Using a Community of Practice to Diffuse Instructional Improvements into the Classroom

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The National Science Foundation (NSF), as well as other entities, has devoted significant funding for discovering and/or perfecting new pedagogies. It is hoped that these innovative pedagogies will deepen and expand learning and improve retention within engineering. The American Society and Engineering Education (ASEE) and Frontiers in Education (FIE), as well as other groups, meet yearly to explore and attempt to disseminate this vital research to engineering schools and faculty. Yet implementing even currently available pedagogies is proving challenging to many engineering schools and individual faculty.[1] One reason is that there are systemic obstacles to changing teaching practices.[2] If engineering education is to move forward, currently available pedagogies need effective paths into engineering schools and individual classrooms. This goal is challenging and there are some significant hurdles to address.

This qualitative study explored using a community of practice to help faculty acquire and implement effective pedagogies while in place in their institution. Our starting premise was that providing social support with the community and the combined experience of the community members could be sufficient to enable faculty to learn and adopt new pedagogies in their classes. Our interest was to observe what obstacles the community encountered and what factors made it succeed.

Background

The sciences of learning and instruction, like every other discipline, are peopled with experts. Becoming an expert at learning and instruction is challenging for most faculty. However, supporting quality learning in one's students does not require full expertise. It does require some facility with learning and instruction and a willingness to learn. Faculty who are uninformed by the body of research on instructional change have difficulty in creating sustaining change.[2] Thus, the issue becomes one of supporting faculty as they learn and implement effective pedagogies in their classrooms, *while they are still in their classrooms*. In short, the issue becomes one of apprenticing faculty in place as they acquire and implement new and effective pedagogies in their current courses.

Potential obstacles to adopting new pedagogies

Having some competency in the science of learning and the science of instruction is required for effective teaching.[3] Yet, engineering faculty often receive little exposure to this domain. In graduate school PhD candidates are appropriately focused on becoming experts in their chosen engineering domain. While some schools do provide basic instruction to their graduate students in how to teach, becoming an excellent instructor is understandably a secondary focus. Few

students have the time, interest, or energy to pursue both their PhD and coursework or other training in teaching.

The situation does not improve much for junior faculty. Junior faculty are often overwhelmed by a rigorous teaching, research, and service load in the effort to gain tenure. While most want their students to learn, they have little time and energy to devote to becoming even somewhat knowledgeable in the sciences of learning and instruction. Further, because junior faculty lack formal training in instruction, their understanding of what occurs in their classroom can be intuitive or based on their own experience as students. These approaches are not representative of their students' experiences or abilities. Thus, junior faculty rely on the "tried and true" methods they have personally experienced in their own education because it is what they know and it is what often worked well for them.[4] However, most of these methods do not incorporate current research or innovative pedagogies.

Lueddeke [5]and Lindblom-Ylanne, Trigwell, Nevgi, and Ashwin[6] claimed different academic disciplines view teaching differently. These differences are epistemologically based within particular disciplines. Those in the "hard sciences" (physical sciences, math, and engineering) typically enact an "Information Transfer/Teaching Focus" (ITTF) with a goal of transmitting concepts or knowledge. Within an ITTF framework faculty work hard at organizing and presenting the content well so students can understand it. There is also significant emphasis on problem-solving. This focus contrasts with a "Conceptual Change/Student Focus" (CCSF), common within the social sciences, which has with a goal of changing or developing students' underlying conceptions. This approach is much more interactive.[5]

With an ITTF focus, it is understandable that the majority of faculty rely heavily on lecture and instruction in problem-solving strategies. However, Johnson, Johnson, and Smith[7] argued "Talking at students promotes lower-level (surface) learning, favors those with an auditory learning style, and does not recognize the limits of the average student's attention span" (pp. 2-3). Ambrose et al.[3] concurred, adding that traditional lecture-based methods may actually thwart learning rather than support it. Indeed, much of the NSF-funded research explores creating effective student-centered pedagogies within engineering with a goal of improving learning and retention. However, Lueddeke's[5] study revealed that changing engineering faculty from an ITTF orientation to a more interactive approach may prove difficult.

