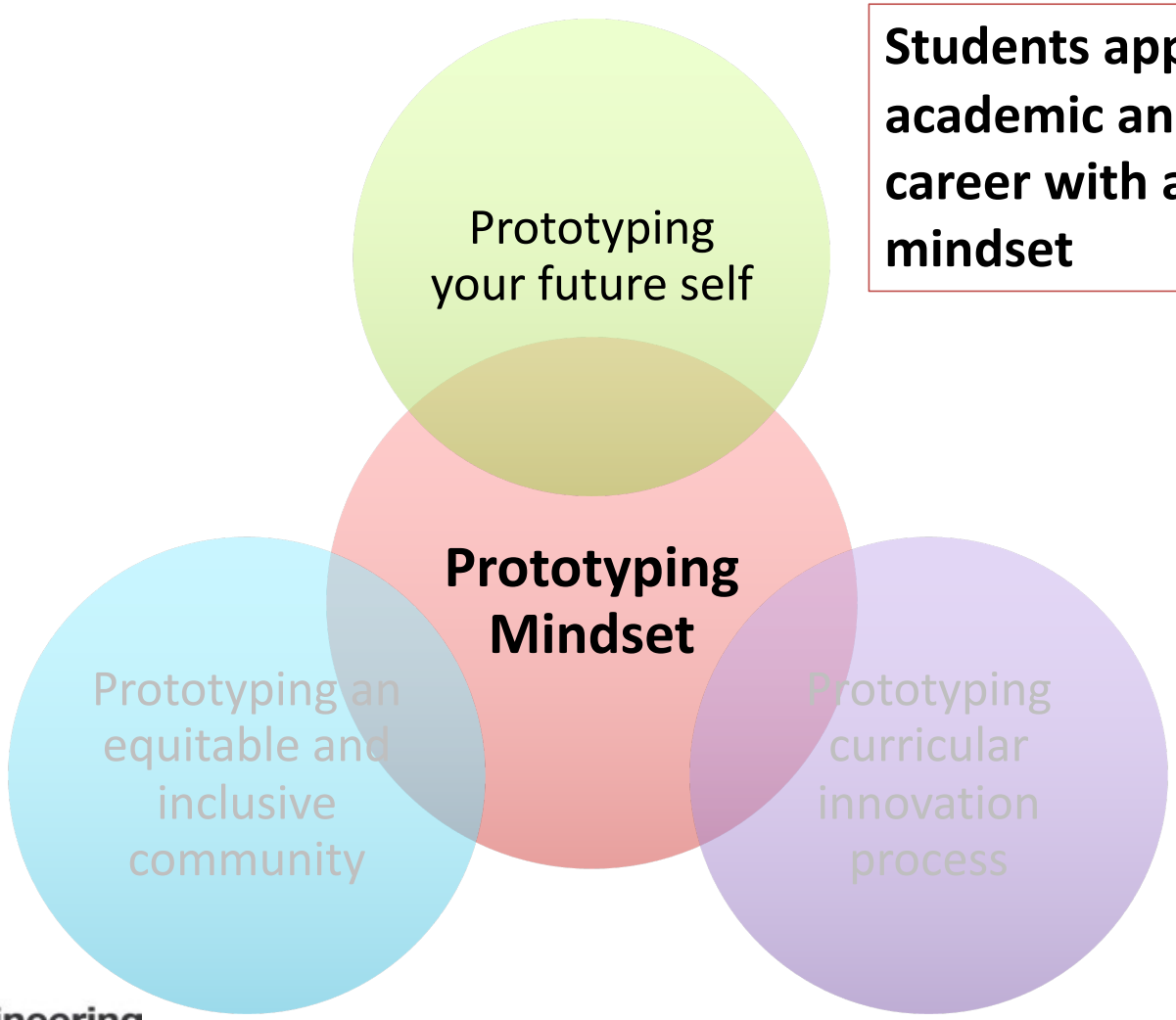
HARVEY MUDD COLLEGE



Department of Engineering

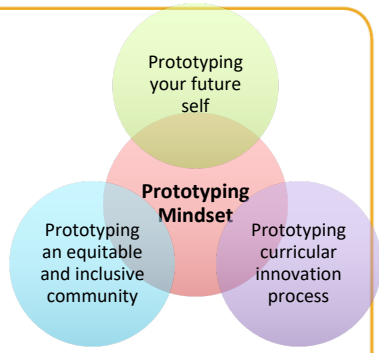
HARVEY MUDD COLLEGE

Students approach their academic and professional career with a prototyping mindset



