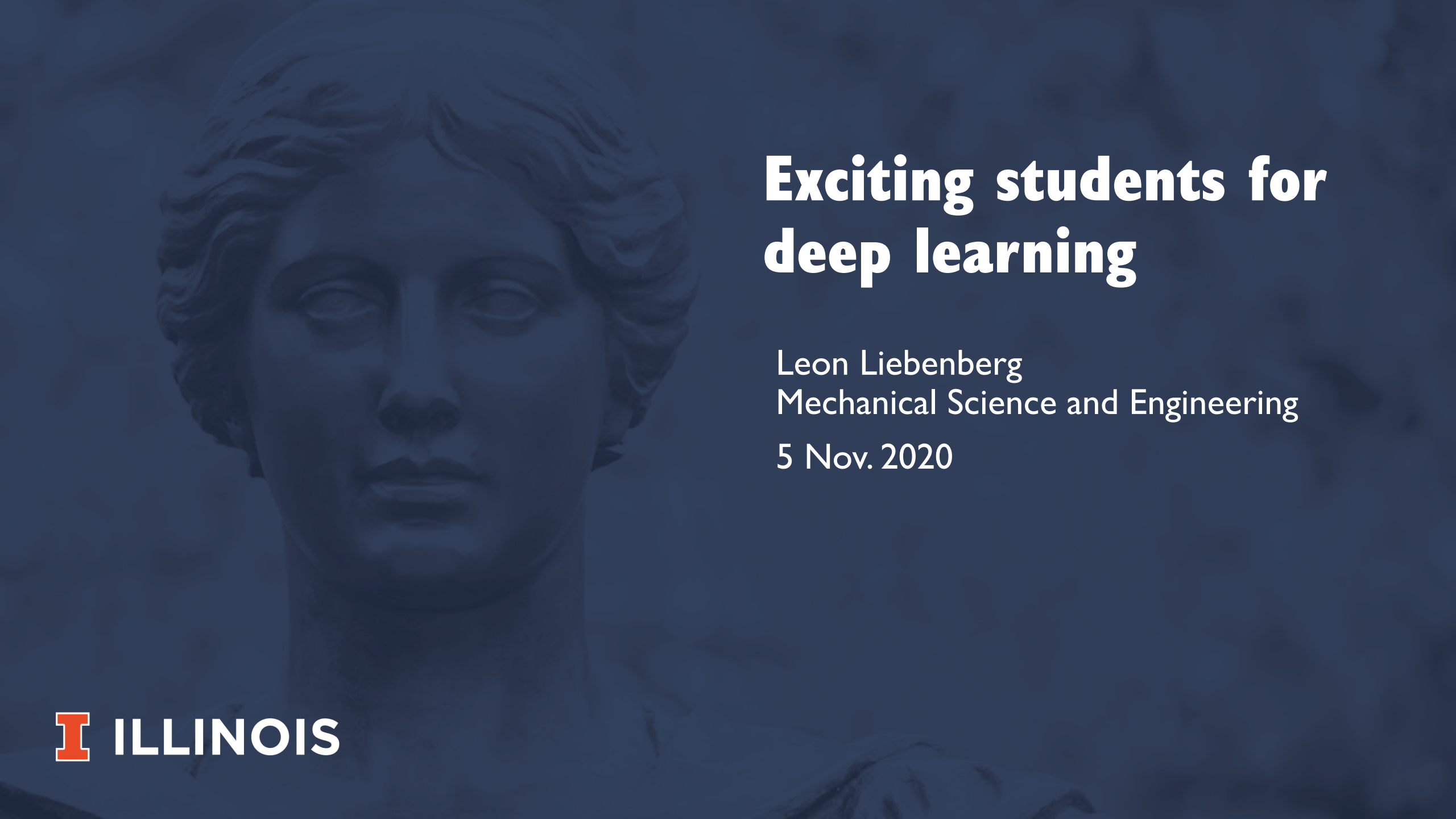


Exciting students for deep learning

Leon Liebenberg
Mechanical Science and Engineering

5 Nov. 2020

ILLINOIS

‘I did not realize that I took my routine and university day for granted until now.’

‘Difficult to work in the same environment all day.’

‘Online labs do not have the same impact as physical hands-on counterparts.’

‘Seeing friends was a key part of coming to class. I miss that.’

‘Sharing design ideas virtually is difficult.’

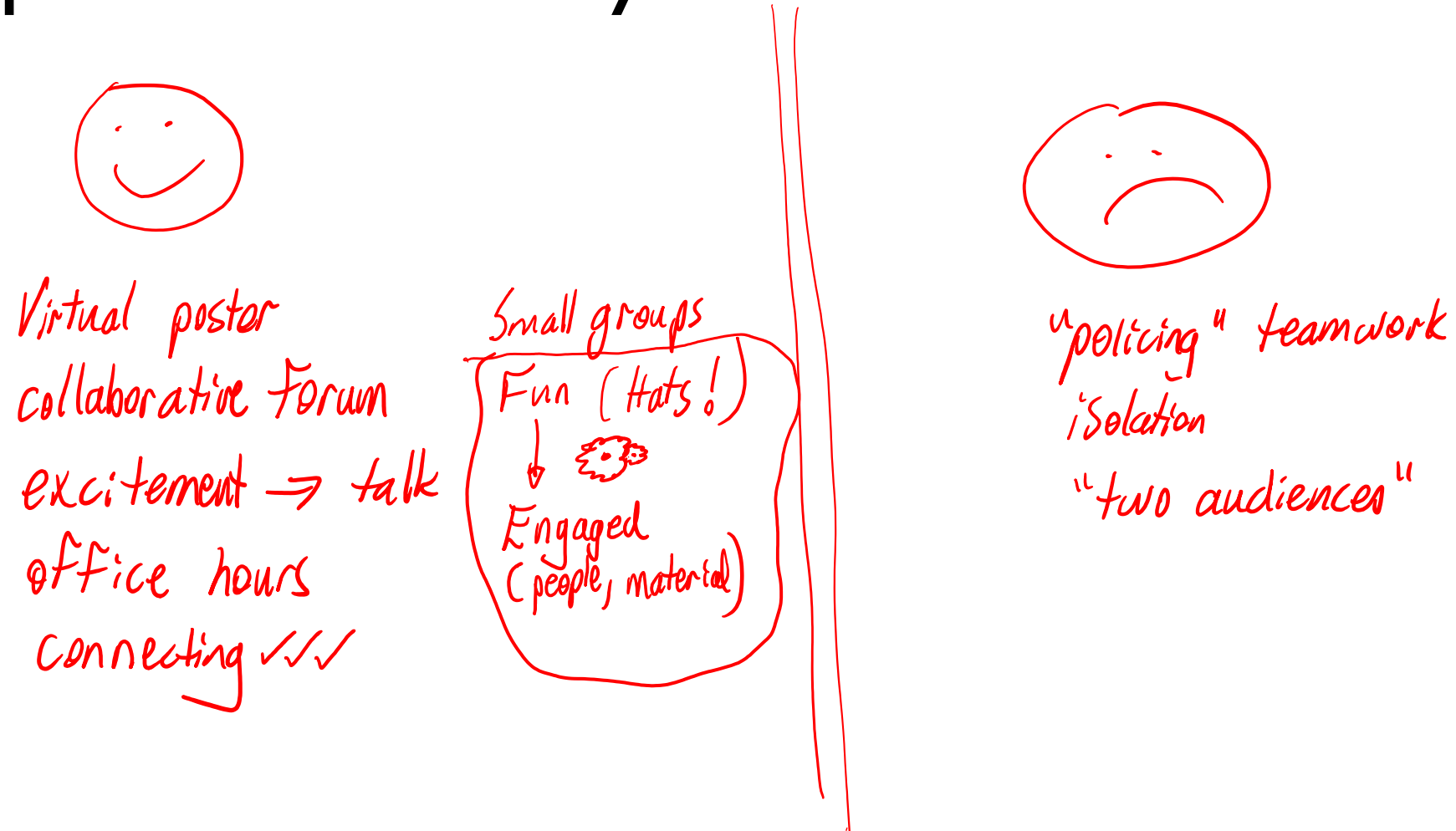
‘I am actually quite fond of it.’

