Conducting Virtual Focus Groups to Identify How Rewards Have Affected the Valuation of Technology in Engineering Education

Dr. Flora P McMartin, Broad-based Knowledge, LLC

Flora McMartin is the founder of Broad-based Knowledge, LLC (BbK), a consulting firm focused on assisting educators in higher education in their evaluation of the use and deployment of technology assisted teaching and learning. BbK specializes in building organizational and project level evaluation capacities and integrating evaluation into management activities. Current research projects focus on: innovations in technology, student learning and faculty roles; effective dissemination of innovative teaching practices; development of collaborative faculty workgroups and the institutionalization of educational innovations.

Sarah Holsted, Broad-based Knowledge
Joshua Morrill, Morrill Solutions Research (MSR)
Prof. Joseph G. Tront, Virginia Tech

Dr. Joe Tront is a professor of Electrical & Computer Engineering in the Bradley ECE Department at Virginia Tech. He is an international thought leader in the deployment and use of tablet PCs in learning environments. He has responsibility for developing techniques for the appropriate use and assessment of mobile learning technology across the university. In addition to the faculty and student training he provides at Virginia Tech, Joe has delivered over 50 workshops world-wide where he has introduced people to the new technology and has provided them with methods to enhance the way they teach and the way they perform their daily work using mobile devices such as tablet PCs.

Dr. Tront received his Ph.D. in EE from SUNY at Buffalo and has worked in a variety of technical fields including integrated circuit design, space-based systems, computer and network security as well as learning psychology as applied to engineering education. He is a member of the IEEE and ACM and has published numerous papers in professional society journals and conferences. He has received several awards for his leadership in the use of technology in the learning environment including the Computerworld Laureate medal and the Pete White Chair for Engineering Education Innovation.

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Abstract

This paper reports the results from a multi-phase study to assess the impact of rewards on the teaching practice of engineering educators and to describe the spread of pedagogical innovations across engineering education. The study is situated within the context of the *Premier Award for Excellence in Engineering Education Courseware*, which from 1997 – 2012 highlighted and rewarded teaching innovations associated with technology. The study is guided by the research question, "What has been the impact of efforts to motivate faculty to innovate with technology in engineering education?"

The phase of the study spanning 2012-2013 involved conducting a survey with engineering deans and department chairs asking how faculty members are rewarded for creating, testing and using innovative educational courseware in their teaching on their campuses. Forty-two percent of the respondents indicated that this type of activity is rewarded on their campuses, mainly through teaching awards. Respondents interpreted the term "courseware" broadly, referring to a variety of online learning tools, not just curriculum or learning environments. Almost a fifth of respondents indicated they did not know of any faculty rewards on their campuses. To gain more insight into the survey responses, two virtual focus groups were held. The focus groups yielded little in terms of extending the analysis of the survey data but did lend insight into the effectiveness of these types of online discussions as a research methodology.

1.0 Introduction

This paper reports the results from a multi-phase study to assess the impact of rewards on the teaching practice of engineering educators and to describe the spread of pedagogical innovations across engineering education. The study is situated within the context of the *Premier Award for Excellence in Engineering Education Courseware*, which from 1997-2012 highlighted and rewarded teaching innovations associated with technology at a national level. The National Engineering Education Delivery System (NEEDS digital library), the precursor to the Engineering Pathway (http://www.engineeringpathway.com/ep/about/index.jhtml) developed the *Premier Award* "to recognize high-quality, non-commercial courseware designed to enhance engineering education." One of the aims of establishing and promoting the award was to provide faculty members who create innovative online teaching materials rewards and recognition for their efforts. The award

Figure 1: What is Courseware?

"Engineering courseware is computer-based educational material that can be used to assist engineering students in their learning process…. Courseware can be used in lectures, during recitation sections, as self-paced study, as reference material for the student, or as exercises for the student to perform alone or in a group. Typically, courseware takes advantage of multiple media, such as graphics, photographic images, sound, video and animation to illustrate engineering concepts, devices, or practices. Courseware will often include features such as hyperlinks or hypertext which permit users to explore related information or greater depth of information as they are interested." [7, 9]

was an effort to initiate and spread an appreciation for this work with the intent of ultimately shifting the engineering educational environment from one that did not appear to support or reward the efforts of these faculty members who developed and used courseware to one that did. [15] Results from the first phase of this research project indicate that the award holds some prestige and that winning the award has helped shape the careers of young faculty members and graduate students who were award recipients. [16]

The second phase of this research was guided by the research question, "What has been the impact of efforts to motivate faculty to innovate with technology in engineering education?" The goal of this phase of the research was to determine *if* the engineering education environment has changed to being one that rewards faculty members for their innovations associated with courseware, and if it has changed, *how so* and *to what extent*?

