



Work in Progress: What Makes “Good” Engineering Pedagogy? Preliminary Results from a Qualitative Study of Engineering Faculty

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Work in Progress: What Makes “Good” Engineering Pedagogy? Preliminary Results from a
Qualitative Study of Engineering Faculty¹

This work in progress paper analyzes faculty members’ perceptions of their role in education and develops a model of those perceptions. We report some results of a larger study focused on faculty’s perceptions of pedagogy and the role of organizational and institutional culture (Offorna, 2016) in improving engineering education. Improving engineering education requires includes careful attention to not only changing *what* is taught and *how* it is taught, but the *beliefs* of faculty teaching them. Our paper adds to the faculty development literature by interviewing faculty members about their opinions and beliefs about good teaching (Buswell & Berdanier, 2020; Keltchermans, 2009). This differs from prior literature because it does not engage with what faculty do and do not know (e.g., Borrego et al., 2010; Borrego et al., 2013), but instead interrogates the underlying structures onto which they map knowledge about teaching and learning. Further, we differ from Buswell & Berdanier (2020) in that we directly asked faculty about their beliefs regarding teaching and learning and we interviewed faculty at a single institution and at a variety of career stages to elicit their conceptions of good teaching. We build on prior suggestions that engineering faculty members’ beliefs about knowledge and about teaching and learning may be linked to the difficulties in improving engineering education (Montfort et al., 2014). Our research question is: how do engineering faculty members at a single institution describe good teaching?

Methods

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Our study utilizes the methodology of focused ethnography (Wall, 2015), following the lead of previous ethnographic work in engineering education (e.g., Stevens et al., 2013). Focused ethnography uses multiple modes of data collection—such as interviews, targeted observations, and images—to perform a thorough investigation of a context familiar to the researcher (Knoblauch, 2005).

As part of the larger, ongoing project, in this study we interviewed 21 self-selected engineering faculty members (including non-tenure track faculty as well as tenured and tenure-track professors) at a large research-intensive institution in the American Southeast about their educational background and career trajectory, their teaching philosophy, their perceptions and beliefs about teaching, and their teaching practices. See Table 1 for participant demographics.

Table 1

Participant Demographics

Baseline characteristic	Guided self-help	
	<i>n</i>	%
Gender or Sex		
Woman or Female	7	33
Man or Male	6	29
Did not specify	8	38
Race or Ethnicity		
Asian	1	5
Hispanic or Latino	2	10
White	10	48
Did not specify	9	43
College Generation Status		
Continuing Generation	21	100
Employment Type		
Full-time non-tenure track	13	62
Tenure-track	2	10
Tenured	6	29

Note. Participants reported their own demographic identities.

The interviews used a semi-structured interview protocol (Patton, 1990) and the interviewer frequently asked follow-up questions to clarify understanding of participant comments or inquire about a topic the participant raised in their responses (Rubin & Rubin, 2005). The interviews were supplemented by other parts of data sources in the larger project, primarily six months of the first author’s field notes about the context (Bernard, 2005), as well as visual material jointly produced by participants through Google Jamboards as part of training sessions. In this paper, the interviews constitute the primary data source.

For analysis, we used a combination of inductive and deductive coding procedures to discover themes in the research (Miles et al., 2013). In other words, we designed an initial codebook for the data by using existing literature and theory about the topic to guide our reading of the data for themes (deductive coding), but also used inductive coding procedures by creating and adding to the codebook based on what was in the data itself (Miles et al., 2013). To ensure trustworthiness in our interpretations of the data, we utilized a number of procedures. First, we engaged in member checking by verbally confirming understanding of participant comments within the interviews to ensure our interpretation was correct (Hays & Singh, 2011). Second, preliminary results of the study were presented to participants for feedback and any changes in a secondary form of member checking (Hays & Singh, 2011). Third, interview data were checked against other information about the institution received through prolonged engagement (Hays & Singh, 2011), including the first author’s field notes and the above-mentioned visual material.

