# AC 2012-4440: FOSTERING EXCELLENCE IN TEACHING AND LEARNING IN A COLLEGE OF ENGINEERING

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# Fostering Excellence in Teaching and Learning in a College of Engineering

Abstract

While there has always been an emphasis on excellent teaching in the College of Engineering and Technology at Brigham Young University, there have been limited formal efforts to expose faculty to research and strategies of effective teaching practices. With the establishment of a Teaching and Learning Committee, consisting of faculty members from each department, this emphasis has been formalized with the purpose to "encourage, inspire, and facilitate excellence in teaching and learning." Over the course of 2 years this committee has organized two annual Excellence in Teaching and Learning Seminars and a series of one-hour luncheons focused on a variety of topics, ranging from principles of inquiry-based learning to suggestions for an improved process for the peer review of teaching. While these seminars have been developed for the college at large, they have been particularly beneficial to new engineering educators. This paper will discuss the lessons learned as the Teaching and Learning Committee has implemented this program, will highlight impactful topics that have been presented in these seminars and luncheons, and will discuss how these activities have impacted new engineering educators.

## Introduction

A culture of excellence in teaching and learning generates enthusiasm for teaching improvement and encourages the incorporation of best teaching practices in the classroom. With recent emphasis on learning outcomes in undergraduate education and the developing global environment of engineering practice, the need for cutting-edge teaching practices is increasingly critical. There is a wealth of material available for improving education including research into cognitive processes, methods for increasing engagement and motivation, active and cooperative learning, and new methods for developing expertise relevant to modern engineering practice. Yet with the pressing responsibilities of the typical faculty member in research and citizenship, in addition to teaching demands, it is difficult for faculty to devote large amounts of time to development activities. This is particularly true for young faculty who are trying to establish strong research programs.

Fostering a culture of excellent teaching and planning efficient and effective seminars has been a goal in our college. There are many possible ways to structure a program for teacher development.[1] Programs may vary in topics covered, expected time commitment, involvement of outside experts, and whether the programs are mandatory. The purpose of this paper is to relate the lessons learned in our efforts to develop such a culture and program, and it is hoped that our experience will help to inform others who are involved in or contemplating similar efforts.

## Process

The college leadership organized the Teaching and Learning Committee by asking one faculty member (with demonstrated commitment to good teaching) from each of five departments to serve on the committee. The members of the committee have from 5 to 25 years of university

teaching experience.  One has experience in teaching technology in public schools and brought awareness of a body of motivation and engagement research that facilitated discussions and presentations to the college faculty.  Two members were junior faculty (untenured when assigned to the committee) who brought the perspective of new engineering educators.

The college initially established the committee to prepare an Excellence in Teaching Seminar to take place in December of 2010 during the break between Fall and Winter semesters.  It was anticipated that this could become an annual event.   However, consistent with research that maintains professional development should be continuous and supported,[2] it became apparent that an annual event would only marginally foster the desired cultural shift, and it was decided that, in addition to an annual meeting, activities spread through the school year would be needed to build and maintain an excellence-in-teaching consciousness among the faculty.  The annual meeting was planned to be a 2-3 hour relatively intensive seminar, and 2 or 3 later luncheons each semester were planned to fit within a one-hour time constraint presentation/discussion. Involvement in the seminars and luncheons has been strongly encouraged by the college, but attendance has been voluntary.

The committee was given autonomy over topic selection and presentation format, and has met approximately weekly to prepare the meetings.  In considering possible topics that might be presented, we followed research findings suggested by[3, 4] in that effective in-service is predicated on the fact that teachers must be provided with knowledge and skills that they perceive as potentially useful in expanding their teaching capabilities, and that professional development seminars should include the delivery of immediately useful teaching materials and methods that teachers can put into practice in their classrooms the next day.  Additionally, despite the research finding that teachers prefer workshops that focus on the tricks-of-the-trade[4], we agreed with[3] in that we felt there is also need for in-service to address concepts such as philosophy or curriculum development in order to motivate and initiate program changes.