2.0 Context for the Study

In the higher education environment of the late 1990's within which the *Premier Award* was implemented, the culture of engineering education was such that few faculty members were creating courseware materials, and the quality of materials varied widely. Engineering education administrators, promotion and tenure committees, and faculty colleagues did not value or know how to judge the value of the innovative courseware created or authored by these innovative faculty members. [6, 13] The faculty members who made up the NEEDS community however, envisioned a future where computer-based, electronic teaching and learning materials would play a much more central role in engineering education; [9, 13, 17] and where evaluating the quality of courseware would become an essential practice by and for faculty who would use these materials. Peer review criteria were developed for the Premier Award and were used in the yearly judging process for the award. They also served as best practice guidelines for faculty developing courseware. [7]

The *Premier Award* was also initiated in a period in which there was some controversy about how teaching was not adequately recognized or rewarded in higher education. In the then-emerging debate about the Scholarship of Teaching and Learning (SOTL), [22] the movement claimed that research was rewarded more, while faculty members who focused on teaching and learning jeopardized their opportunities for promotion and tenure. [4]

Writing in 2000, Hattendorf-Westeney observed that using information technology for teaching was novel and that recognition and valuation of this practice was not well integrated into the promotion and tenure process for faculty. Faculty members encountered a range of perspectives across disciplines, from "technology is simply a means for information delivery" to "teaching with technology is a form of scholarship." [11] The developers of the *Premier Award* adopted the latter position, and instituted several measures they hoped would help ensure that award-winners received the recognition and validation that would be acceptable to promotion and tenure committees.

Recent studies of the impact of innovative programs in education [20, 21] suggest that promotion and tenure was, and still is elusive, though not unattainable for faculty members who choose to focus on the scholarship of teaching and learning. [4, 18] These studies also highlight the lack of consistency in the criteria used for promotion and tenure review at the department and campus

levels as well as regionally and nationally. [1, 2, 4, 18] This late phase of our research has been influenced by these findings and the dearth of information on rewards and awards in the literature.

To that end, we broadened our research question, which was focused on the *Premier Award*, to include all forms of rewards to determine *if* the engineering education environment has changed to being one that rewards faculty members for their innovations associated with courseware, and if it has changed, *how so* and *to what extent*? To answer this question, we implemented a national survey followed by focus group discussions with engineering education administrators to learn more about the value (operationalized as rewards) that higher education institutions and the discipline of engineering education places on innovative uses and development of courseware by engineering faculty members.

3.0 Survey Methodology and Results

3.1 Methodology

In April 2013 a 17-question survey was distributed to our target audience (engineering administrators, deans, associate and assistant deans and department chairs) via an email listserv with 1,854 members that is managed by ASEE. The goal of this survey was to collect qualitative and quantitative data to inform follow-up online focus groups. The survey, "Rewarding Faculty for Improving Engineering Education," was available online at SurveyMonkey from April 15 to April 22, 2013. The ASEE list members received an invitation to participate in the survey and two follow-up reminders.

The survey gathered information from engineering education campus leaders and administrators about their perceptions of their school or department's value for the creation of or use of innovative courseware. Value was defined in terms of the kinds and types of rewards or awards given to faculty members who engaged in creating or using courseware. The survey covered the following areas:

- Demographic data
- Familiarity with the *Premier Award for Excellence in Engineering Education*
- Experience developing or teaching with courseware
- How institutions recognize the use or development of courseware
- Changes in the past five years regarding the use of courseware

In the following section we report the results that were deemed most interesting with regards to generating and promoting discussion in the focus groups.

3.2 Survey Results

3.2.1 Demographics

Two hundred and thirty six responses were received for a response rate of approximately 13%. Respondents were predominantly from comprehensive or research universities (62.5%), respondents from four-year colleges made up 37.1% of the responses and only 3 respondents (1.3%) were from two-year institutions. Respondents were most likely to be a department head or chair (57.3%) with 14.6% being a dean or an assistant or associate dean. Responses were

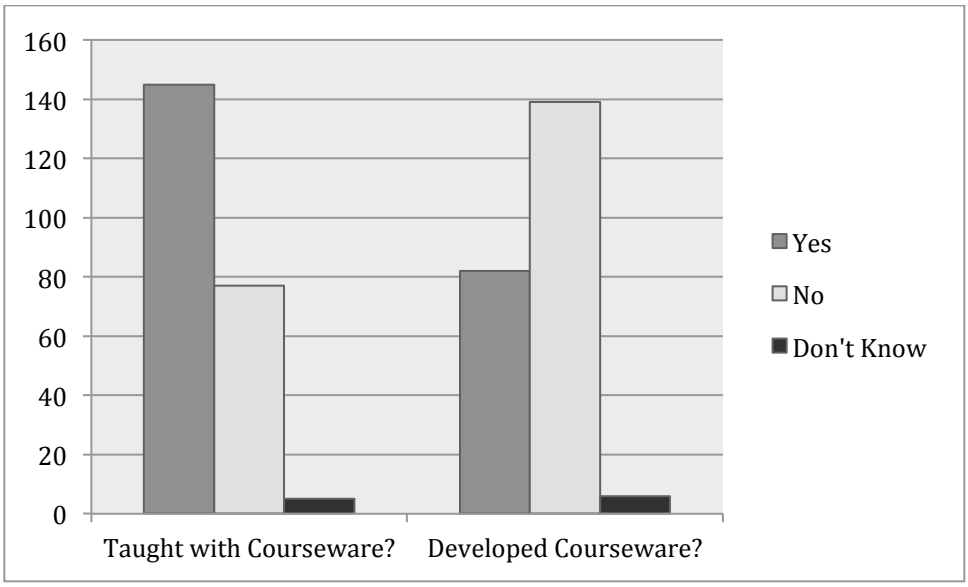
received from 171 campuses. Responses came from each state, as well as Puerto Rico and the District of Columbia. Multiple respondents completed the survey from 44 institutions. The number of respondents from these institutions ranged from two to eight, with the mode being two. The small number of multiple responses, except for the one outlier, did not merit more detailed analysis.

