

Decisions About Teaching: What Factors Do Engineering Faculty Consider?

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Decision making is central to the teaching of engineering, however, little has been written about the teaching of engineering educators. We believe that engineering educators can benefit from insights into how to better prepare for teaching decisions since they are faced with teaching-related decisions on a daily basis.

Implications of Findings

The findings from this study illustrate that time can be a valuable lens for showing the complexity of engineering educator decisions. These ideas and findings support the following tips for new engineering educators:

- Talk with other colleagues about how they make tradeoffs given time limitations – how to allocate class time, etc. Ask them about decisions and considerations.
- Be cognizant of how scheduling can function as a surrogate for other significant judgments about materials. For example, when scheduling materials you can cover a) most significant items first, b) harder items first, or c) prioritize items with longer time constants.
- Look for ways to make time by blurring boundaries between research and teaching. In extreme cases, educators/researchers have formulated their research to include teaching issues (focus on educational technology, focus on how to teach X). Other strategies include having students read papers relevant to your research, having students do projects relevant to your research, using your research as examples in your teaching.
- Use time as a lens for asking questions about students, and thus becoming more student centered. For example, ask questions or gather information on what students are doing with their time this term.
- Play with notions of time as it relates to content. For example, consider the time constant or half life of some of the ideas you are teaching. Since good instruction is also content-centered, this becomes a way to think about content that is also student-centered.
- Utilize resources on college and university campuses to help faculty members to manage their time (i.e., senior colleagues, faculty developers, faculty development workshops).

Time is intrinsically tied to all aspects of teaching-related decision making, whether it is explicitly said or implicitly implied. It is commonly acknowledged throughout higher education that time management is one key skill that a successful faculty member should master.

Method and Background

This current study uses the Critical Decision Method (CDM) approach to elicit the specific information regarding processes and factors that engineering faculty use when making teaching-related decisions. This approach is especially apt because it can be used to study people at different levels of expertise in a naturalistic setting by relying on interviews to examine recent teaching-related activities.

During the interviews we first ask the interviewees their background and demographics. Second, we then ask them to talk about their definition of teaching decisions and their reactions to framing teaching as decision making. Through these initial questions we gain an understanding of how engineering faculty define decisions in their own terms and we also gauge their reactions to teaching as a decision-making activity. Third, we ask them to talk about a pre-active teaching decision, which we define as decisions that they have made while planning a course. Fourth, we ask them to talk about an interactive teaching decision that they have made spontaneously while teaching a class. Additional questions about context, process, factors considered, and satisfaction with the outcome of each decision were asked.

For the purposes of this paper, we focus on reporting one key issue – the pervasiveness of the references to the time factor among the participants.

Participants include both genders, were all volunteers, and indicated a strong interest in teaching and learning issues within engineering education. All participants currently hold faculty positions ranging from senior lecturer to full professor within the College of Engineering and are currently teaching or have recently taught courses in engineering. Participants' disciplines represent all ten departments within the College, and teaching experience ranged from a couple of years to almost 30 years of college teaching.

What We Found

Time is intrinsically tied to all aspects of teaching-related decision making, whether it is explicitly said or implicitly implied. It is commonly acknowledged throughout higher education that time management is one key skill that a successful faculty member should master. We anticipated that faculty would mention time as a factor, limitation, constraint, or scarce resource for their teaching decisions, and all of the 10 engineering faculty participants in fact did talk about time in those terms.

Time Factor

Faculty characterized specific time intervals as constraints that they factored into their teaching decisions. Examples of these time intervals included the total number of hours in a term-long course, the minutes allocated to specific activities during a class session, the amount of time needed to grade or assess student work, and how much time faculty expected to spend on specific activities. Faculty also characterized time as a scarce resource when they were deciding how much time to allocate to their teaching with respect to the time allocated to other professional and personal responsibilities.

New faculty members in our study confirmed how some experienced faculty seemed to minimize the time they allocated to teaching preparation. However, the observations from new faculty participants were not echoed by all of the more experienced faculty.

In some cases, time can also be framed as a context for not considering the use of crucial information such as student diversity, student prior knowledge and misconceptions, and the variety of available pedagogies. Faculty members tend not to optimize because they are under time pressure or constraints.

The limitation of time seems to be a constant frustration for some faculty members, even after tenured. One full professor explicitly acknowledged that it is like a race to catch up with time in terms of planning class content for delivery.

Creative Approaches to Overcome the Time Barrier

Although participants generally acknowledged time as constraints or limitations, some participants' responses suggested creative solutions to overcome time as a limitation. We categorized these creative approaches along three dimensions:

- (1) Faculty-centered approaches
- (2) Student-centered approaches
- (3) Content-centered approaches

Faculty-centered approaches: Faculty members need to balance their time in terms of the three main responsibilities: research, teaching, and service. Creating time for oneself is important as faculty members need to juggle between multiple roles and responsibilities within their positions. Most participants commented that research, teaching, and service have arbitrary and complicated boundaries. In order to deal with the limited resource of time, some faculty members talked about blurring the boundaries between their teaching assignments and their research interests. Examples include assigning students readings that match their current research interests, using active learning activities to create time, having graduate students or colleagues teach their classes while they are traveling, and planning ahead for the classroom.

Student-centered approaches: Faculty reported that they often considered the needs of their students with respect to time. The majority of the responses related to scheduling issues such as "changing term paper deadlines and mid-term dates, depending on the needs of the audience." Faculty also considered time in their teaching decisions as it related to the maturity of the students, both in terms of preparing them for their professional responsibilities as engineers, and in considering the maturity of students while making design decisions about their courses. For example, one associate professor based a decision to postpone the due date on an assignment on his core philosophies of flexibility, the need to maintain a healthy balance between professional and personal responsibilities, and giving students feedback in a timely manner. In another example, an instructor used student maturity as a surrogate for engineering experience when framing a design problem for upper level undergraduate students. In a third example, an instructor with extensive military experience used maturity and experience as a surrogate for time. In the military he often taught classes to senior officers with more experience and who outranked him, whereas in academia, he found that the power differential was in his favor, even with more mature students.

Content-centered approaches: Because our study was situated in a Research Extensive university with a quarter system, choosing and selecting the most crucial content to deliver in class became time-dependent. Faculty members in our study talked about being "selective" and "meeting industry and application requirements." While they felt it was important that students have an

understanding of theory and fundamentals, they also wanted to prepare students for the forefront of research and industry work to prepare them for the engineering work force and/or graduate school. This was discussed in terms of efforts to continuously update teaching materials and trimming content to make room for new curriculum materials because of the ever changing technology in this field.

The interview excerpts reveal approaches that faculty members adopt in order to cover the most crucial curriculum content and convey the right balance of information to students. The pervasiveness of references to time in this study clearly makes the time factor a central and critical issue among all levels of faculty members.

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