Creating Small Interactive Teaching Development Groups

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Abstract: This paper describes two aspects of an ongoing faculty development model that uses small interactive teaching development groups. We used the model with engineering faculty at five institutions. The groups focused their work on the design and implementation of research-based, interactive teaching strategies.

The focus of this work is using ongoing faculty development as a means to broaden the use of research-proven instructional practices in engineering courses. Jamieson and Lohmann explain the need for pedagogical research to connect with the needs of instructors [1]. There is a long-standing gap between research about interactive teaching strategies and the implementation of those strategies in classrooms. In our project, we attempted to bring research-based practices into classrooms via small groups of instructors working on interactive teaching. Interactive teaching, for our purposes, can include almost any strategy that can support instructors shifting from only lecturing toward including more active participation in class sessions. For example, having students solve problems in class is a strategy increasing in prominence with the advent of the "flipped" classroom where students may watch video of lectures outside of class time. Using less technology, interactive teaching could also include pausing the lecture for students to solve problems on their own or in small groups in class. This is consistent with models for learning that emphasize that students need to learn facts, algorithms and procedures as well as higher order thinking and problem solving at a conceptual level [2]. We recognize that these shifts in format may be challenging for instructors who do not have models for interactive instruction in their own background as learners or as teachers. In addition, it is challenging to know where to start when creating a more interactive classroom even when the benefits may be evident in terms of students' learning and overall experience. It is especially difficult without support from colleagues in the department who can share their successes and challenges with interactive teaching. In this paper, we focus on two characteristics of small teaching development groups that can support successful use of interactive teaching strategies. The first is scaffolding the groups' discussion with outside resources (e.g., books and videos) and organization by a facilitator. The second characteristic is balancing the external resources with a focus on the needs of participants and having needs-driven participation in the group.

Background literature

This paper addresses a strategy faculty can use to create teaching development groups for discussion, learning and implementation of more interactive teaching. Part of our theory relies on the idea that increasing student engagement in learning will require increased instructor engagement in teaching [3], recognizing that interactive teaching requires that the instructor break the fourth wall. To be interactive in class, the instructor needs to be engaged in thinking about teaching outside the classroom, as well. This requires developing new knowledge about teaching engineering. As an example, the instructor needs to be able to select appropriate problems for class work, as well as build a system for providing feedback to students about their work (either in class or after class).

Shulman described this knowledge for instructors as pedagogical content knowledge or the knowledge of engineering that faculty need to teach[4]. This knowledge is different than the knowledge required to practice engineering in the sense that it requires understanding learning and teaching of engineering as well as engineering itself as a discipline. The goal of our small groups was to provide a means for developing instructors' pedagogical content knowledge in an ongoing, supportive setting in which they were simultaneously trying and refining interactive teaching strategies in their own classrooms.

The design of ongoing, small groups draws on research in K-12 teacher professional development that emphasizes the need for more than isolated workshops or seminars about teaching[5]. While such seminars are useful for sharing ideas and finding resources, it can be challenging for instructors to implement new strategies without ongoing support and feedback. Since teaching could be considered a design profession[6] where the instructor is the designer of a learning environment (similar to how engineers design tools, procedures and products for specific environments), instructors need time for testing and revision as well as modifying innovations for local contexts. In this sense, the small group becomes a professional learning community[7] in which ideas, knowledge and resources for teaching are shared. In K-12 settings, such professional learning communities often consist of teachers of similar grade levels or courses. In the university engineering setting, the members are other engineering (or STEM) faculty who have similar needs in terms of teaching and similar dilemmas due to the nature of the content.

Small group structure

We worked with engineering faculty at five institutions to develop a structure for ongoing teaching development groups to support interactive teaching strategies. These groups include the following characteristics: small, ongoing, needs driven, and scaffolded. We focus in this paper on the need for scaffolding and the needs-driven nature of the groups. Small groups for discussion create a supportive environment for both discussing results from research and other resources and examining an individual's current teaching strategies. The ongoing group structure shifts from a workshop model for sharing strategies toward an ongoing conversation that can provide support and feedback over time as instructors try and revise new strategies in their classrooms. Overall, the groups should be small enough to foster discussion (4-6 people) and provide a supportive environment.

In our project, the group leaders first met for a year in a small, teaching development group. Since the leaders were geographically dispersed, these meetings (with the exception of a kickoff meeting) took place virtually. In the second year of the project, each group leader formed a group at their own institution. Each group consisted of 4-6 members drawn from STEM departments, primarily engineering disciplines. Groups included tenured and tenure-track faculty members as well as term instructors and (in one case) a graduate student instructor. The group leaders used a variety of recruiting strategies but primarily relied on personally identifying instructors who would likely be interested in focusing on interactive teaching. One group also used the university's center for teaching for advertising and to create a forum for presenting their results in a panel

discussion. We designed the structure to focus on interactive teaching, but with a great deal of logistical flexibility to accommodate local needs and constraints. Groups typically met either weekly or every other week for 1-2 hours (often over lunch). This small but informal structure allowed for greater participation of the members and provided a supportive, low-risk forum for discussing teaching. Our previous papers include additional detail about the professional development structure[8,9].