Sophomore Matt Grendzinski working at home (April 2020), chatting with his ME 270 teammates. (Photo used with permission)

To succeed in online classes, students must take more responsibility for their learning.

Self-direction!

What positive and negative teaching experiences have you had?



Core of success in teaching:
Creation of enthusiasm about knowledge and learning

To get students excited to learn

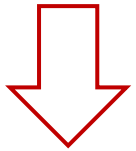
Reason does not get people to act.

Emotion is what causes people to act!

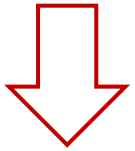
It is neurobiologically impossible to build memories, engage complex thoughts, or make meaningful decisions without **emotion**.
We only think deeply about things we **care** about.

- Antonio Damasio

I teach, by motivating



Students get motivated, and excited



They learn (by teaching themselves)

1. Make it Collaborative

Learning awakens a variety of internal developmental processes that can operate only when the student is interacting with people in her environment and in cooperation with peers.

– Lev Vygotsky

Sharing knowledge and perspectives

Teaching and motivating each other

Social recognition

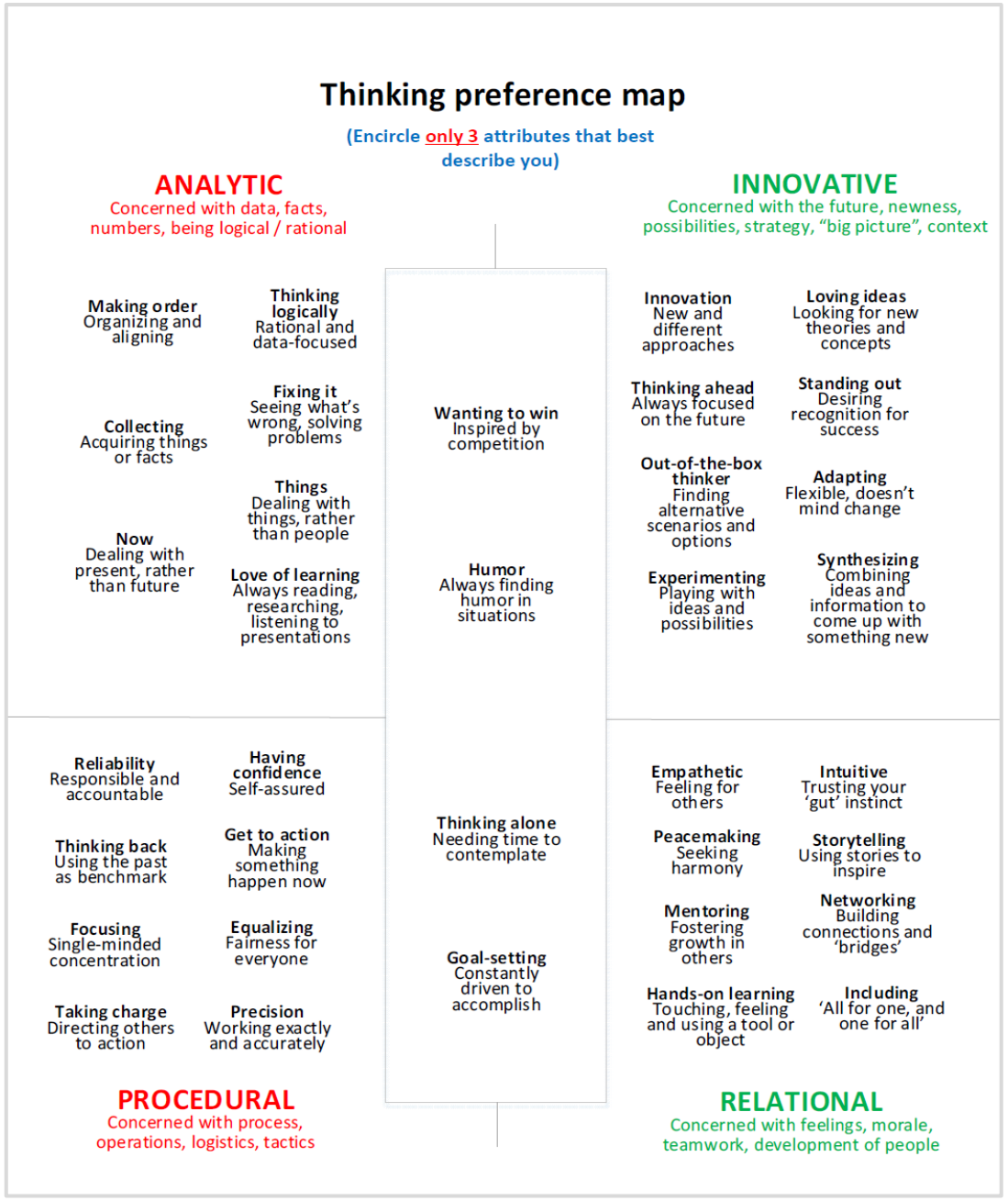
Relatedness

2. Mix them up

Diverse teams

Thinking preference questionnaire
& answering an open-ended question

Team contract helps



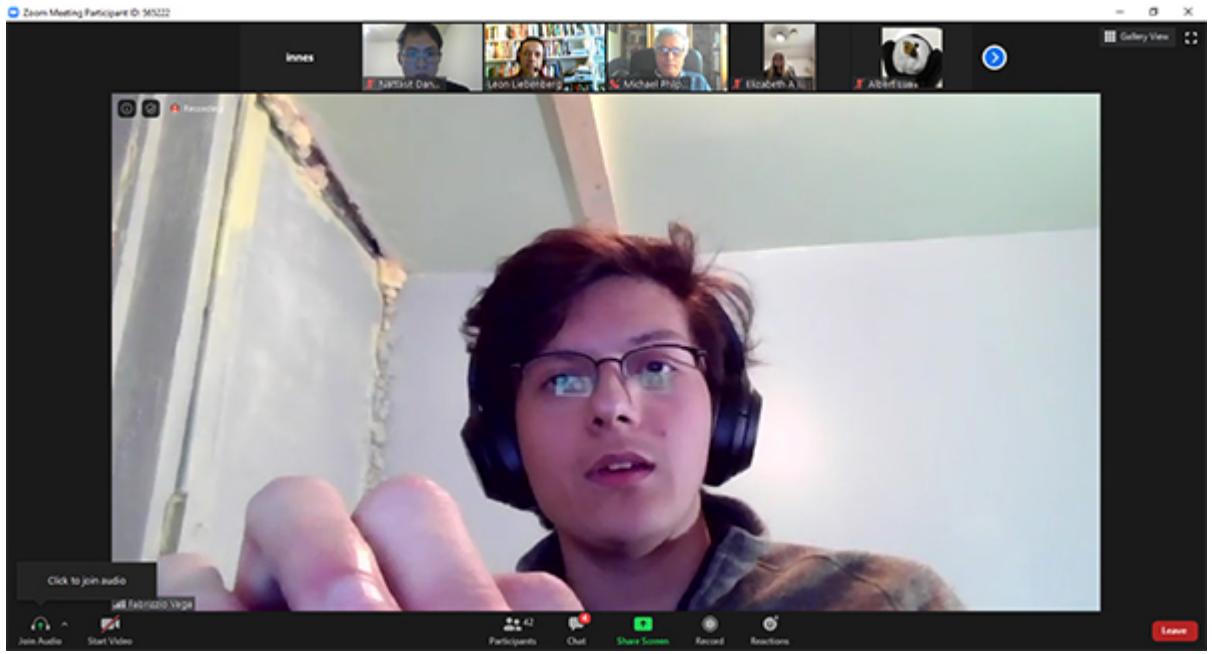
3. Make it Performative

Get students to introduce themselves via a 1-minute video.

Let students document their work with ePortfolios (Wix, Digication …)

- ✓ Communicate abstract concepts in simplified manner
- ✓ Brings students onto same page, organizes information, and presents it an efficient and accessible manner

https://psg203.wixsite.com/me270-petergutfeldt



Fabrizzio Vega (freshman) introducing himself to his ME 400 teammates. (Image used with permission)

4. Break syllabus into bite-size chunks

Several mini assignments, "Mini-Projects"

