



# Discovering Implications of the Academic Pathways Study for Your Campus

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## Center for the Advancement of Engineering Education (CAEE)

- Academic Pathways Study
- Studies of Engineering Educator Decisions
- Engineering Teaching Portfolio Program
- Institute for Scholarship on Engineering Education
  
- 7-year grant
- 100+ researchers at 16 institutions

**CAEE Leadership team:** Robin Adams, Cynthia Atman, Sheri Sheppard, Lorraine Fleming, Larry Leifer, Ronald Miller, Barbara Olds, Karl Smith, Reed Stevens, Ruth Streveler, Jennifer Turns



## Workshop outcomes

- By the end of this workshop, participants should be able to...
  - Articulate reasons why an emphasis on decision making is a promising way to study teaching.
  - Identify teaching decisions on a variety of levels.
  - Understand multiple findings resulting from the Academic Pathways Study.
  - Identify ways in which the APS findings can influence specific teaching decisions.

## Part 1: Teaching Decisions



## What comes to mind when you hear the phrase “teaching decision”?

### ■ Dissonance

- “So I’m not sure how to answer that.”
- “That’s a big, nebulous question.”

### ■ Resonance, but lots of decisions...

- “Well, I mean there is all kind of decisions on all kind of different levels.”
- “Well, there’s a tremendous number of decisions.”
- “I mean there’s just so many—everything is a—you know, is a decision.”

## What comes to mind when you hear the phrase “teaching decision”?

### ■ Rationale

- “Well, I’m trying to communicate to students in all classes that teaching and learning is not about regurgitation.”
- “I’m always motivated by what can be done the most efficiently.”

## What comes to mind when you hear the phrase “teaching decision”?

### ■ Distinguishing types

- “A couple of levels. There’s big-scale structural, what should the students be taking, and...the really microscopic of this student is giving this excuse... what do you do?”
- “Strategic decisions, so that’s the stuff you do before you actually teach the class...and the tactical decisions, where that’s in class or during the class as the course goes along.”

## What comes to mind when you hear the phrase “teaching decision”?

### ■ Specific decisions

- Getting students into teams
- Which classes to teach
- Adding writing assignments to promote better discussions
- Creating a plagiarism policy
- Choosing a textbook
- When to assign exams
- Whether to skip a topic in real time...

## General Insights

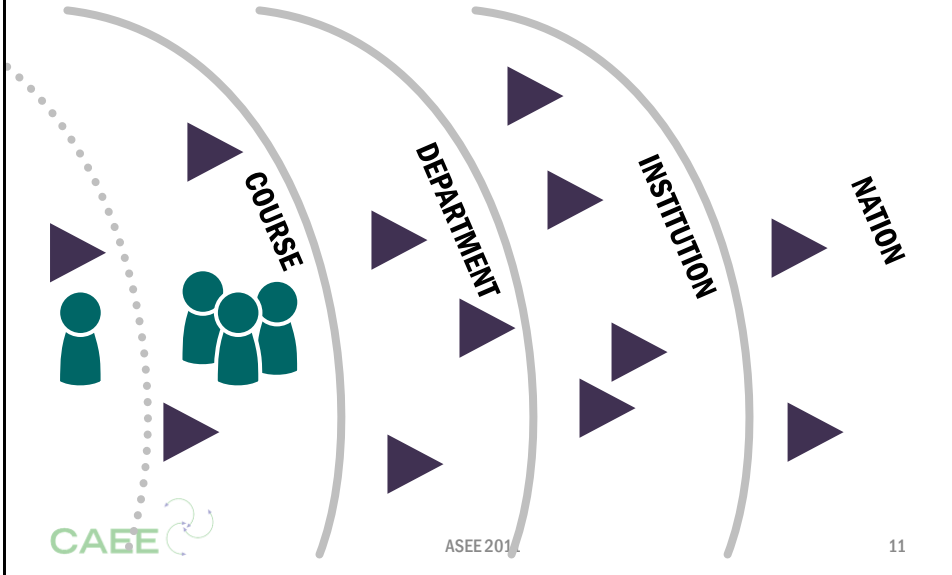
- Decision making was comfortable lens for most (but not all) participants.
- Asking about decisions is a good way to generate “talk” about teaching.
- Upcoming
  - Talk about our study to motivate and orient decision emphasis.
  - Ask you to identify a decision, then find a group of peers.

