

The Real World: A Factor that Engineering Faculty Consider in Making Decisions About Teaching

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Decision making is central to the teaching of engineering, however, little has been written about the teaching decisions of engineering educators. By exploring the processes through which engineering educators make teaching decisions and the factors they consider, we can use decision making as a means to understand their teaching practices and gain a better understanding of how to help engineering educators make more effective decisions about their teaching.

The results of this study will be useful to practicing engineering educators because it describes specific ways in which current faculty address preparing their students for engineering practice.

Recommendations to Engineering Faculty

Findings from this study represent pedagogical content knowledge (i.e., the knowledge that educators have about teaching discipline-specific topics to students) that involves the inclusion of real world engineering issues in the classroom.

Engineering educators could:

- Use the examples from these results as a starting point or counterpoint for their own thinking about ways to include aspects of the real world into their teaching.
- Address the issue of real world engineering through direct conversation with students and/or through pedagogies that involve authentic engineering activity.
- Use the themes and specific examples from the results as a launching point for broader discussions of ways to address real world preparation in teaching within their discipline.

Method and Background

This study included 33 engineering faculty at a major research-oriented university on the West Coast of the United States. The faculty participants came from a variety of different engineering departments including aerospace, chemical, civil, and mechanical engineering. Of the 33 participants, 12 were full professors with tenure, 7 were associate professors with tenure, 7 were assistant professors on a tenure-track, and 7 were non-tenure track faculty. Women were deliberately oversampled, with 23 male and 10 female faculty (30.3% female faculty).

These findings showed that this sample of engineering faculty members echoed the needs described in the National Academy of Engineering report “The Engineer of 2020” which makes strong recommendations for teaching engineering students how to incorporate global and societal issues into their engineering processes.

The current study used the Critical Decision Method (CDM) approach to elicit specific information regarding processes and factors that the engineering faculty used when making teaching-related decisions. The CDM builds on critical incident techniques by using a set of cognitive probes to determine the basis for situation assessment and decision-making during critical incidents. This approach can be used to study people at different levels of expertise in a naturalistic setting by relying on interviews to examine recent cases of interest—in this case, teaching-related activities.

The semi-structured interview protocol was designed to highlight specific cases of critical decision-making on the part of the professor. For each participant, the team identified two teaching decisions for analysis using the CDM. Not all of the transcripts yielded decisions that could clearly be analyzed as critical decisions. The interviewers had difficulty in getting participants to identify a critical incident and maintain their focus on a single critical decision. All decisions were coded regardless of how well they conformed to the CDM approach.

A “real world” theme emerged from the data, i.e., faculty articulated the importance of preparing their students for engineering careers in industry, and used the term “real world” as a proxy for these issues. The coding scheme for “real world” was then developed and refined, leading to the following questions:

- How did engineering faculty refer to the real world?
- In what ways did faculty consider the real world in making decisions about their teaching?

What We Found

Three real world sub-themes emerged from the analysis of the participant transcripts.

- Hands-on activities (e.g., senior portfolios/capstones, group projects)
- Professional standards (e.g., ABET)
- Trade-offs in teaching (e.g., making choices about including material)

For a detailed discussion of CDM and data analysis for this study, please refer to the full paper at the link below. These findings showed that this sample of engineering faculty members echoed the needs described in the National Academy of Engineering report “The Engineer of 2020” which makes strong recommendations for teaching engineering students how to incorporate global and societal issues into their engineering processes.

The contribution of this work, indeed the expected contribution of the team's entire study of engineering educator decision making, is a better understanding of teaching in engineering education. Looking ahead, this work has implications for engineering educators in terms of helping their understanding of teaching decision making based on pedagogical content knowledge.

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