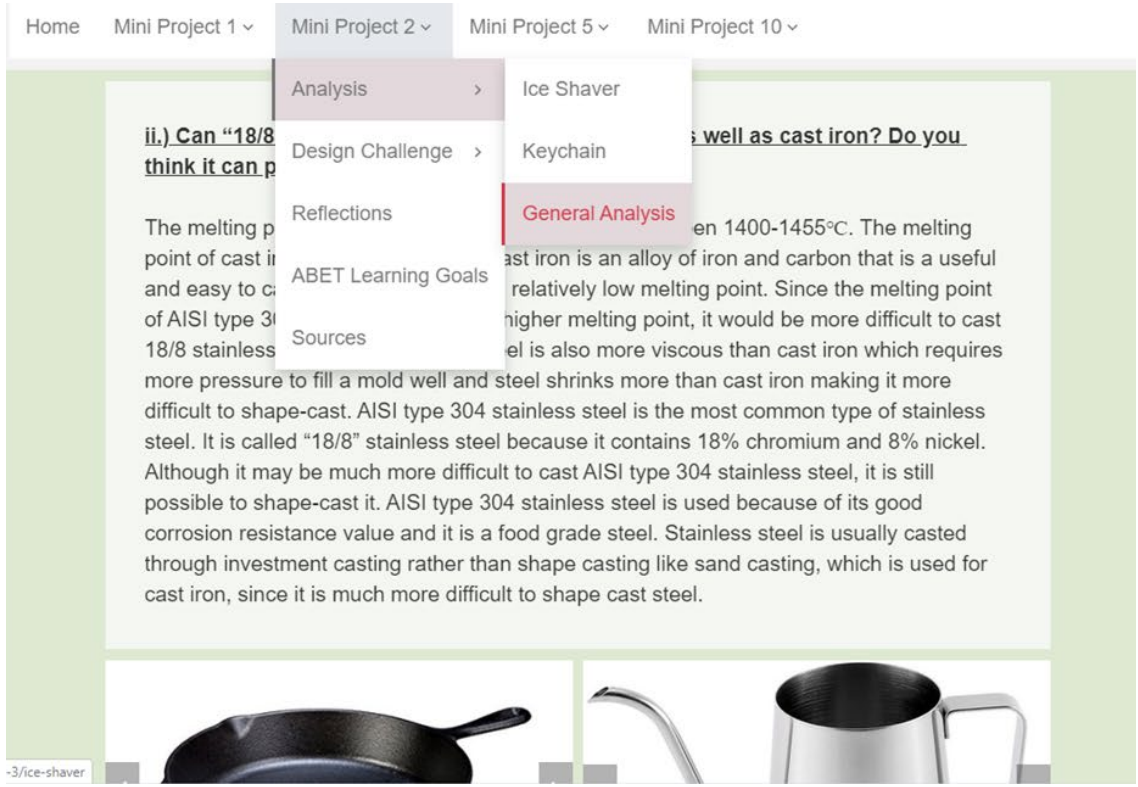
Cumulative (formative) assessment

Self-directed and Scaffolded

Team-based assignments; last one is solo

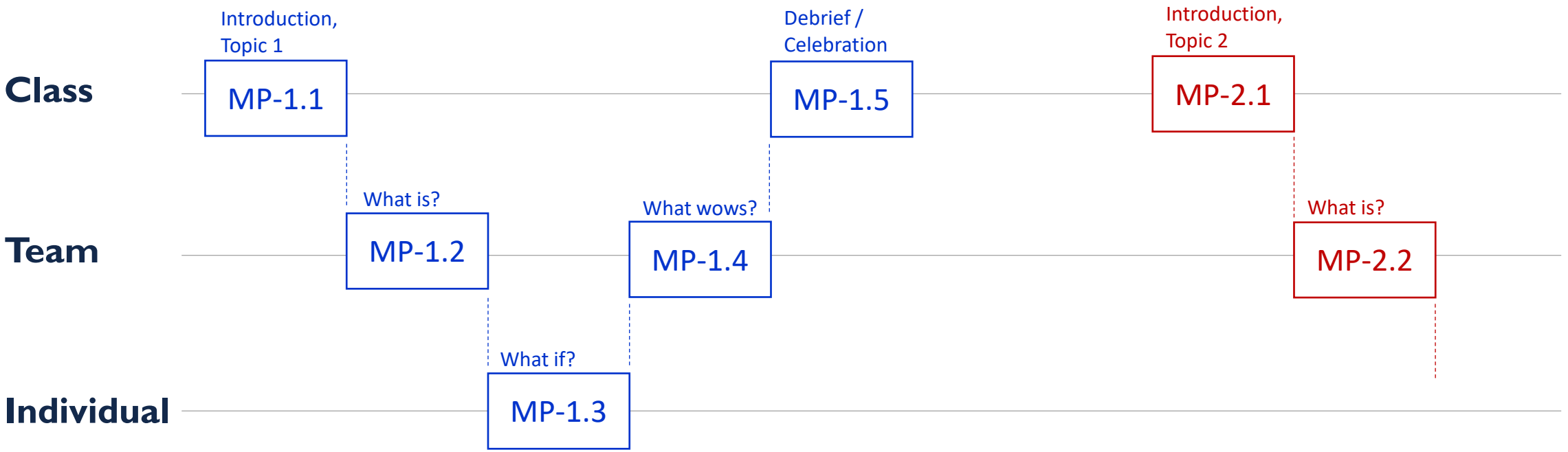
Every mini-project:

- ✓ Covers a core aspect of syllabus
- ✓ Analysis + Synthesis
- ✓ What is? What if? What wows?
- ✓ Disassemble discarded products
- ✓ Honor Code statement



