



Engineering Faculty Experience During Emergency Remote Teaching: A Case Study

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BACKGROUND

Pre-COVID State of Engineering Teaching and Learning

- Engineering courses are difficult to deliver remotely due to hands-on nature of material
- Benefits of remote engineering courses:
 - Financial
 - Accessibility
 - Flexibility
- Current obstacles are course quality and breadth
 - Stereotype of online courses being "easier"
 - Narrow offerings of courses

Emergency Remote Teaching (ERT)

- Rapid transition in course delivery mode due to a crisis
- Differs from traditional online instruction
 - Preparation time
 - Available resources
 - Desire to use format

Adaptability as a Framework

- Ability to regulate psycho-behavioral functions in uncertain situations (Martin et al., 2012)
- Cognitive, emotional, and behavioral domains
- Traditionally used in K-12 education settings

RESEARCH QUESTIONS

The purpose of this case study is to examine how engineering faculty adapted to ERT over the course of three semesters. There are three research questions that guide this study:

1. How did successes and challenges that one faculty member faced change over the course of remote instruction?
2. How did the challenges that one faculty member faced during ERT impact their behaviors?
3. How did one faculty member's behavioral adaptability lead to teaching successes during ERT?

METHODS

Setting and Participants

- Engineering faculty at R1 university in Midwestern U.S.

Data Collection

- Data collected across Spring 2020, Fall 2020, Spring 2021 semesters
 - Surveys (7-8 per semester; 23 total)
 - Interviews (3 per semester; 9 total)
- Case study subject was chosen based on full participation in data collection across all data collection semesters

Data Analysis

- Deductively coded for behavioral regulation, teaching successes, and teaching challenges (Table 2)
- Built narrative maps based on faculty experience (Figure 1)