## Teaching decisions



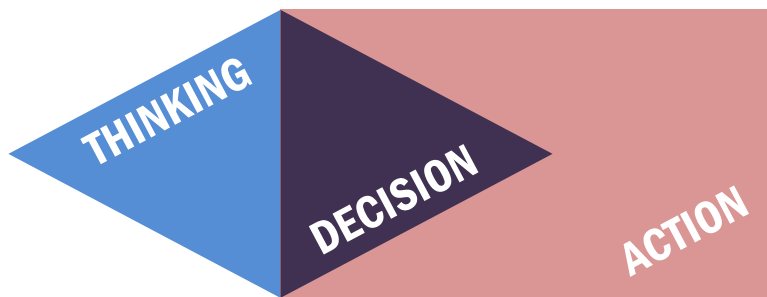
- Decision as a commitment to action

## Teaching decisions at various levels



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## Why focus on teaching decisions



Teaching decisions as commitments to action, *i.e.*, where thinking is translated into action

## Studies of Engineering Educator Decisions (SEED)

### ■ Approach

- Critical decision method interview: A planning and an interactive decision; also demographics, teaching history, process for making decisions
- 31 participants, all ranks, 9 of 10 departments, volunteer
- One-hour interviews

## General findings

- All but one educator responded by talking about decisions.
- References to time were pervasive.
- Few information sources were mentioned.
- Faculty talked about engaging in *some* teaching practices that are theoretically linked to motivation.

## How do the educators take learners into account in their teaching decisions?

- Why: Being “learner-centered” is a best practice, yet has divergent meanings
  - From *How People Learn*: Effective learning environments are learner-centered...
  - From research on teaching conceptions: More effective teachers have “learner-centered” rather than “instructor-centered” conceptions.
- Can we explore learner-centeredness with our data?

## Differentiating based on learner characteristics

- Knowledge (18 of 31)
  - Behavior (29 of 31)
  - Educational classifications (22 of 31)
  - Social classifications (14 of 31)
- ➔ Faculty in this sample were taking learners into account. How can we help with a next step?...

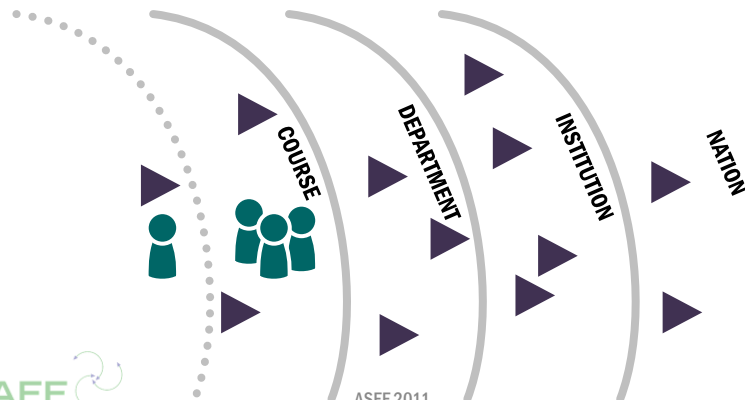


## Challenges in learner-centered decision-making

- Learner information is only one type of information.
- Limited time to get to know students
- ...
- What can faculty know about students?

## Your teaching decisions

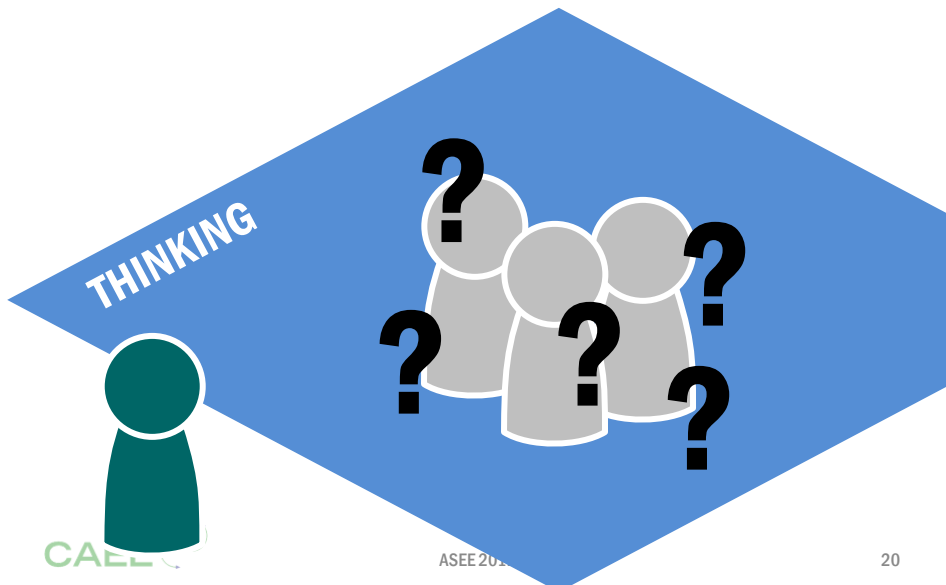
- Write down a teaching-related decision that you have made recently or will make soon.