Extract from a team-based ePortfolio of a series of 10 "mini-projects" in ME 270. (John, Shanay, David, Matt, and Francesco)

5. It takes a lot of preparation



Typical sequence of mini-project activities

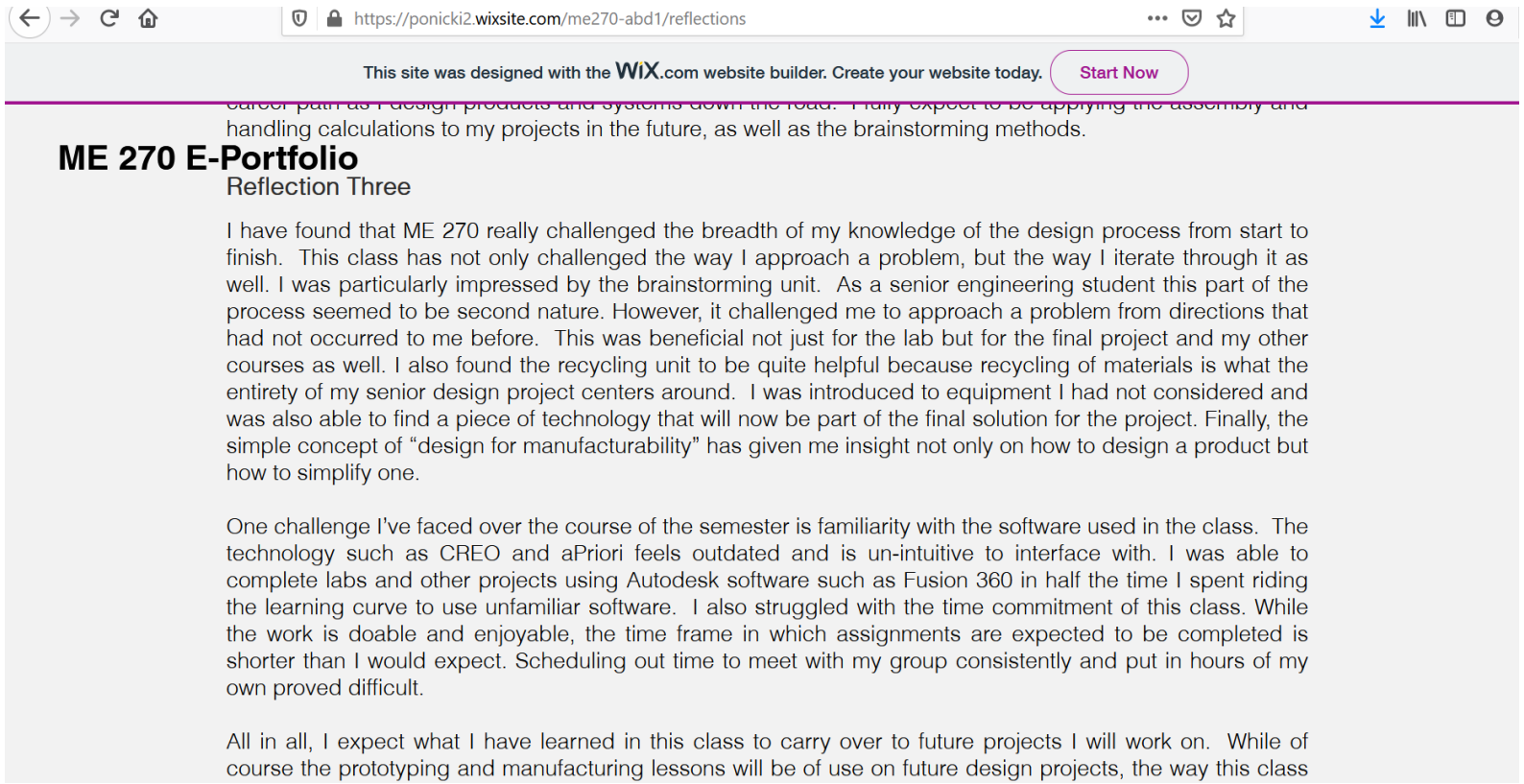
6. (Guided) Self-directed learning

Open-ended questions have tips

Required: Rigorous, independent research

Self-reflection on learning

'How to?' + "Why?" + "Value judgment"