Department of Engineering

Prototyping Mindset: Why and How



The main challenge:

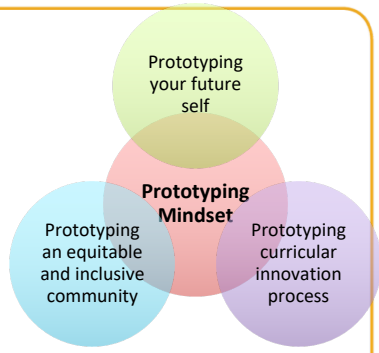
Students feel they lack agency in their college experience and future career.

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



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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

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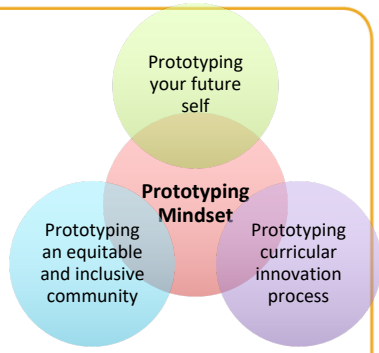
Prototyping Your Mudd (*sophomores*)

- **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

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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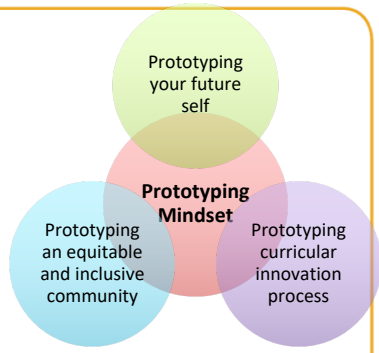

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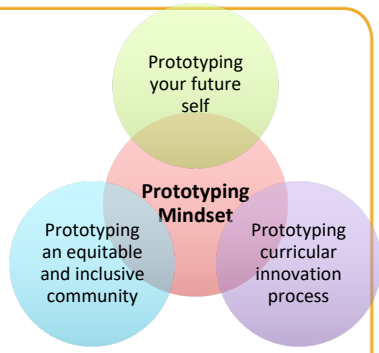

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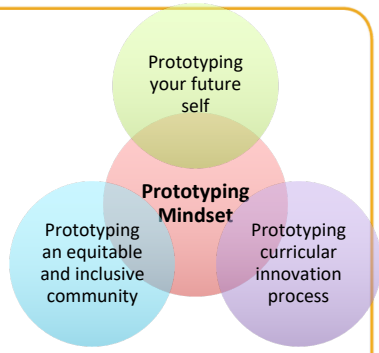

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If you want to know more, email me at lape@hmc.edu!

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 to 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
S4: Structures activities to develop effective learners	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)
Vibrancy: activity and level of engagement	
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

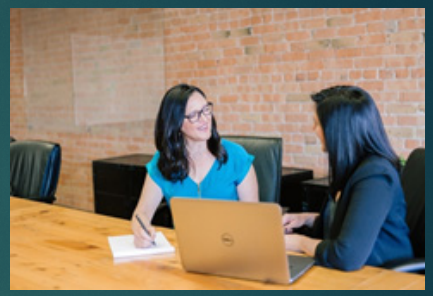
Focus: Faculty Assets

Asset-Based Peer Observation Process

Observee Selects 10-15 behaviors they want to be observed on

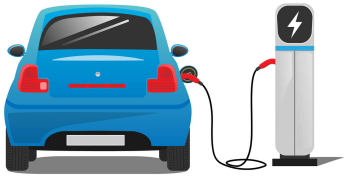
Discuss overarching goals for the observation. Narrow list to 8-10 behaviors and generate Tailored Observation Tools

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

ASEE AMERICAN SOCIETY FOR ENGINEERING EDUCATION

National Science Foundation WHERE DISCOVERIES BEGIN

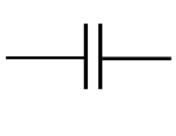
Guidelines for Sociotechnical Integration

- 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"

National Science Foundation
WHERE DISCOVERIES BEGIN

"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.