## Your teaching decisions

- Level: Course
  - ...
- Level: Department
  - ...
- Level: Institution
  - ...
- Level: Nation
  - ...

## What can we know about students?



## Part 2: Academic Pathways Study

### Academic Pathways Study (APS)

- **APS lead:** Sheri Sheppard
- **APS team:** Cynthia Atman, Lorraine Fleming, Ronald Miller, Karl Smith, Reed Stevens, Ruth Streveler

## APS research methods & samples

### **N** NSSE national sample (2002, 2006–2007)

- National Survey of Student Engagement
- $N = 11,819$ ; matched pairs (first-year and senior) from 247 institutions

### **L** Longitudinal cohort (2003–2007)

- Surveys, structured interviews, ethnographic interviews and observations, engineering design tasks
- $N \approx 160$ ,\* from four campuses

### **B** Broad national sample (Spring 2008)

- APPLES2 survey
- $N = 4,266$ ,\* cross-sectional sample from 21 engineering colleges

### **W** Workplace cohort (2007–2008)

- Interviews
- $N = 101$ , early-career engineers at a range of private and public organizations

\*Oversampled for underrepresented groups

## Selected APS findings

- 1. Enriching educational experiences  
(Gary Lichtenstein)
- 2. Student-faculty interactions and student motivation  
(Holly Matusovich)
- 3. Workplace supports and barriers  
(Sam Brunhaver and Russ Korte)

# 1. Enriching educational experiences

Lichtenstein, McCormick, Sheppard, & Puma

## ■ Research question:

How do engineering majors compare to students in other majors in terms of their participation in enriching educational experiences?

- Lichtenstein, G., McCormick, A., Sheppard, S. D., & Puma, J. (2010). Comparing the undergraduate experience of engineers to all other majors: Significant differences are programmatic. *Journal of Engineering Education*, 99(4).

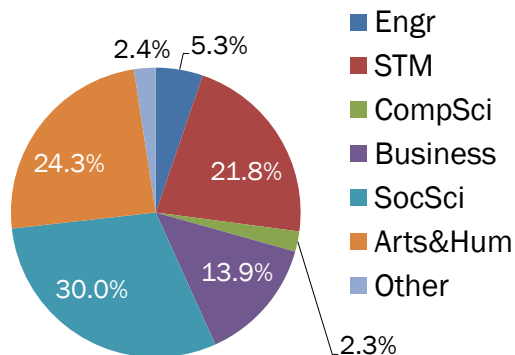


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## NSSE data

- ▶ National Survey of Student Engagement
- ▶ 11,819 students at 247 U.S. colleges and universities
- ▶ Broad range of majors, including engineering
- ▶ Students took NSSE in their first year and again in their senior year.



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## Enriching educational experiences

	Engr	STM	Comp Sci	Bus	Soc Sci	Arts & Hum	Other
Culminating senior experience (e.g., capstone, thesis)***	95%						71%
Practicum, co-op, field experience**	86%					75%	87%
Foreign language coursework***	34%					77%	
Study abroad***	22%					51%	
Independent study or self-designed major***	23%			20%		37%	
Research w/ faculty***	39%	52%		28%			
Participate in a learning community***	29%		21%				39%
Community service or volunteer work*	81%		67%		88%		



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## Finding: Less participation

### ■ Research question:

How do engineering majors compare to students in other majors in terms of their participation in enriching educational experiences?

### ■ Answer:

Engineering majors report *less* participation in enriching educational experiences than do students in other majors.



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## Engineering trade-off?

