Discovering Implications of the Academic Pathways Study for Your Campus

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ASEE 2011

This material is based upon work supported by the National Science Foundation under Grant No. ESI-0227558. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation (NSF).

CAEE
RESEARCH · LEARNING · TEACHING · DIVERSITY · COMMUNITY
CENTER FOR THE ADVANCEMENT OF ENGINEERING EDUCATION

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

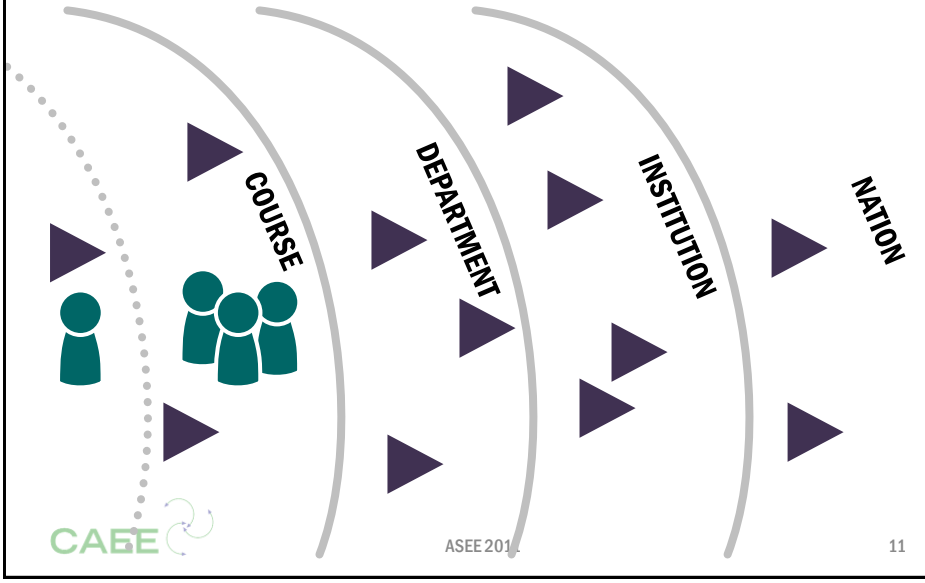
- Decision making was comfortable lens for most (but not all) participants.
- Asking about decisions is a good way to generate "talk" about teaching.

- Upcoming
  - Talk about our study to motivate and orient decision emphasis.
  - Ask you to identify a decision, then find a group of peers.

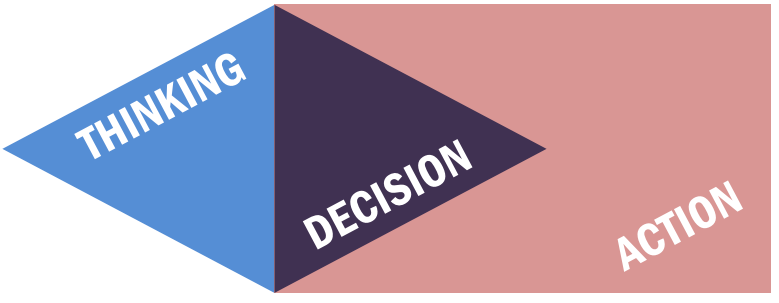
Teaching decisions

- Decision as a commitment to action

Teaching decisions at various levels



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)

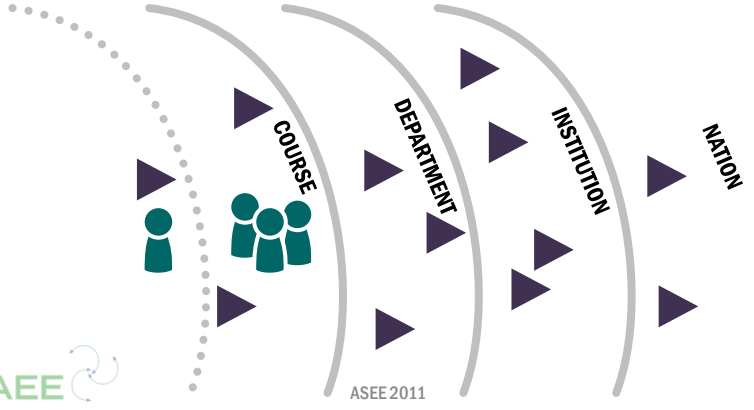
➡ Faculty in this sample *were* taking learners into account. How can we help with a next step?…