Training is available in effective pedagogies for faculty who desire it. Indeed, national workshops, such as NETI[8] and MACH[9] expose faculty to new and effective pedagogies in just a few days. Similarly, many institutions host workshops and/or guest speakers on pedagogy. However, learning a new pedagogy in a workshop or from a guest speaker and applying it effectively and efficiently in one's own classroom are two very different experiences. Just as with becoming moderately informed in the sciences of learning and instruction, implementing new pedagogies requires time, energy, and support, which faculty often lack. Kolikant et al.[4] noted that faculty struggle with converting a theoretical framework for learning into a practical curriculum and may need expert support to do so. Further, curricular changes require significant mental energy and time.[10]

Lueddeke [5] suggested faculty are interested in engaging "in ongoing dialogue on matters pertaining to teaching and learning" and further suggested creating communities of practice to sustain this dialogue (p. 224). Lindblom-Ylänne et al.[6] concurred, noting that faculty support during change was necessary. Thus the question becomes what kind of supportive strategy works well in a real-world environment.

Supportive Strategies

Three common supportive strategies are discussed in the literature. The first, a professional learning community (PLC), focuses on creating a school climate that ensures all students learn.[11] Although this strategy is common in K-12 school reform, it appears to be uncommon in higher education, at least within STEM disciplines.

The second supportive strategy is a community of practice. Wenger and Snyder[12] claimed communities of practice (CoP) consist of "groups of people informally bound together by shared expertise and passion for joint enterprise" (p. 139). They noted that communities of practice support creative solutions to new problems. They can become effective at transferring best practices across a larger group. Snyder and Briggs[13] argued that CoPs "operate as 'social learning systems' where practitioners connect to solve problems, share ideas, set standards, build tools, and develop relationships with peers and stakeholders" (p.7). Thus, the "joint enterprise" of the CoP is developing a deeper expertise in the group's chosen domain.

Snyder and Briggs[13] maintained that CoPs consist of three overlapping structural elements: the domain or area of interest, the practices, and the community. Within CoPs, practices consist of techniques and methods that are being learned or refined. Community engenders feelings of trust, openness, belonging, and commitment. They noted the need for community is why participation is voluntary. One cannot mandate trust and openness. Indeed, Steinert[14] argued that a CoP enables its members to find community and learn to value the community in which they are embedded. A CoP provides opportunities for networking, support, and sustaining relationships.

Since CoP membership is informal and consists of those who are interested there is a wide variety of expertise and experiences within the group. Experts with years of experience rub shoulders with novices. Yet novices can bring new ideas into the group. Within a CoP everyone has something to contribute as the group learns. Thus, CoPs can be understood as informal mentoring or apprenticeship groups.[15] They form an effective way to develop expertise in those new to the domain. They are also valuable for supporting professional development for those with more experience.[12]

People are not assigned to a CoP. Rather, members self-select based on passion for the topic and identification with the group's expertise.[12] The motives for creating the CoP arise from the grassroots rather than being driven from the top. This self-selection makes them unlike other types of groups. Leadership is also informal. The group decides the topics it wishes to pursue and

the frequency of meetings. There is often no formal "chair." Rather, a facilitator manages the details of making the meetings happen and may informally moderate discussion.[13]

Since there are no formal membership requirements, the community's boundaries are permeable. Although there is a committed core, there are also those on the periphery, who attend as interest or time allows.[13] This peripheral layer enables knowledge to pass to the larger organization. Frequently, those on the periphery are boundary crossers. Boundary crossers excel at transferring knowledge and expertise from one domain or network to another.[15]

However, CoPs also have some challenges. Since CoPs are informal and often *ad hoc* in nature, they do not fit well into traditional organizational structures.[12] Their lack of organizational position means that support, such as a budget, reward for involvement, release time for attendance, and oversight/protection may be lacking, as is appreciation for what the community can bring to the larger organization in the way of learning, mentoring, and professional development.

This lack of organizational support and appreciation can make it difficult to sustain CoPs over time. Snyder and Briggs[13] found that for CoPs to be successful over time they require a committed facilitator. For larger groups, facilitators are paid or otherwise rewarded for their services. When the facilitator is removed, CoPs wither. While members are eager to bring their expertise to the group they seem to be unable to manage the processes required for meeting as a group.

The third type of supportive strategies is a faculty learning community (FLC). FLCs are typically used to support faculty as they develop expertise in teaching. Unlike traditional seminars and workshops, FLCs have a multipronged tactic of developing expertise, capacity for reflection, and supportive community.[16,17] This multipronged focus requires a significant time and energy commitment from members. In typical FLCs, faculty apply, rather than join informally, with a formal goal of refining a curriculum or a particular expertise. FLC leaders construct small, diverse cohorts with a mix of interests, needs, and expertise. Members are expected to attend off-site retreats, focus on community building within their cohort, develop portfolios, engage in reflective journaling, and participate in seminars, usually for an academic year.[16,17]

Some practitioners view FLCs as a special subset of CoPs.[16] FLCs share the focus on learning and on community. However, with a formal membership, highly structured exercises, designated time commitment, and more top-down approach, they differ markedly from traditional CoPs.