Over the course of the past two years, the topics that have been covered include tools for enhancing motivation, engagement, active learning, and a new initiative for peer mentoring of new engineering educators.  Insights from the science of learning, such as practices of "expert learners" and developing higher-order learning skills, have been incorporated into these presentations where appropriate.

Topics that have been covered in the seminars and luncheons include the following:

> ***Student Motivation.***  Specific strategies based upon principles of self-determination theory[5] were presented for fostering intrinsic motivation in students through classroom activities aimed at developing student autonomy, perceptions of competence, and mastery of material[6].  Methods of promoting student perceptions of competence, including the Zone of Proximal Development (optimal challenges, sub-goals, and just-in-time instruction), were presented.

> ***Tools from the University Center for Teaching and Learning.*** Specific tools that are designed to facilitate teaching were presented.  Included were tools for developing course

syllabi, recording grades, learning student names (flashcards), and facilitating online class dialogs.

***Student Engagement.*** Principles and practices to increase student engagement were presented. Bloom's revised taxonomy was discussed in the context of engineering activities, and practices that were discussed included neighbor discussions, on-board work, and the use of clickers.

***Inquiry-Based Instruction - The Continuum of Inquiry Instruction.*** This continuum, which includes Confirmation/Verification, Structured, Guided, and Open Inquiry[7], was discussed along with strategies for moving some classroom instruction toward higher-autonomy activities.

***Questions: Asking the Right Questions.*** Asking questions in the classroom has a variety of good motivations. Thinking about what questions to ask and how to ask them can help make this simple practice more impactful for student engagement and learning. Questions can be simply classified as convergent - getting to the right answer, and divergent - broadening the scope of inference[8].

***Peer Mentoring.*** A topic that received significant attention in the most recent December seminar, and will receive more attention in future luncheons relates to classroom visits. Prior to December 2011, almost all classroom visits conducted in the college were evaluative visits associated with rank and status reviews. Observations from the visits were reported in confidential letters, rarely providing meaningful feedback for the new faculty being evaluated.

The committee has championed a different model for classroom visits that may be more beneficial to both new and experienced educators. In the "peer mentoring in teaching model" faculty take turns visiting each others' classes, and then spend a few minutes together outside the classroom to discuss observations. This type of two-sided formative evaluation provides opportunities for feedback and gives new faculty an opportunity to observe other teachers. For rank and status packets, new faculty can report on these peer mentoring experiences – what observations were made and how teaching was improved as a result.

The committee has made progress in promoting the peer mentoring in teaching model. For the December 2011 seminar, the two youngest committee members presented a video segment they produced explaining the peer mentoring in teaching model and illustrating how classroom exchanges might work. In early 2012, twelve faculty in the college (half having less than 10 years of teaching experience) voluntarily participated in classroom exchanges and follow-up mentoring visits. In a luncheon in March 2012, these participants reported back on their experiences and benefits and challenges with the model were discussed. The college leadership is very supportive of this model for classroom visits. The Teaching and Learning Committee, through the regular seminars and luncheons it organizes, has provided a structure for promoting and encouraging these types of activities that are particularly beneficial for new faculty.

In addition to these topics we have recorded and shared video interviews of students responding to questions about what makes a good teacher and of experienced faculty responding to similar questions. These have been powerful means of bringing student perspective into our discussions and of learning from faculty beyond the members of the committee.

We have also established an Excellence in Teaching web page hosted on the college website that catalogs presentations and articles that have been used in the seminars and luncheons, as well as other resources and links that contain pertinent information.