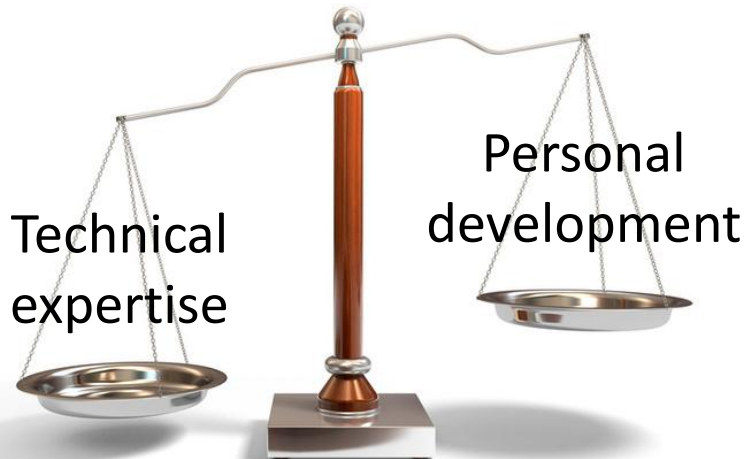


Photo credit: Flickr user winnifredoxo

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## 2. Student-faculty interactions and student motivation

Winters, Matusovich, & Streveler

### ■ Self-Determination Theory (SDT)

- People have three basic needs
  - Autonomy: a sense of control or agency
  - Competence: mastery
  - Relatedness: belonging to a group
- Satisfying these needs leads to greater motivation and psychological health.

### ■ 43 interviews with with 11 students at TPub

## Faculty interactions and student motivation

- Feelings of autonomy-support decrease
- Little competence support
- Generally feel related to faculty

*Some of the teachers are just, here's the material, you should understand it. So you ask questions, you know like, I wouldn't even try to ask questions because I'd be afraid... (Leslie, Senior)*

## 3. Workplace supports and barriers

Brunhaver, Korte, Sheppard

- Interviewed 60 engineering graduates
  - In their 1<sup>st</sup> or 2<sup>nd</sup> year of an engineering job
  - Dispersed across four companies



## Manager and coworker support

- Support from managers and coworkers is very important and can vary greatly.
  - Coworkers were the most significant source of information about work tasks and group culture.
  - Some managers and coworkers provided a lot of assistance, while others provided little.

*My manager wasn't there to greet me, or nobody was there to be like, "Hey, welcome aboard"... He's [manager] busy as hell, and he's never at his desk.*

## A need for more support

- Company on-boarding and training efforts can be insufficient.
  - New hires had difficulty understanding what their role was in the company.
  - New hires also wanted to know more about "the big picture."

*I wanted always more overview, more overview. Tell me about how the whole company process and procedures work... I was getting into too much depth of information on specifics without getting an overview.*

# Part 3: Linking Findings to Decisions

## Individual-level decisions

- **DECISION:** Leveraging student expertise for mutual (peer) support, e.g., w.r.t. competence, relatedness, accounting for relative lack of enriching experiences (vicariously?), in seeking resources
- **FINDING(S):**
- **DECISION:** How we get students to talk to each other, share experiences

## Course-level decisions

- **DECISION:** Providing students opportunities to develop competencies...via exercises in class? How to address Grand Challenges (NAE), even in a first-year course? Leads to curricular-level decisions, coordinating classes, faculty...
- **FINDING(S):** Autonomy, competency, relatedness
- **DECISION:** Choice of pedagogical technique, current materials (textbooks, supplements), assessment approaches
- **FINDING(S):** Workplace entry findings (seeking help, big picture), SDT needs

## (More) course-level decisions

- **DECISION:** Acknowledging, celebrating successes
- **DECISION:** Classroom mgt decisions to prepare for real-world challenges
- **DECISION:** Providing opportunities to work independently (experiences with more autonomy), e.g., independent study
- **FINDING(S):** Workplace findings, need for and preparation for autonomy

## Institution-level decisions

- **DECISION:** How to support faculty (via structures...), finding out what students seek in their educational experiences, adapting to better meet them
- **FINDING(S):** Missing enriching experiences
- **DECISION:** Scaffolding via PBL, etc., but minding the need to prepare faculty to do so

## National-level decisions

- **DECISION:** Balancing practical and abstract, theoretical training, given curricular pressure and emphasis on technical content.
- **FINDING(S):** SDT lens on workforce entry, development of confidence, mastery (lack thereof?)

# Wrap-up



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## CAEE resources

- CAEE final report ⇨
- Tools and curricula
  - Surveys, interviews
  - Portfolios, institutes
- Research briefs and publications
- All available at [www.engr.uw.edu/caee](http://www.engr.uw.edu/caee)



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