Results

When describing ‘good teaching,’ faculty members described a variety of forms, examples, and actions, with some answering the question by speaking about good teachers they had encountered. From their responses, we identified four perceptions about faculty’s role in a

classroom underpinning their descriptions of good teaching: (1) as the curators of course content, (2) as caring for students, (3) as facilitating students’ growth as lifelong, curious learners, and (4) as helping students learn how to learn. Some faculty responses were squarely in one category while others spanned multiple categories. Below, we describe the perceptions in more depth.

Some faculty saw their role as the curators of course content. It was their job to ensure that all necessary knowledge for the course was transmitted from them to their students and that the organizational elements of the course such as the learning management system were student-friendly. In the words of one participant, good teachers are those who have "effectively...imparted the learning objectives on the students." Based on the rest of the interview with this participant and our observations, we take the verb “imparted” to mean a one-way transmission of learning objectives from the teacher to the student. Another said good teaching happens when "statistically more people learn more things." The participant continued: “[there’s the] input student and there's output student. Right? After the semester. And what have you done to raise the level of knowledge, skill, whatever it is of the students. That's what I need to do basically." We interpret these quotes to mean that the good teacher holds primary responsibility for learning; they are the ones steering the learning ship. They are the ones who effect change in the students, rather than the students themselves possessing agency in the learning environment. These participants reflect a view of teaching in which the role of the teacher was to share engineering content with the students in their class.

Beyond information sharing, participants also emphasized caring for and supporting the students as a key part of good teaching. Within faculty’s telling, caring consistently meant supporting students and making them feel safe. One participant said "the teaching is when you see a student," which we interpret to mean viewing the student as more than an academic learner,

including aspects outside of the classroom context and caring for them. Within the interview, to illustrate the example this person told a story about encountering a student having a mental health crisis. The participant took the time to speak with the student and refer them to resources to get them the help they needed. Another offered that a good teacher makes students feel: “if you do have tough material, you're not just the scary monster, but someone who's on their side...to conquer the material and to support them through that.” Based on the interview and observations of this participant, this role situates a good teacher as one who is supportive of individual learning, understands its challenges, and provides pedagogical supports to help the student master the material.

Other participants reported that a good teacher was someone who “inspired curiosity,” as one reported, helping students develop into self-motivated, self-directed independent learners. They wanted students to be excited about learning, and they wanted them to take that energy with them into future classes and their careers. Within this conception of teaching, practices included “focusing on helping students learn” and “creating a learning experience,” to utilize the phrasing of one participant.

Because faculty were mindful that the programs and tools they shared with students could become rapidly out-of-date due to the quick pace of technological change in engineering, faculty wanted to give students the tools to learn for themselves. As one faculty said: “I tried to...give them a good unique learning experience that they can leverage, at least for the next three to five years of their careers.” Ideally, students’ ability to learn independently would create opportunities for them to form their own learning experiences beyond that time frame. We see the primary difference between the final two conceptions as student motivation for learning versus the tools to learn on their own, even when they had left the classroom.

Discussion, Implications, and Conclusion

These perceptions indicate that for this group of faculty, good pedagogy is not a singular phenomenon. Instead, what constitutes a good teacher can take many forms, whether focusing on curating content, creating a positive environment for students, or enabling students to learn well and independently outside the classroom. This finding is important for both faculty pedagogical improvement efforts as well as curricular change activities, as curricular change depends on the efforts of individual teaching faculty to succeed. *What* is being improved will necessarily influence *how* it is improved. We contend that improving faculty pedagogy cannot be successful unless both participants and change agents alike agree on their shared goal. Faculty seeking to improve their pedagogy and faculty development professionals should be clear on their definition of good pedagogy prior to undertaking change. This paper adds nuance to the faculty development literature by analyzing how faculty think about quality pedagogy, a preconception essential to analyze to create a foundation for both pedagogical and curricular change. The next steps in this research include continuing analysis focusing on the heuristics faculty use to understand good teaching, following the heuristic analysis model of Evans et al. (1986), and interviewing the participants again to determine how their understandings have changed over time in response to faculty development efforts. We suggest faculty evaluate our categories to see where they fit into these teaching self-perceptions to create change efforts that will last.

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