This qualitative study explored using a CoP to support faculty as they acquired new pedagogies. We selected a CoP for several reasons. First, as detailed below, we faced a challenging environment. We did not believe potential members would be able to sustain the time or energy commitment required by an FLC. Second, we hoped to have a community that could persist when the study ended. A CoP has that potential. Third, creating a collegial community would be healthy for the institution. Finally, we hoped to learn how to transfer a CoP beyond our setting

and into other small schools. Thus, we were particularly interested in what sustained the CoP and what hurdles it faced.

Setting

This study occurred at a small, liberal arts institution with an engineering school over the course of an academic year. The engineering school served approximately 700 students, with programs in mechanical, electrical, civil, and computer engineering, as well as in engineering management and computer science. It had no graduate programs in engineering. With no graduate students and the number of adjuncts limited by institutional mandate, teaching loads and faculty contact hours were high. The school had also experienced significant recent conflict, which hampered collegiality. Most senior faculty were strongly invested in traditional ITTF methods. Further, the school culture was ambivalent toward pedagogical research or innovation.

At the beginning of fall semester we established the "Teaching Club." We invited, through email and personal contact, all faculty within the engineering school as well as faculty from the math and physics programs. All told, 28 engineering, 10 math, and 6 physics faculty were invited to the Teaching Club. Ten faculty showed initial interest. Of those showing interest, five attended routinely throughout both semesters, with two other faculty attending for a few weeks at a time. As expected, several faculty who expressed initial interest were unable to attend due to schedule or workload constraints.

Faculty from civil engineering, computer science, and math formed the stable core of the community. Teaching Club members included two senior faculty with several decades experience, two faculty who had been recently tenured, and a lecturer preparing his final dissertation defense. The group consisted of two men and three women. The group was led by a faculty-facilitator from mechanical engineering.

The Teaching Club met weekly on Mondays from 12-1 during the fall and spring semesters. Meetings did not occur over breaks or on holidays. Members brought their lunches. Food or snacks were not provided by the engineering school or by the researchers. The engineering school provided a conference room but did not provide any other support.

During the fall semester, conversation at the Teaching Club centered on topics initiated by community members. There was no standing agenda, although frequently there were informal plans for the next week's topic. This topic would be noted in the weekly email sent to all who had shown interest. During the fall semester, the community met 11 times.

During the spring semester the community chose to work through "How Learning Works: Seven Research-Based Principles for Smart Teaching" by Ambrose et al.[3] During the spring semester, the community met nine times. This decrease in meetings was due to various holidays.

Methods

Club members were asked to sign an IRB-approved consent form to participate in the study. However, if they chose not to opt into the study, they could still participate in the community, but their comments would not be used in the study. Members were assured that all discussions would be kept confidential. They were also assured that meeting content *would not* be made available to Chairs, Deans, or to promotion and tenure committees.

We initiated the Teaching Club with four goals, based within the three-part structure of a CoP. These goals were to:

1. Create a sustainable level of effort in the community.
2. Create a safe, supportive, and fun environment to support the social aspects of the community.
3. Explore areas of teaching, learning, and instruction of interest to the group.
4. Have members bring examples or issues from their current courses, rather than create artifacts. Focusing on current issues/examples would support relevancy and hopefully support a practical, rather than theoretical approach.

To support these goals we asked members to be willing to: a) preview an idea with the club to improve it, b) try the idea out in class, and c) review what happened in class with club.

The co-author, a faculty in mechanical engineering with a strong expertise in pedagogy and working with small groups, facilitated the community of practice. He was responsible for all email and personal contact, scheduling, beginning and ending the meetings, and moderating discussions, as well as providing content on learning and instruction when requested during the fall semester. During the spring semester he prepared short PowerPoint® presentations on the chapters in Ambrose et al.[3] each week and moderated the discussions.

The author, an independent researcher with a PhD in leadership, observed the community and recorded the discussions. The community voted that the author could participate in the discussions as desired. However, she generally confined her comments to explanatory or exploratory questions, rather than deep involvement in the conversation. She occasionally offered research results from social sciences, when applicable. In short, she acted as a participant-observer within the community with heavy emphasis on observation.