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

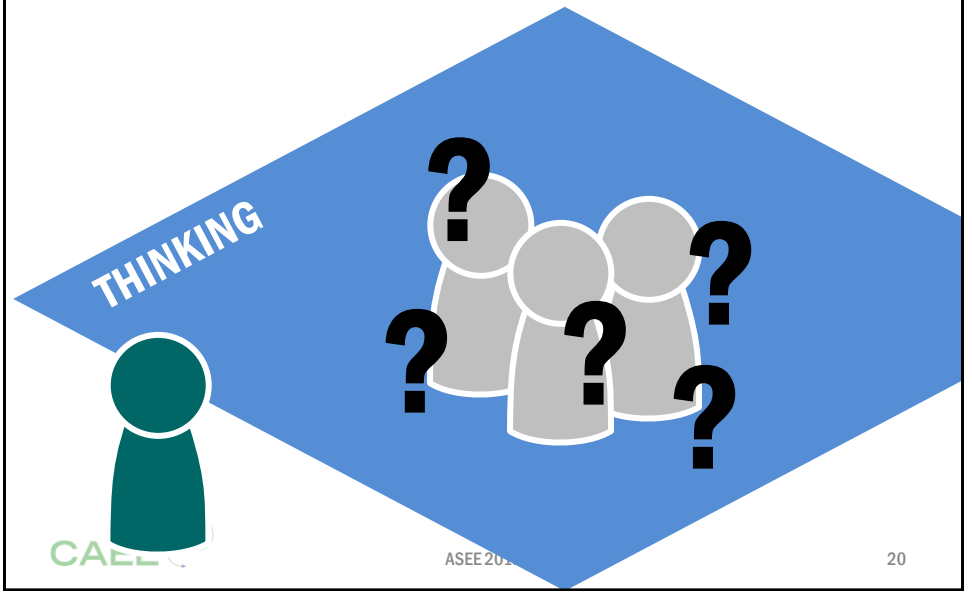
- Write down a teaching-related decision that you have made recently or will make soon.



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* ≈ 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)

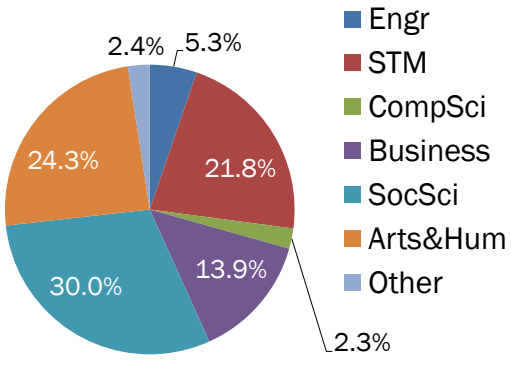
1. Enriching educational experiences
Lichtenstein, McCormick, Sheppard, & Puma

- **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).

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.



Enriching educational experiences

highest mean lowest mean

	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%		

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.

Engineering trade-off?

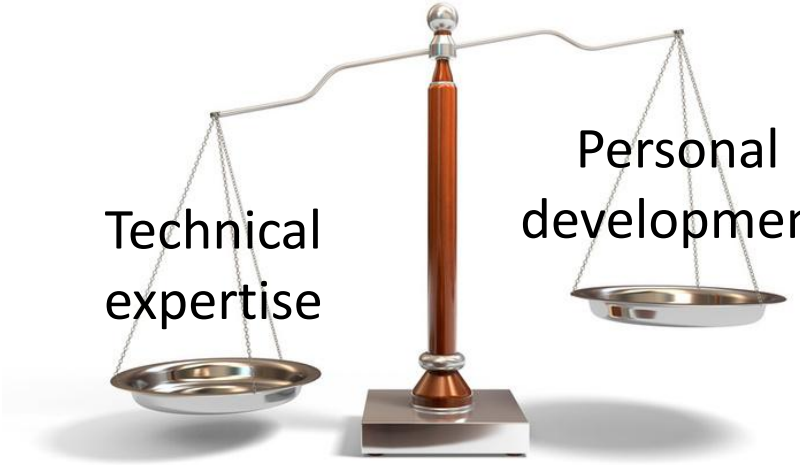


Photo credit: Flickr user winnifredxoxo

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 1st or 2nd 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

CAEE resources

- CAEE final report ⇨
- Tools and curricula
  - Surveys, interviews
  - Portfolios, institutes
- Research briefs and publications
- All available at **www.engr.uw.edu/caee**