7. Make it situated

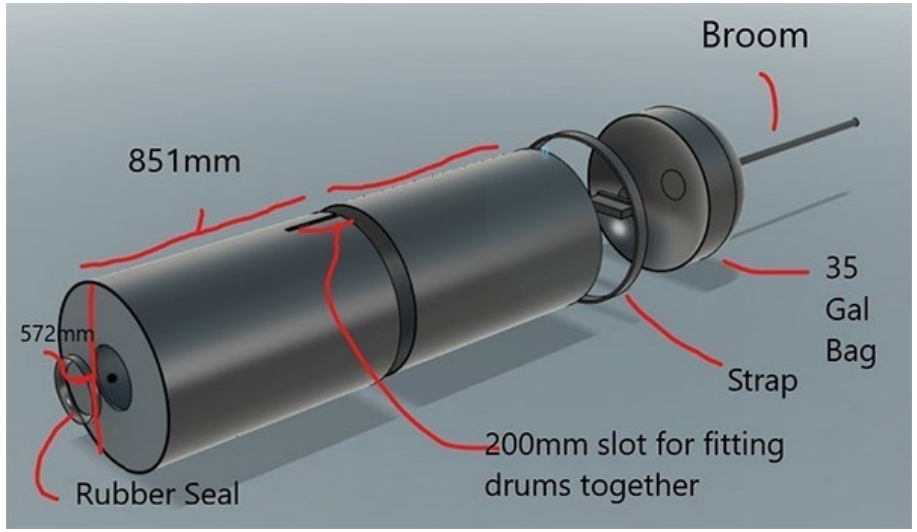
Establish a context that gives value to the necessary skills.

Adoption of contexts helps students to appreciate the immediate situation and underlying content.

"Real-world" challenges!

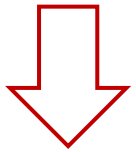
Discover the larger, interrelated system. Immersion!

https://maciekmbaran.wixsite.com/mbaran20/2-1-the-product

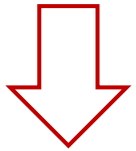


Spring 2020 individual mini-projects. ME 270 Students challenged to repurpose existing non-medical products for application in Covid-19 emergency scenarios

Learners not only need to learn but also need to know what they know



Self-confidence



Motivation

8. Virtual ideation

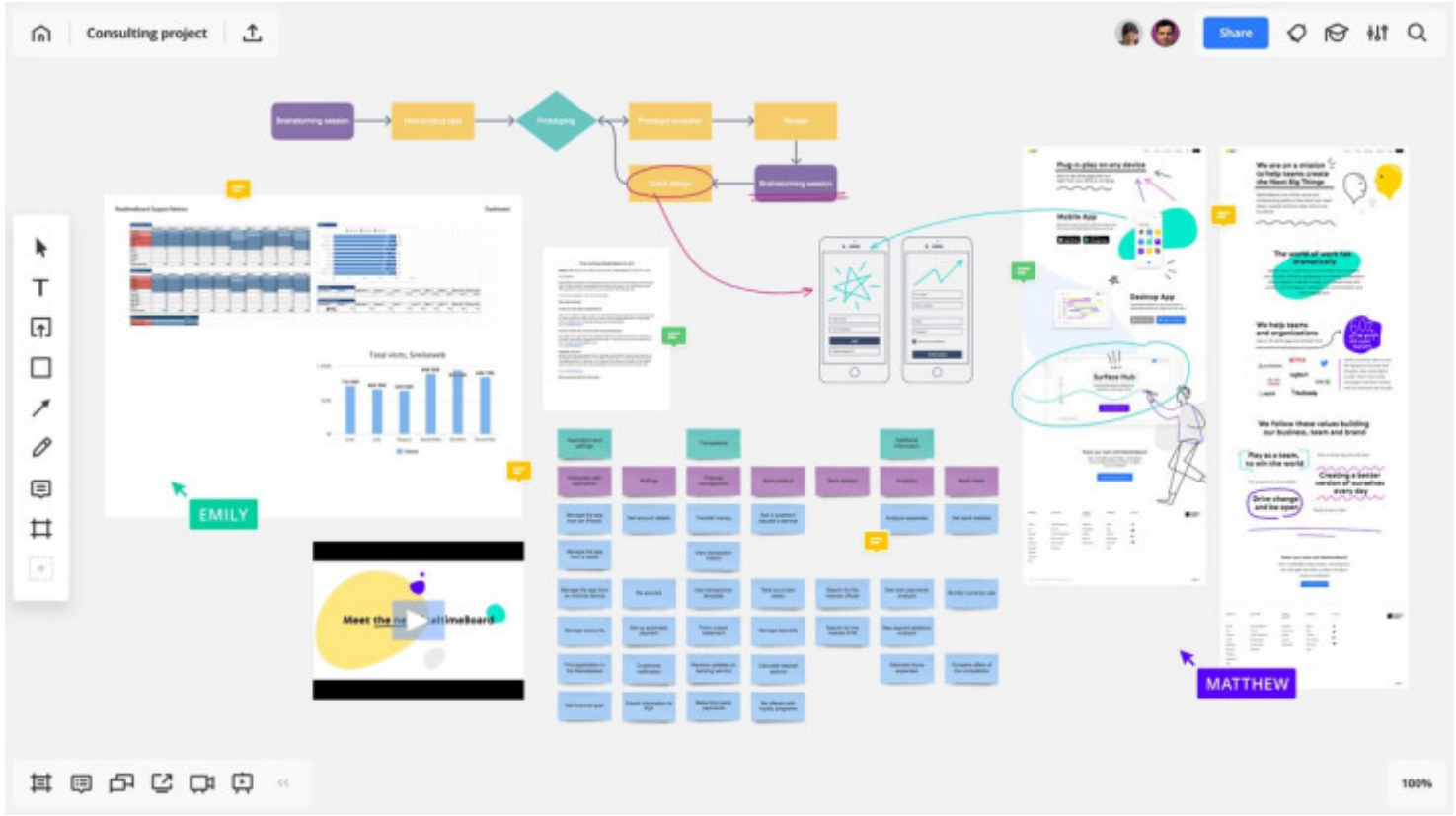
GroupMe, WeChat, Discord

Miro idea boards

Active participatory learning

Synchronous interaction

Captures essential elements of a face-to-face ideation environment



https://miro.com/app/board/o9J_kncIk9M=/

9. Make it Tangible

Students like stuff they can see and touch.