Results

The annual seminars and the luncheons have been enthusiastically received by the college faculty who attend. Attendance at these is voluntary, but encouraged by the college leadership. Approximately 70% of full-time faculty attend the annual seminars and about 40% attend the luncheons. Due to the inevitability of schedule conflicts that prevent many faculty from attending the luncheons, it is not always the same teachers who attend the luncheons.
Two general observations have surfaced from discussions with faculty members attending these meetings: 1. Faculty members like tools that are easily and quickly implemented: high impact, low-cost. Most faculty members are not deeply interested in pedagogy except as it illuminates and facilitates the application. 2. An hour or two is a good amount of time to devote to these activities. This is an effective balance between limited faculty time and the need to teach an appropriate amount of new material. In fact, faculty members prefer receiving just a few things to consider and try at a time.

In addition to positive anecdotal feedback that has come from informal discussions with faculty members and administrators, we have obtained more analytical feedback through a survey given at the 2011 annual seminar. This survey asked faculty members to rate on a 0-5 scale (0 - no value to 5 - exceptional value) how valuable the presentation was in helping them be effective teachers. It also asks them what they have done to implement ideas from the presentation and what impact this implementation has had. (Note: this survey did not include the above-mentioned topics of Questions and Peer Mentoring.)

Seminars dealing with student motivation were rated highest, receiving average ratings of 3.9. The seminars dealing with student engagement and inquiry-based instruction received average ratings of 3.7 and 3.6, respectively. The presentation about the university's Center for Teaching and Learning tools was rated somewhat lower, probably because faculty members were already familiar with these tools. Table 1 below shows these results along with representative examples of feedback about implementation.

Table 1.  Excellence in Teaching and Learning Survey Results

Topic: Student Motivation                                    Rating (0-5): 3.9

    Implementation/Impact Feedback

        It has raised my awareness of different motivations students have. I have specifically tailored my approach in class to try to ensure I hit as many motivations as possible to try to reach as many students as possible

        Students behave more as professionals and expect more of themselves

        Shown 'Drive' video and discussed motivation in class

        I added a creativity project (in which I gave full credit for completion, 'taking compensation off the task') to one of my courses

Topic: Center for Teaching and Learning Tools          Rating (0-5): 3.2

    Implementation/Impact Feedback:

        My use of these tools has helped with classroom management

        Use flashcards to learn students' names

        Using gradebook. Syllabus builder can't work for me; I tried it with 3 classes and each one had a different show-stopping problem

Topic: Student Engagement                                    Rating (0-5): 3.7

    Implementation/Impact Feedback:

        Used more neighbor discussion and on-board work.  Neighbor instruction went well. On-board work was not positive for time it took.

        More think/pair/share activities. More student involvement in class.

        Tried small group discussions.  Students are anxious to share with other students.

        More small-group discussions; more iClicker use.  More student engagement and ownership of the material.

Topic: Inquiry-based Instruction                              Rating (0-5): 3.6

    Implementation/Impact Feedback:

This helped me think differently about teaching and ways to do open-ending teaching.

I have tried several more open-ended assignments but including some guidance. Before this I didn't focus on giving the guidance needed.

Rethought, reworded some of the assignments, some of the questions drive in class discussions.

The series of seminars and luncheons in our college has resulted in noteworthy changes in the way teachers teach, with initial indications of improved student motivation and engagement, which can't help but lead to better learning. There is also an increased sense of energy and enthusiasm about excellence in teaching across the college.

Conclusions

A culture of excellence in teaching and learning gets faculty thinking and talking about new ideas and encourages and facilitates implementation of state of the art teaching techniques. However, any process that seeks to build such a culture must also achieve a reasonable balance between these activities and all of the other responsibilities of typical faculty members.

We have found success in a program that:
1. Combines an annual seminar and hour-long luncheons spread through the school year.
2. Presents content that combines learning science with practical techniques and gives faculty a continuing menu of concepts to think and talk about and ideas to implement in their classrooms.
3. Is led by a committee that represents all of the departments in the college, represents both new and seasoned faculty, and brings passion to the task of building this culture.

There is a strong commitment in our college to continue with this program into the future, and there seems to be growing enthusiasm for future meetings. The teaching and learning committee continues to develop a growing list of potential topics for future meetings, and we believe that this program will continue to build and strengthen our culture of excellence in teaching and learning.

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