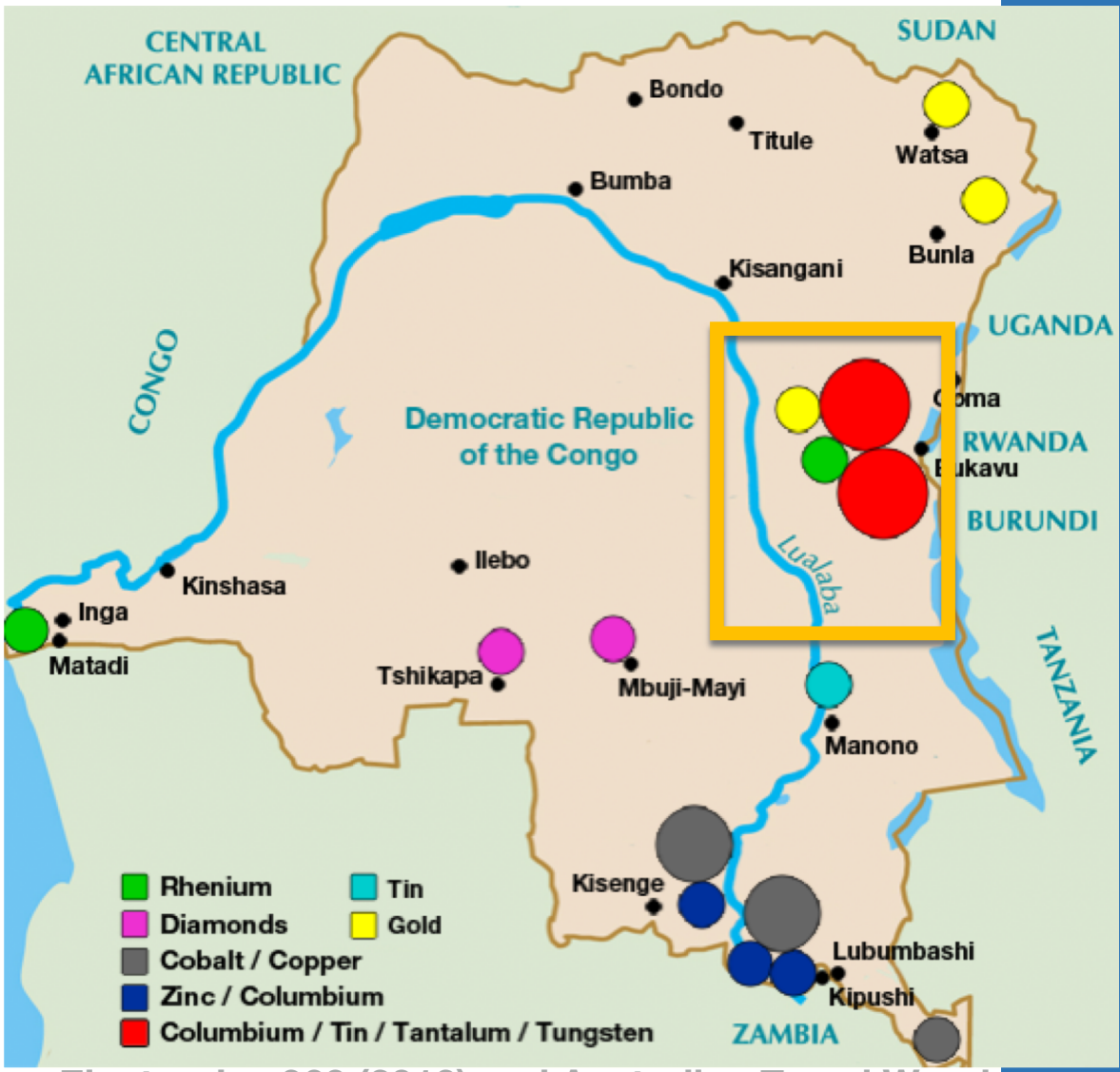
By the end of this ***module***, students will be able to