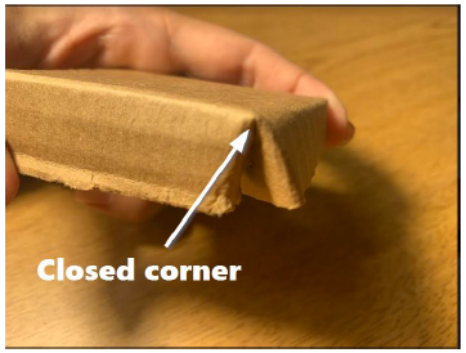
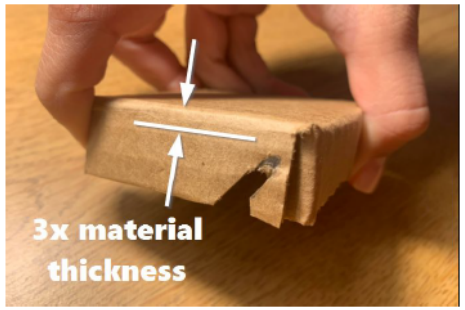
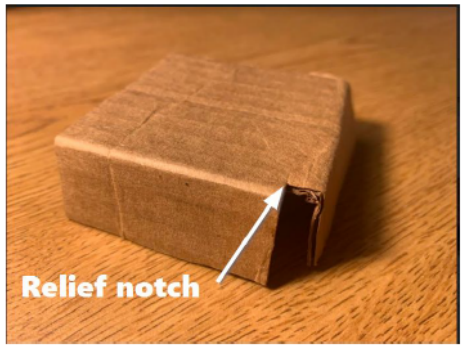
Ask students to disassemble products.

And to make low-fidelity prototypes.

Play with ideas!

Big payoff is not the stuff they build, but insights gained.

MP #3
Team AB9_1

		
Folding the cardboard caused the material to crumple, creating a deformation in the sheet, and the worst strain. This was the most difficult cardboard to fold and put together.	Folding this sheet still resulted in some crumpling (deformation) in the sheet, but the cut out reduced some of the strain.	Due to the relief notch, the sheet did not deform much, therefore there is less strain. This design was the easiest to form; as you can see in the picture, an extra hand was not needed.

10. Stay in touch

Talk to students in real time.

Empathize!

Adjust your expectations.

Our classroom "personality" affects the learning environment.

From:
Sent: Monday, September 14, 2020 10:40 AM
To: Liebenberg, Leon <leonl@illinois.edu>
Subject: Thank you

Good morning Professor Liebenberg,

Thank you for your understanding, encouragement, and feedback; it means a great deal to me. I am indeed doing better this week!

Sincerely,

From: Liebenberg, Leon <leonl@illinois.edu>
Sent: Sunday, September 13, 2020 3:51 PM
To:
Subject: How are you doing?

Dear

Thank you for your quiz. And for your superb work!
No problems regarding the lateness, and no apologies necessary.
Your problem-solving methodology is absolutely stunning, beyond being exemplary.

I am however concerned about the snow-ball effect due to your assignments being constantly late.

11. Activate peer learning

- ✓Get students to peer-grade each other's assignments *(Google Forms)*
- ✓Detailed grading rubric and grading key
- ✓Peer review promotes curiosity and critical evaluation of other approaches
- ✓Prompt response

ABG_2	AB1_1	4	The picture is not really clear because of the rack that is on top so it is hard to tell what the tray exactly looks like. Also there are more pictures	5	The descriptions are clear and covers all the criteria.	6	The worst and best material was switched around and the discussion of strain to failure percent difference was missing.	10	The graph was correct as well as the discussion was detailed.	10
Everything was answered correctly.	10	Everything was answered and detailed.	5	The process and answer was correct.	2	The answer was wrong and there were missing and wrong variables that were inputted.	10	The steps that were taken along with the answer is correct.	8		
Dashed lines were not used to notate bend lines and there were no slots for the sides to insert into.	10	Clear pictures along with clear notation met the criteria.	9	Some components were missing and the formatting was not compact however, it was a good project overall.	89						

12. Make it Fun

Discovery, re-inventing new perspectives, new solutions

Excite students with projects of their choice.

Use "playful" tools.

Stage a virtual class competition.

Student presentations (celebrations)

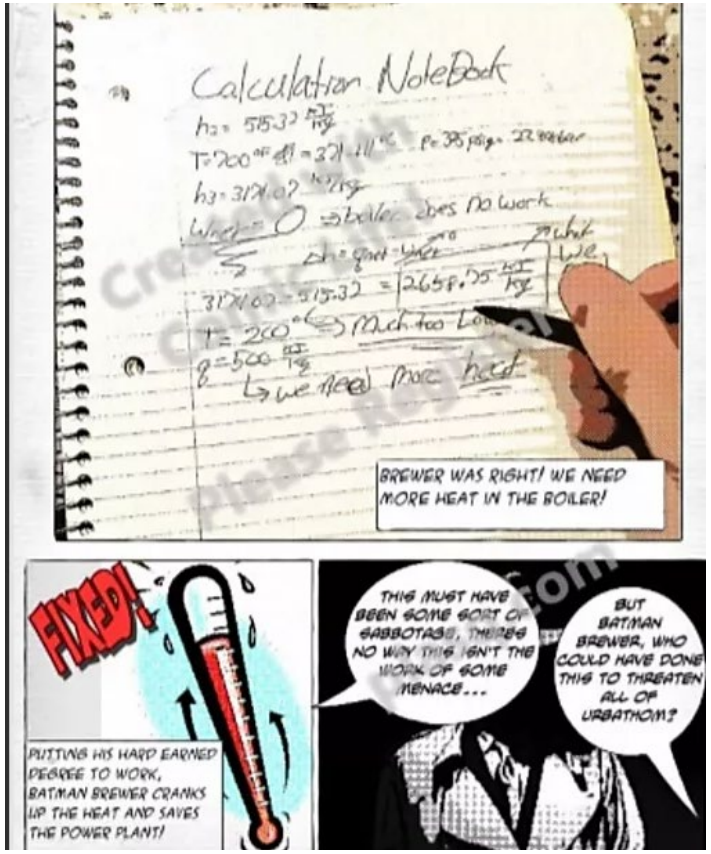
GOLD AWARDS

Mini Project 3

Team AB9_1: Alexis Larson, Madison Yang, Maritza Renteria, Alex Stevens

Team AB8_4: Adithya Ramakrishnan, Dean Wiersum, Frank Baez, Matthew Lotarski

Team ABG_2: Kang Yoon Lee, Yantong Lin, Yun Hui Phoon



https://kierann2.wixsite.com/website

https://averyrh2.wixsite.com/website

https://roundme.com/tour/373767/view/1278498/

https://me200group11.wixsite.com/website

Connections between the course material and students' lives outside of the course are one of the best available learning tools

Hailing the “whole”-student

COGNITION + EMOTION + ACTION (+ SPIRIT):

(Guided) Self-direction
Logic + Intuition / Imagination
Sense of control
Intrinsic motivation
Divergent (+ Convergent) thinking
Synthesis (+ Analysis)
Experiential (+ Abstract) learning
Immersion
Constant challenges
Reframe questions
New experiences from old circumstances
Clear + prompt feedback
Enjoyment
Excitement

Does this integrative pedagogy work?