Results

The small, ongoing groups are supported by two significant characteristics of our model: scaffolded and needs driven. The scaffolding supported knowledge development within the group. The second aspect, needs driven, provided the motivation for participants to continue using interactive teaching methods and learning more about them. The two aspects work together to create a small group environment focused on interactive teaching and learning.

Scaffolded groups included two aspects in our project: expertise of the facilitator and use of outside resources. An important aspect of the group was finding a facilitator who can both organize the meetings (ideally, weekly or biweekly) and share resources with the group. The facilitators were familiar with interactive teaching within the discipline and who is active in reflecting about teaching and in trying new strategies. Ideally, the facilitator was from the same discipline as the group members; however, we also had interdepartmental groups of faculty all from STEM disciplines in our study. In addition to the facilitator's knowledge, the use of outside resources provided research-based information and kept the conversation focused on teaching and how to improve teaching. For example, some of our groups used *How Learning Works: Seven Research-Based Principles* [10] to foster discussion and keep the group focused on developing their teaching practice. A common strategy was to help faculty learn more about students' learning as well as effective teaching. It can be challenging as an expert in a field to see the discipline from the perspective of a novice, so readings about students' learning helped faculty see how interactive teaching could be used in many cases to help students organize and apply information and procedures they were learning. The use of external resources helped to keep the groups focused on finding new means to increase student engagement and interaction in the classroom rather than discussing particular complaints or frustrations with students. The external resources also provided a connection between practices some instructors might already be using and the educational theory that supports those practices, as well as introducing instructors to new educational theory and practices.

Needs-driven groups means that the group members joined the group having identified a need in their class and with a teaching-related strategy in mind that would like to implement to address that need. The group members were identified as instructors who were interested in working on their teaching and trying new strategies but needed some support and new ideas in order to move forward. Hence, they came to the group with some internal motivation for seeking new ways of teaching and working with students. Having a group focused on needs they had identified also kept participants motivated to attend the group meetings consistently. The ongoing nature of the groups provided relatively quick feedback to instructors if they had pressing dilemmas.

The group conversations focused on ways to improve teaching that arose out of the needs identified by the group members. Each group member came with their own questions and interests including a specific strategy they were going to try for the current or next semester. For example, one participant in a group had heard of other faculty using clickers in the classroom to have short questions to ask students in a large lecture-style class. He wanted to try using the clickers in his next class, and the group provided him support and feedback as he experimented with the strategy from designing questions to learning how to use the clickers most effectively in class. The meetings supported discussing the strategy, motivated his attendance at group meetings to get feedback and support for what he was trying in his classroom, and grounded the discussion of theories if teaching in practice. In addition, the ongoing nature of the groups supported continued development over a long period to encourage implementation.

The two aspects (scaffolded and needs-driven) together are intentionally simple and flexible, meaning that local adaptation and design is encouraged and built into the characteristics. However, they serve to focus the work of the group and provide some structure even within the flexibility. The two characteristics together also allow for differentiation within the teaching group where both instructors who are new to interactive teaching and instructors who have been using such strategies for a long time can have a productive experience. Among our group leaders who had been using strategies such as in-class problems for a long time, they still found new ideas and new things to think about within the groups while also serving as mentors for faculty (and graduate students) newer to interactive teaching strategies. The two characteristics also allow for a group to develop over time and continue to work beyond an academic year if they find ongoing value in the group structure.

Conclusion

Overall, the idea of a small, ongoing group focused on teaching development was a successful intervention for encouraging more interactive teaching. The participants and leaders learned new teaching strategies and new ways of reflecting about their teaching in order to continue transforming their teaching practice. The two characteristics we emphasize in this paper provide a foundation for creating small, ongoing teaching development groups to support interactive classroom strategies. However, there are other aspects that are also important and require further investigation. One aspect to consider is the relative benefits and drawbacks of multidisciplinary groups vs. groups with instructors drawn from a single discipline/department. In our groups, there were some groups with only engineering instructors and other groups that included other STEM disciplines. Depending on the institution, it may be more or less feasible to have only engineering instructors in a group. In addition, the interdisciplinary groups can share teaching ideas across classes and it can be helpful for engineering faculty to learn what teaching is being used in classes that may be pre-requisites or co-requisites (e.g., calculus, physics) to understand what tools students may already have. For instance, the clickers used in the engineering course may have been purchased by students for another class. An additional aspect worthy of study is how best to structure teaching development groups for graduate student instructors. One of our groups in our study successfully included a graduate student instructor. In other contexts and/or at other institutions, it

may be more helpful for graduate students to have their own teaching development groups, as they may feel more comfortable sharing challenges and pitfalls in a student-only environment.

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