The author took real-time notes of the conversation. These notes were not verbatim but did record the content of the conversations in which the community engaged. This content was explored to surface what practices were successful and what challenges the community faced. Email communication from the facilitator to the community was also examined.

We used qualitative methods for this study. Qualitative methods were selected because we wanted to more fully understand the experience of faculty in a CoP in a naturalistic setting. Our goal was to explore and begin to describe these experiences, focusing on what worked well and what did not.[18,19,20,21] Qualitative methods effectively meet this goal.[18] Further, since little is

currently published about faculty using CoPs to support learning new pedagogies within engineering an exploratory and descriptive approach seemed best.[18]

The goal of the study was to explore the life of the Teaching Club in a challenging, real-world setting. We explored what practices were successful and what challenges the group faced.

Results

Results will be reported by semester since the Teaching Club operated differently each semester. These differences were based on community desires.

Fall Semester

The Teaching Club began meeting three weeks into the semester to allow everyone time to get the academic year started. During the fall semester the Club met 11 times, with very consistent attendance and high engagement. One faculty dropped out after the first several weeks due to workload issues, leaving a consistent community of five members, plus the facilitator. During the fall semester community members decided on the discussion topics weekly, which then were noted in the weekly reminder email sent by the facilitator to club members and others who had expressed interest. The first two weeks were spent generating topics of common interest to the community and these topics were pursued the rest of the semester.

Each week the community met for an hour over lunch. The first 10-15 minutes were spent eating and chatting while waiting for everyone to arrive. Sometimes this talk concerned teaching and sometimes it did not. This approach left 45-50 minutes of "content time." Some faculty had classes immediately after the meeting, but those who did not frequently remained after the Teaching Club was adjourned, discussing related topics or offering informal mentoring.

The community began by spending four weeks exploring how to successfully work with groups in the classroom. Issues such as assessing groups, structuring groups, managing time when working with groups, and working with low performing groups during class-time were discussed. "Group work" included everything from homework partners to highly functioning design teams. One member had the community participate in a "jigsaw" strategy to show how she used it in her course. The facilitator was highly skilled in working with teams and he provided expertise in addressing teamwork issues. The community spent time troubleshooting various group work issues members experienced and developed potential solutions for members to try. With the exception of the facilitator, the rest of the community appeared to be novices in group work. Although all the members used various types of group work in their courses their confidence was low and they admitted to struggling with effective implementation. Thus, members were highly engaged in learning effective strategies.

The community next spent three weeks discussing how to create exam questions to test conceptual knowledge. The community decided that each person would volunteer to bring a conceptual question or approach to the group for discussion and refinement. While this approached seemed sound, it proved difficult to implement in an interdisciplinary community.

When a member brought a conceptual question forward many of the other members could not participate because they did not sufficiently understand the material and therefore could not assess it. During one meeting the facilitator and one of the civil engineering faculty engaged in a long, involved discussion of a fluids problem, with the facilitator disagreeing with the content of the exam question. The rest of the members were left on the sidelines. The facilitator later sent a group apology for getting off track and an individual apology to the civil engineering faculty for his critique. Although the community continued to work with conceptual questions, the strategy of bringing one to try out on the other members was never very successful since members were unable to offer effective critique.

However, the group continued to be interested in teaching and assessing concept knowledge. To that end they requested that the facilitator create a presentation based on "Knowing What Students Know" by Pellegrino, Chudowsky, and Glaser.[22] This presentation described concept maps and various issues related to the transfer of knowledge. While community members were engaged with the material, there was lower enthusiasm in the group than with less-structured conversation. After this presentation, the community moved on to a different topic.

The final meeting of the semester was spent exploring how to generate higher response rates on student evaluations. The response rate was important at this institution since it affected faculty tenure and promotion. The community also explored how to effectively help "needy" or struggling students with homework. During both of these discussions, practical troubleshooting occurred. Finally, the community planned to discuss their own teaching evaluations at the first meeting in the spring semester. Although this suggestion engendered some anxiety, the group agreed to pursue it.

While the topics mentioned above occupied most of the time, several other issues arose. One faculty member caught a ring of cheaters in a course. She came to the group sharing her frustration and asked for feedback. A significant part of that session was spent discussing cheating and various strategies to address it. Similarly, a faculty had a student with a medical event in class. Again, the group discussed various strategies.