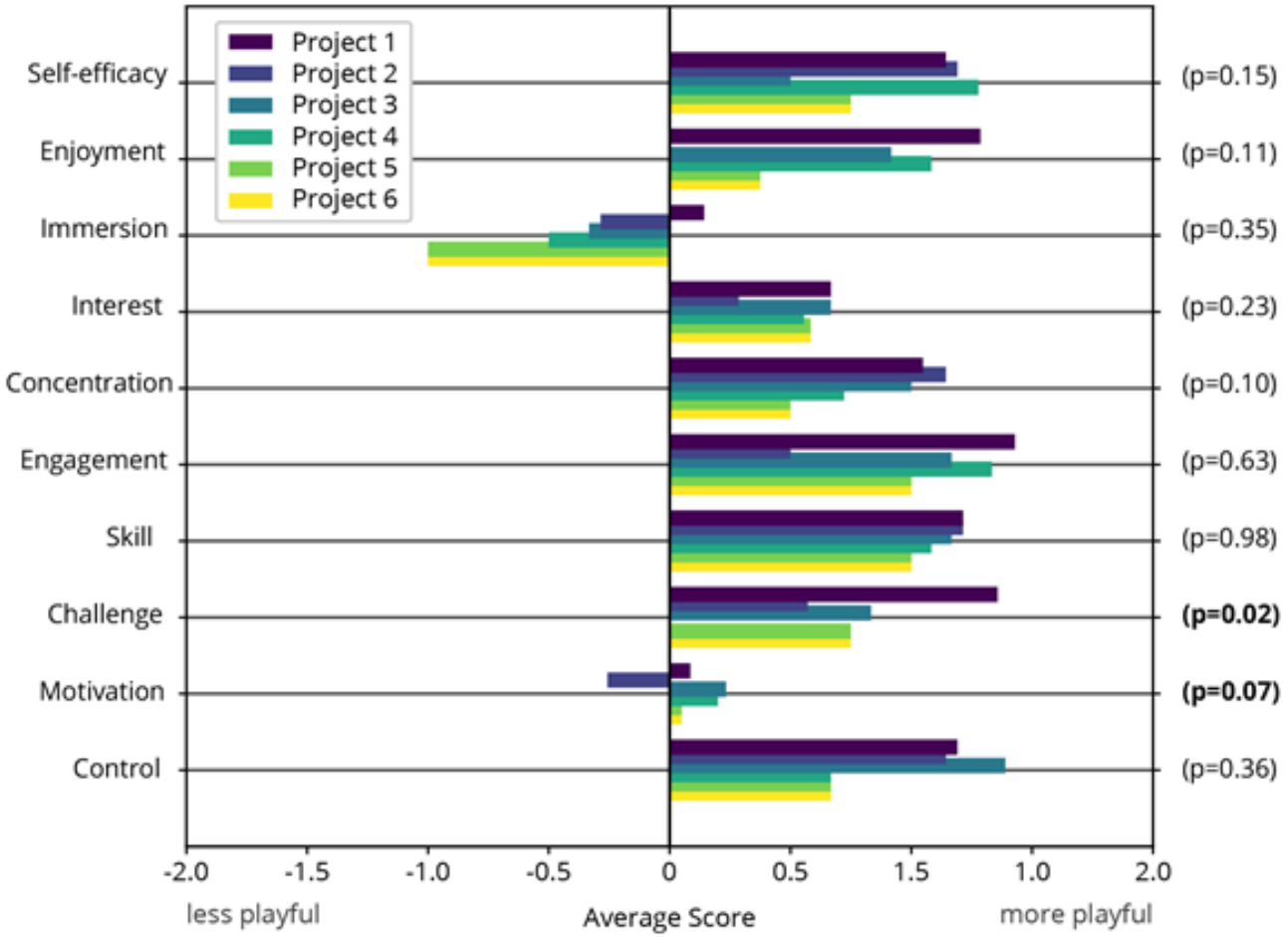
"Flow experience"

"Flow": Total involvement, focus

Challenge vs. Skill

A state of "flow" leads to greater interest and motivation to learn.

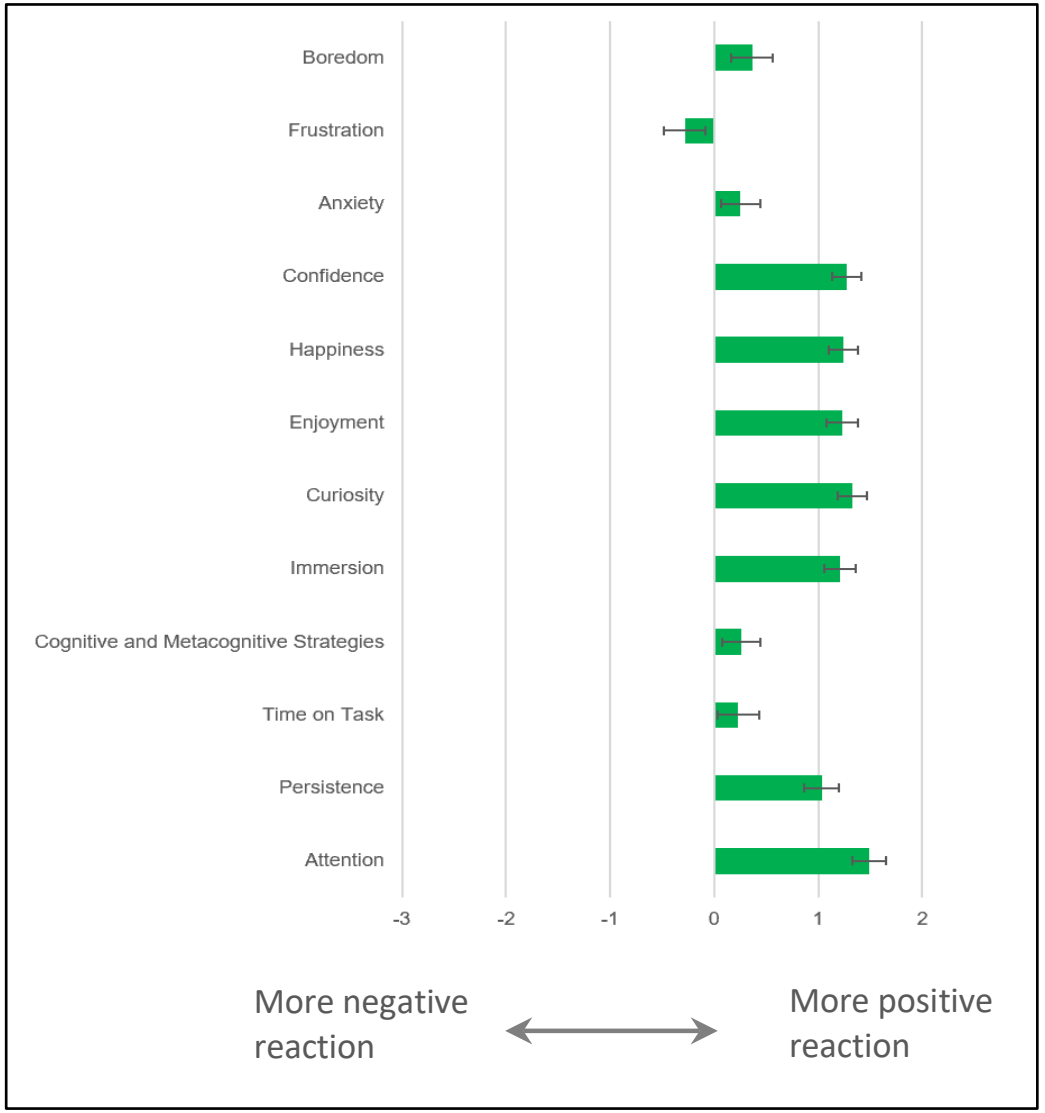
Does greater engagement due to "flow" (via mini-projects) lead to a more holistic learning experience?
(ME 200, Thermodynamics, Fall 2019)