- Describe potential options for engineers concerned with the use of conflict minerals

S. Lord, B. Przestrzelski and E. Reddy, "Teaching Social Responsibility in a Circuits Class," ASEE 2019.

What are "Conflict Minerals"?

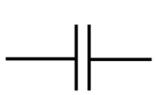
- Minerals that are mined in the Democratic Republic of the Congo (DRC) and surrounding areas where income from mining used to finance armed conflict.
- Commonly known as "3TGs": Tungsten, Tin, Tantalum, and Gold
- Common in consumer electronics



Electronics 360 (2013) and Australian Travel Warnings (2018)

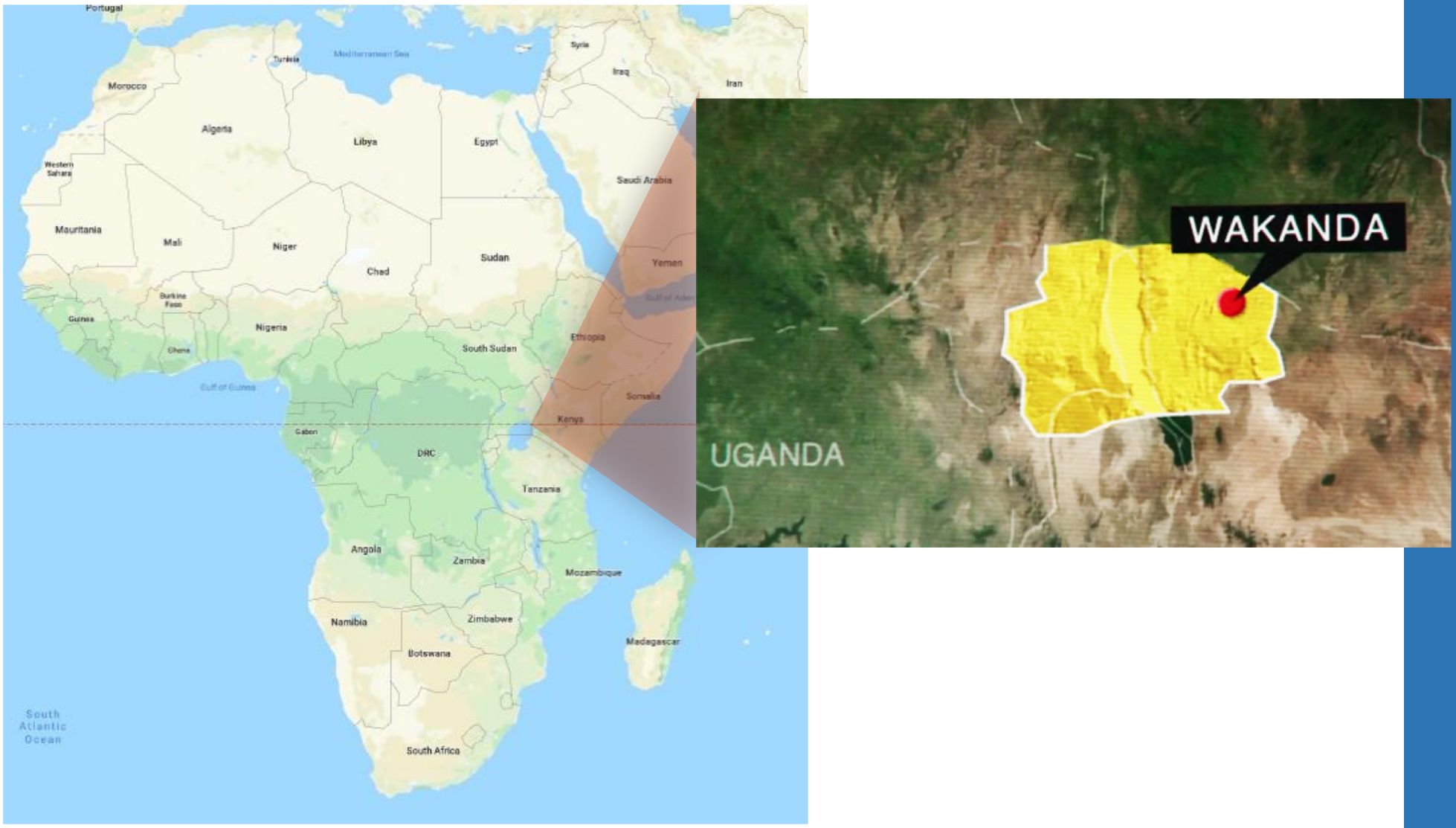
“Conflict Minerals” Module (Circuits)