Informal mentoring outside of the group also occurred. The lecturer, who had completed his dissertation and was awaiting final approval, struggled with a very difficult PhD committee. Community members offered strategies for managing his advisor and committee, which were several thousand miles away. This informal mentoring continued until he officially received his degree.

Faculty entered into the community ready to share their experiences. The group quickly became supportive of each other and members became very transparent about their challenges in teaching. They began to share where they felt inadequate, where they felt they had failed (and succeeded), and their difficulties in creating a positive classroom culture. Gender issues for women faculty in STEM arose as well. During these revealing, and sometimes difficult discussions the facilitator was supportive, noting that learning new pedagogies was difficult.

Spring Semester

During the spring semester, the Teaching Club began the second week of the semester, due to a Monday holiday. It continued meeting at the same time, but the conference room varied due to technology malfunctions. The community met nine times over the semester, maintaining the same core people. However, continuity was significantly affected by Monday holidays, spring break, and one planned absence by the facilitator. Attendance was also more spotty due to illness, family emergencies, conferences, and a burgeoning workload as the academic year ended. One new faculty attended for a few weeks, but eventually bowed out. As before, the time began with a short time of chatting and concluded with some members staying after to continue the conversation.

The first meeting of spring semester was to be reflection on teaching evaluations from fall semester. The faculty with enthusiasm for leading that discussion was unable to attend due to illness. However, there was ample attendance and there was engaged discussion of what to do with poor teaching evaluations. This discussion changed into addressing student frustration and a perceived misalignment of the curriculum.

The next seven sessions were spent working through the first four chapters of Ambrose et al.[3] Members had purchased the book, with the intent to read the proposed material beforehand, which most members did. The facilitator, with a strong background in engineering pedagogy, prepared short PowerPoint® presentations on the material to facilitate discussion and include those who may have not had time to read the material. He also offered his expertise in pedagogical literature and research when requested. Much of the book's material was either new to the community or introduced new ways of perceiving chronic issues. Topics covered included student misconceptions, how students organize knowledge, motivating students, and supporting mastery learning. Each chapter took more than one session to cover, which made continuity an issue.

The material on student misconceptions proved especially challenging. Faculty repeatedly viewed misconceptions as gaps in learning. This misunderstanding led the group into discussing the lack of transfer from one course to another, misaligned curriculum, and how students have changed over the years. At the next session the facilitator had to begin again, focusing on the definition of "misconception" and how it differed from "gap."

The final meeting consisted of feedback on the Teaching Club (explored below), which evolved into very spirited discussion of faculty workload, faculty social loafing, and creating balance for oneself and for the various departments. The community agreed to continue meeting the next academic year and to return to the less structured approach used in the fall semester.

Community Feedback

During the last session the facilitator asked for feedback on the Teaching Club. Feedback was uniformly positive. Faculty appreciated the ability to honestly share their challenges with each other. While they valued the book's content, they felt the conversation around it was more important than a detailed study of the book. In fact, they felt that all conversation around teaching was especially valuable in the engineering school since there was no formal support for improving teaching or learning about new (or not so new) pedagogies. However, time pressure, especially during spring semester was an issue and some faculty noted they occasionally did not come so they could catch up.

Facilitator Feedback

After the conclusion of the academic year the co-author reflected on his role and how his actions affected the community. The role of facilitator in this instance had competing, and sometime conflicting, roles, which the facilitator found challenging at times.

The first area of tension was serving as facilitator and as a participant-observer, engaged in research. Although the author served as lead researcher, engaged in collecting data, the co-author found himself reflecting on what was working and not working real-time, while facilitating. This less formal data collection consumed attentional resources needed for facilitation. He found it difficult to be a researcher and facilitator simultaneously.

The second area of tension was more problematic. Several of the discussions could be informed by literature in the scholarship of teaching and learning that members were not familiar with, but that the co-author was. Consequently, at times he felt that the group was missing significant opportunities. Yet the club members apparently did not feel the same missed opportunities. It was difficult to let the group move on when he believed this material was important.

Finally, as noted above, the co-author became deeply involved in a few one-on-one discussions where he was an expert in the course material content. Most members were left out as the co-author engaged in extensive technical discussions with one other member. Although these occurrences were rare, they served to derail the session since facilitation was absent. The group seemed unable to move on without facilitation.