RESULTS

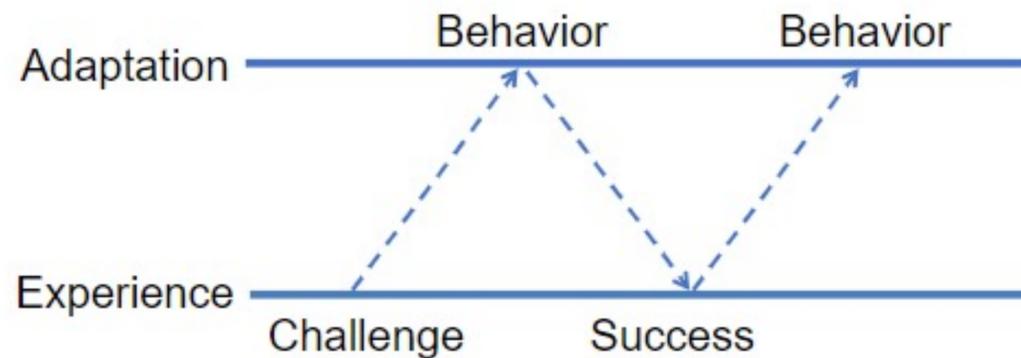


Figure 1: Example Narrative Mapping Framework

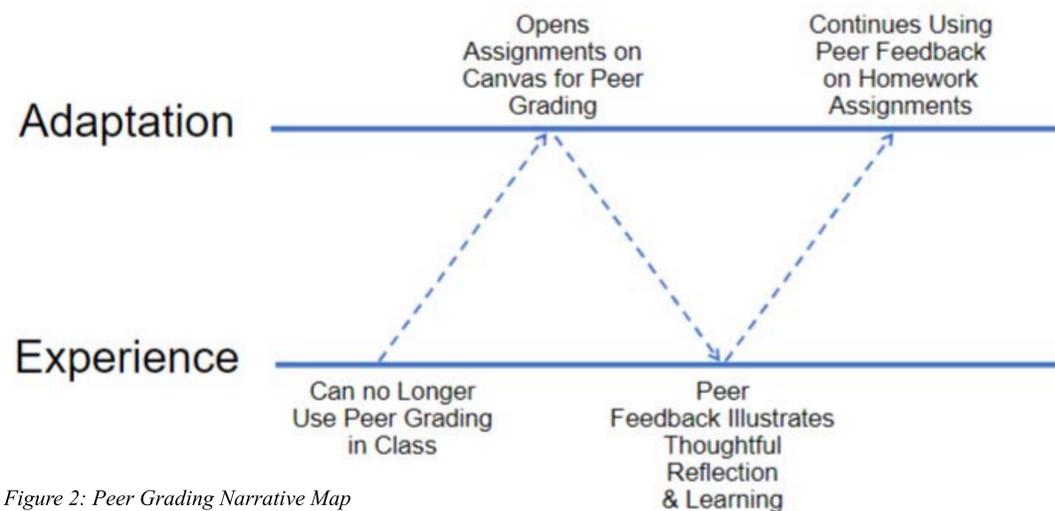


Figure 2: Peer Grading Narrative Map

CHALLENGE	BEHAVIOR	SUCCESS
"Normally in class I pull up a rubric and solution and we just grade. Like they exchange papers and grade papers right there and then. And so that saves me time and it also allows students to see one at least one other person's work...I spot check to kind of see, you know, are they following my rubric. So, it's just a different overall strategy. It doesn't really have to do with Canvas so much as it has to do with the fact that we don't meet as a group. And so, I can't ask students to physically look at someone else's paper... I don't know if there's a way to open someone else's homework submission up so another student can see it."	"So having this peer review thing outside of class in canvas , it shouldn't take them more than the same amount of time that they would have spent in class, but they're not splitting their attention, trying to learn about what they did right or wrong, watch the rubric and solution, figure out the points, look at someone else's paper. I think it's a more focused way to do it...but yeah that was absolutely a response to the changed conditions. "	"Used it for the first time on their first homework this semester, and just kind of hoped that would go well, and it did. I mean not perfectly, but a lot of the students' comments seemed like they were thoughtful, and they were targeting what I asked them to target... that seemed to work okay, so I used that for the first time. I felt successful when I saw the responses from students on the peer homework feedback and saw that they were helpful and good. It kind of gave me some reassurance to continue to do that and to continue to reinforce with students what the expectations are and what the value is to them."
Sp20_02, Sp21_01, Sp21_02*	Sp21_01	Sp21_01

Table 1: Peer Grading Faculty Interview Quotes

*Challenge brought up in multiple interviews across semesters; quote from Sp20_02 interview

*Interviews labelled by semester & interview number during that semester (EX: Sp20_02 is interview 2 from Spring 2020)

THEME	DEFINITION	EXAMPLES
Teaching Challenge	Encountered a difficulty in teaching the class due to the context in which the class is being taught.	Struggled with academic dishonesty, students not participating in class, difficulty with classroom technology
Behavioral Regulation	The ability to adjust how one behaves in order to manage a new or uncertain situation.	Changes how papers are graded, implements a flipped classroom, holds additional office hours
Teaching Success	An action taken by the instructor had a positive outcome in teaching the class while in the new context of ERT.	Had students engage in class, good exam scores with the new delivery method, utilized a new resource successfully in class

Table 2: Qualitative Themes, Definitions, and Examples

DISCUSSION & CONCLUSIONS

- Experienced challenges in 5 aspects of course delivery
 - Exams
 - Grading
 - Remote Delivery Tools
 - Student Engagement
 - Teamwork
- Challenges both changed and persisted over the course of ERT
- Challenges forced faculty to adapt through a variety of behaviors
 - Teaching strategies
 - Communication methods
 - New technology
 - Self-teaching
- Behavioral adaptability often led to success
- Helps instructors develop best teaching practices
- Best ways for institutions to support faculty in crisis teaching
- Future Work
 - Build more case studies on other faculty experiences
 - Explore additional domains of adaptability

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