- 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



Google Maps and Black Panther (2018)


CHADWICK BOSEMAN
MICHAEL B. JORDAN
LUPITA NYONG'O
DANAI GURIRA
MARTIN FREEMAN
ANGELA WITH BASSETT
FORREST WITH WHITAKER
ANDY AND SERKIS
MARVEL STUDIOS
BLACK PANTHER
IN CINEMAS FEBRUARY 2018
IN 3D, REAL D 3D AND IMAX 3D
FROM THE STUDIOS THAT BROUGHT YOU "THE AVENGERS"
MarvelUK #BlackPanther

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?

ABET

- Solution: Make it as easy as possible. Provide resources!

University of San Diego

UNIVERSITY OF MICHIGAN

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

University of San Diego

Small course at small private institution

Susan Lord USD

Large course at large public institution

Cindy Finelli UM

UNIVERSITY OF MICHIGAN

Large course at large public institution

Others at UM

Multiple courses at diverse institutions

Student Retention-
First Year Advising Program

April 15, 2024

First Year Advising Program

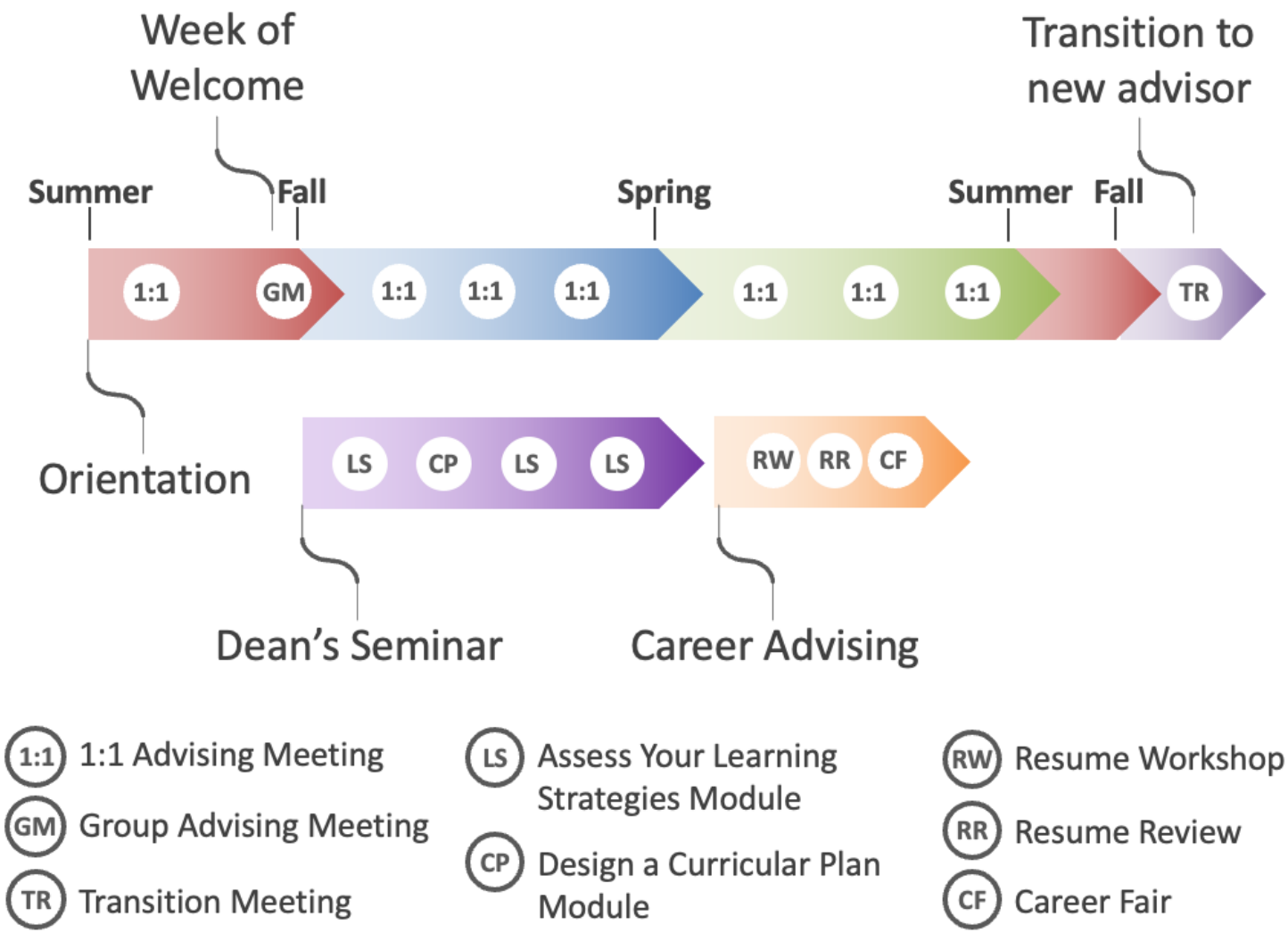
Aims

- 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



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

	Cohort 1	Cohort 2	Cohort 3
Entry Year	AY 21-22	AY 22-23	AY 23-24
Class Standing	Juniors	Sophomores	First-Years
Class size	107	134	109
Ave % Meeting Participation	82%	77%	-
Persistence (to second year)	83%	92%	-
Year 1 GPA	2.89	3.04	-
Resume completion	91%	81%	-
Major Alignment	69%	90%	-

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

Fall 21
- First Year Advising Program began
- Academic Coaches introduced

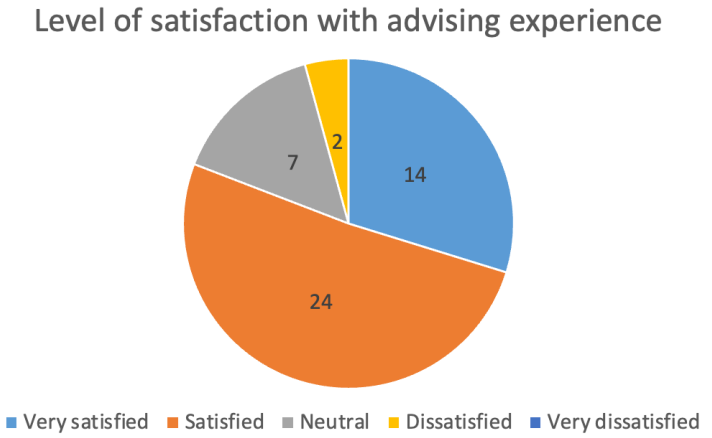
Fall 22
- 52-week retention calendar
- Early Grade (at week 5) – reach outs by faculty advisors and academic coach to students with D and F
- Persistence Team – Academic and Student Life