Discussion

The institutional setting for the Teaching Club was challenging. Although the Dean was very supportive, the high teaching loads, distracting school conflicts, and ambivalence toward learning new pedagogies by many faculty all provided obstacles. Yet in spite of the obstacles, or perhaps because of them, the group seemed to thrive. Members were very transparent about what went wrong in their classrooms, their difficulties in increasing student learning, and the resulting worries. The Teaching Club was a safe space and the sharing was at times deep. Members became loyal to the group. This behavior demonstrates that we succeeded in creating a

community with positive social bonds. Thus, creating a community of practice is possible, even in a challenging setting. Further, social and material costs are low and potential benefits are high.

The Teaching Club thrived when discussing materials the members were using in class. It also thrived when addressing chronic issues members faced. These issues crossed disciplinary lines so all members could participate in the discussion. The close connection of the discussions to the work in the classrooms increased engagement, relevance, and personal investment. At times these discussions would miss opportunities, but the discussions were animated and thought-provoking to the members. Further, these discussions occurred at the level where members were at and appeared to meet their real needs. This result is supported by Hutchings who noted that faculty value "the chance to be a part of a community of teachers, to talk seriously about teaching and learning, to have one's ideas listened to and taken seriously, to get to slow down for a moment and reflect, and to be recognized by peers as contributing to an important larger enterprise" (p. 65, cited in Luddeke[5] p. 224).

In contrast, the discussions that were based on relevant literature did not generate the same engagement, even though the group had chosen the direction initially. Overall, there was less engagement with the book than with the unstructured conversations during the fall semester. The atmosphere seemed to shift from one of engaged conversation to one of accruing knowledge, even though the facilitator worked hard at creating a conversation around the book topics. It is unclear whether using the book and moving to a more structured approach led to the decreased engagement or if other factors such as illness, lack of continuity, workload, and tiredness contributed. The literature provided theoretical depth yet the club members found few ways to actively connect this depth to their more immediate needs in the classrooms. This finding echoes that of Kolikant et al.[4] who noted that faculty struggle with converting a theoretical framework for learning into a practical curriculum and may need expert support to do so. Although both Pelligrino et al.[22] and Ambrose et al.[3] gave much practical guidance, community members did not seem to "gain traction" on applying the material to their current courses. Given the constraints of faculty workload and the reality of about 45 minutes of discussion time each week we simply did not have the capacity to meaningfully translate the literature to practice.

The less structured discussions helped individual faculty try out new approaches. Some members came wanting to try out new ideas and the social support enabled them to do so. The group also engaged in troubleshooting common issues such as discouraging cheating or helping students learn in small groups. However, once the club shifted into studying Ambrose et al.[3] it seemed that classroom innovation ceased. Thus, we did not see the level of practical classroom innovation that we had hoped. Ironically, Ambrose et al.[3] suggested this result. The authors maintained that motivation for learning (which applies to learning new pedagogies) is supported by understanding the relevancy of the material. When members where bringing their own issues to the group, they implicitly understood the relevance of developing solutions. Although the book's content was relevant, the members found it less so.

We also found the group's interdisciplinarity to be a significant obstacle to deep discussion on technical content issues. We simply could not work together on content questions or testing for

conceptual knowledge since disciplines, and the resulting courses, differed. However, we were able to have several thoughtful discussions on developing test questions and working with conceptual knowledge. Alternately, the interdisciplinarity was not an issue when we discussed topics that were common to all members, such as facilitating group work, dealing with cheating, and more general testing strategies.

Finally, it was very clear that the group needed a facilitator. The facilitator was highly skilled in moderating small group discussion, which seems to be a necessary skill. The group did not seem willing to take on the duties required for leading the meetings. This reluctance may be due to the high workloads. In short, people seemed very happy to attend and participate, but not to take care of logistical needs to sustain the group. This result is consistent with Snyder and Briggs[13] who found that when facilitators were removed, CoPs often withered.

Recommendations

Our research supports the following recommendations for those interested in creating effective CoPs, particularly in small engineering schools.

1. Structuring the discussions around faculty's immediate needs in their classrooms generates more engagement than structuring discussion around a reference. Although some theoretical depth may be lost by this choice, application of ideas is greatly increased.
2. A facilitator who is skilled in moderating small group interaction is key. Similarly, assigning someone (facilitator or not) to consistently manage the logistics of meeting is also vital. The meetings and discussions will not happen without intentional support.
3. Protecting the confidentiality of discussions from the promotion and tenure process is vital. Members cannot not be transparent if they feel what they share may adversely affect their evaluations.

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