Pagano A, Goldstein M, Liebenberg L.
Play-in-learning: studying the impact of emotion and cognition in undergraduate engineering learning.
American Society of Engineering Education, ASEE 2019, Tampa.

Cognitive and Emotional engagement

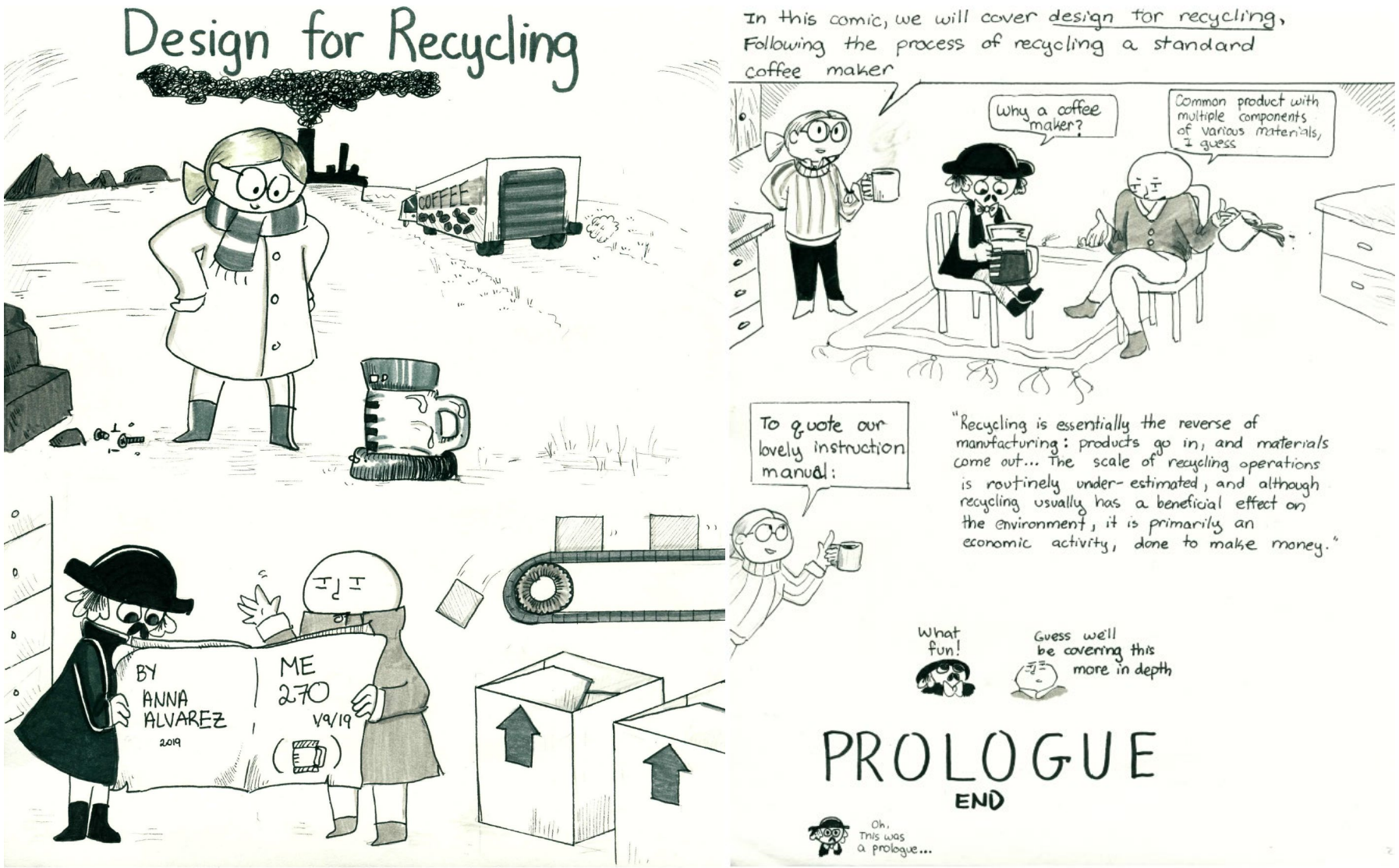
Measured students' cognitive *and* emotional engagement when subjected to mini-project & ePortfolio pedagogy (in ME 270)



Tucker A, Bo-Linn C, LaBore C, Wolf A, Baird R, Liebenberg L. "Transforming an Engineering Design Course into an Engaging Learning Experience using ePortfolios. *American Society of Engineering Education, ASEE 2020, online.*

Continued Learning

Independent study after completion of course



Re-imagining the future

Creative, committed online teaching can create deeper and richer learning experiences.

We should rethink and remake our educational practices.

Consider not only WHAT we have previously done but WHY we have done it and HOW it can be done better (for face-to-face *or* online learning)