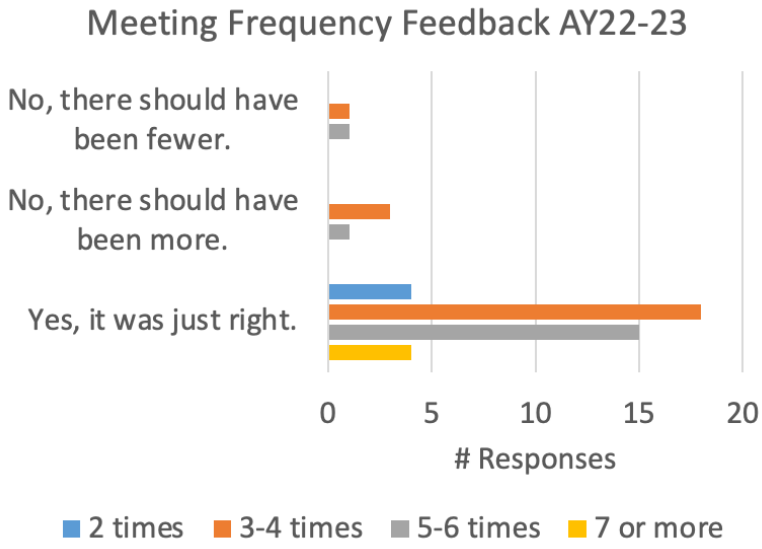
Spring 23
- Advise CRM launch

Fall 23
- Student Outreach Dashboards

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

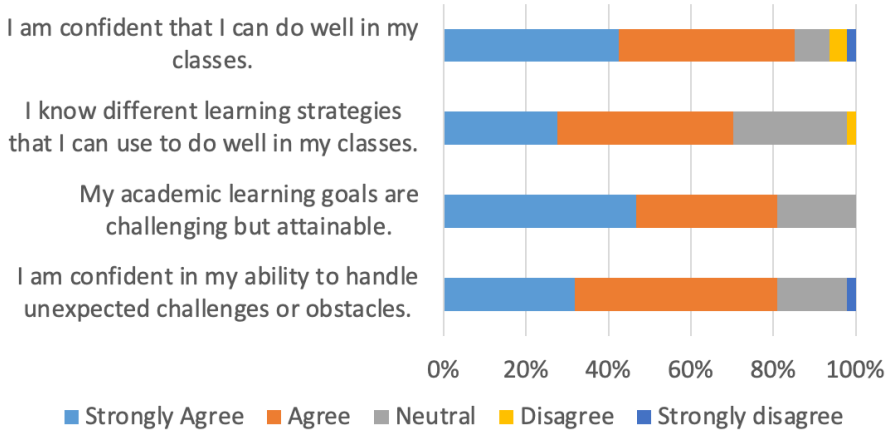




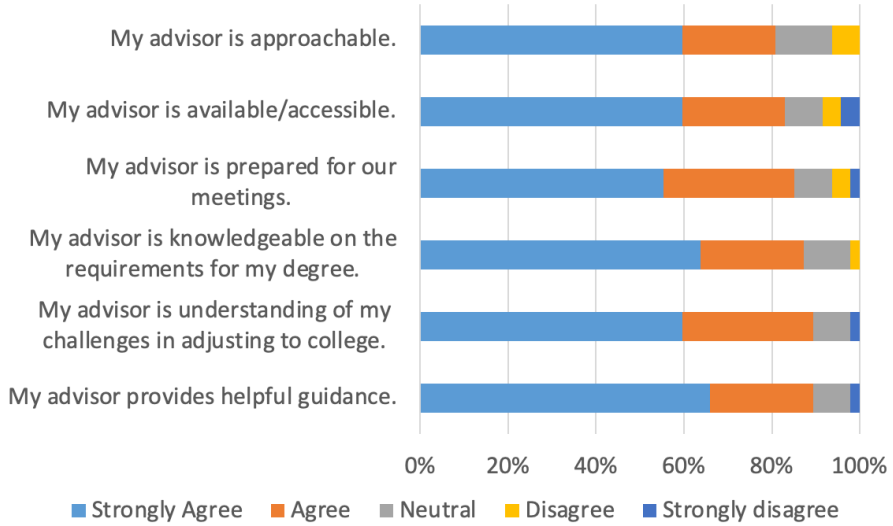
* Rovai et al. (2004)

Student Survey

- Academic confidence



- Feedback on Advisor



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***