Respondents also were asked about their familiarity with the *Premier Award*. The majority of respondents didn't know, or were not sure, if anyone from their school or college had submitted courseware for consideration of the award (97%); they were equally not knowledgeable on the question of whether anyone had been the recipient of the award (96%). Several of the respondents who did report knowing about the submission were past recipients of the award.

3.2.2 Experience Using or Developing Courseware

As a means for determining their familiarity with courseware, respondents were asked if they had ever taught a course using courseware or if they had ever developed courseware. As expected, those teaching with courseware far outweighed those with experience creating or developing courseware (Figure 2).

Figure 2: Experience with Courseware



3.2.3 Rewards for Faculty Members Using or Creating Courseware

The survey was designed for respondents to first consider if their school or college rewarded faculty members for their innovative use of courseware in teaching and learning. Next, similar questions were asked regarding the creation or development of courseware. These questions were separated for two purposes. We hoped to learn about rewards associated with engineering specifically; and, we hoped to learn more about awards (other than the *Premier Award*) that were specifically associated with development and use of courseware. Results from these set of questions indicate that the respondents may have conflated these activities (see Table 1).

Table 1: Recognition for Faculty Members' *Use or Development* of Courseware for Teaching and Learning

	Use		Development	
	N	%	N	%
Yes	99	44.4%	92	42.4%
No	77	34.5%	77	35.5%
Don't Know	47	21.1%	48	22.1%

Over 40% of the respondents indicated that their campuses recognized faculty members for their use or creation of innovative courseware in some way. Approximately a third of the respondents indicated that they did not reward faculty members for this work and interestingly, around 20% indicated that they did not know if faculty members were rewarded, regardless of the type of recognition.

When we examined these responses by type of institution (i.e., two year institutions, four year colleges or research institutions) our analysis yielded few if any differences in the overall data - with one exception. The cross tab shown in Table 1 illustrates that more of the research institutions reported rewarding faculty members for the development of courseware as compared to respondents from four-year colleges.

3.2.4 Types of Rewards

In an open-ended question, respondents described the types of rewards awarded to faculty members for their involvement with the use or development of courseware. Table 2 lists the categories that resulted from a content analysis of these comments.

Table 2: Types of Rewards for Engineering Educators' *Use or Development* of Courseware for Teaching and Learning

Description of Award	Use of Courseware in teaching & learning (n = 139)	Development of Courseware (n = 108)
Teaching award - No details given about level or type of award	37	21
Teaching award – Campus level	28	17
Teaching award – Department or college level	18	4
Part of P & T consideration	18	18
Informal recognition by peers (public praise, campus PR such as recognition in newsletters, etc.)	12	15
Financial support	11	18
Special campus level teaching and technology award	7	0
Invited to lead seminar or workshop	4	2
Award from Teaching & Learning Academy or Center	4	4
See questions about Use of Courseware	NA	9

The survey separated the use of courseware in teaching and learning from its creation. This choice reflected the researchers' assumption that a faculty member who uses courseware may not be the courseware creator or developer as has been shown in the adoption literature.[3, 5, 11] When reviewing the open-ended comments it appears however, that the respondents may not have shared that same assumption. Responses to both questions were remarkably the same; with nine respondents referring back to their previous responses. There was one exception: more respondents specifically noted that availability of grants and other financial support when referring to the creation or development of courseware than for its use. These comments seem to support that rewards were for the development activity prior to its use, rather than rewarding its use in teaching and learning.

No respondent reported any type of rewards specifically for use or development of courseware at their college or departmental levels. Instead, rewards were mainly described as teaching awards. Some respondents clearly noted that the use or development of courseware was considered a teaching activity; others implied it strongly. Awards were also described as being primarily at some level other than the department level. Only those references to the promotion or tenure process suggested recognition at the departmental level. Again, no differences were found in the types of rewards based on the type of institution.

3.2.5 Value and Use of Courseware in Teaching and Learning

One of the research goals was to determine the level to which courseware is valued by its users. While we were aware of no baseline measure associated with this question in the early or late 1990's, much of the literature around technology for educational purposes suggests that educators were highly suspect of its value. [9, 14, 19] Table 3 provides a snapshot view of how educators now value the use of courseware and its development. No differences were found between different types of institutions, e.g., research or four-year institutions.

Table 3: Overall Perception of the Value of Use and Development of Courseware

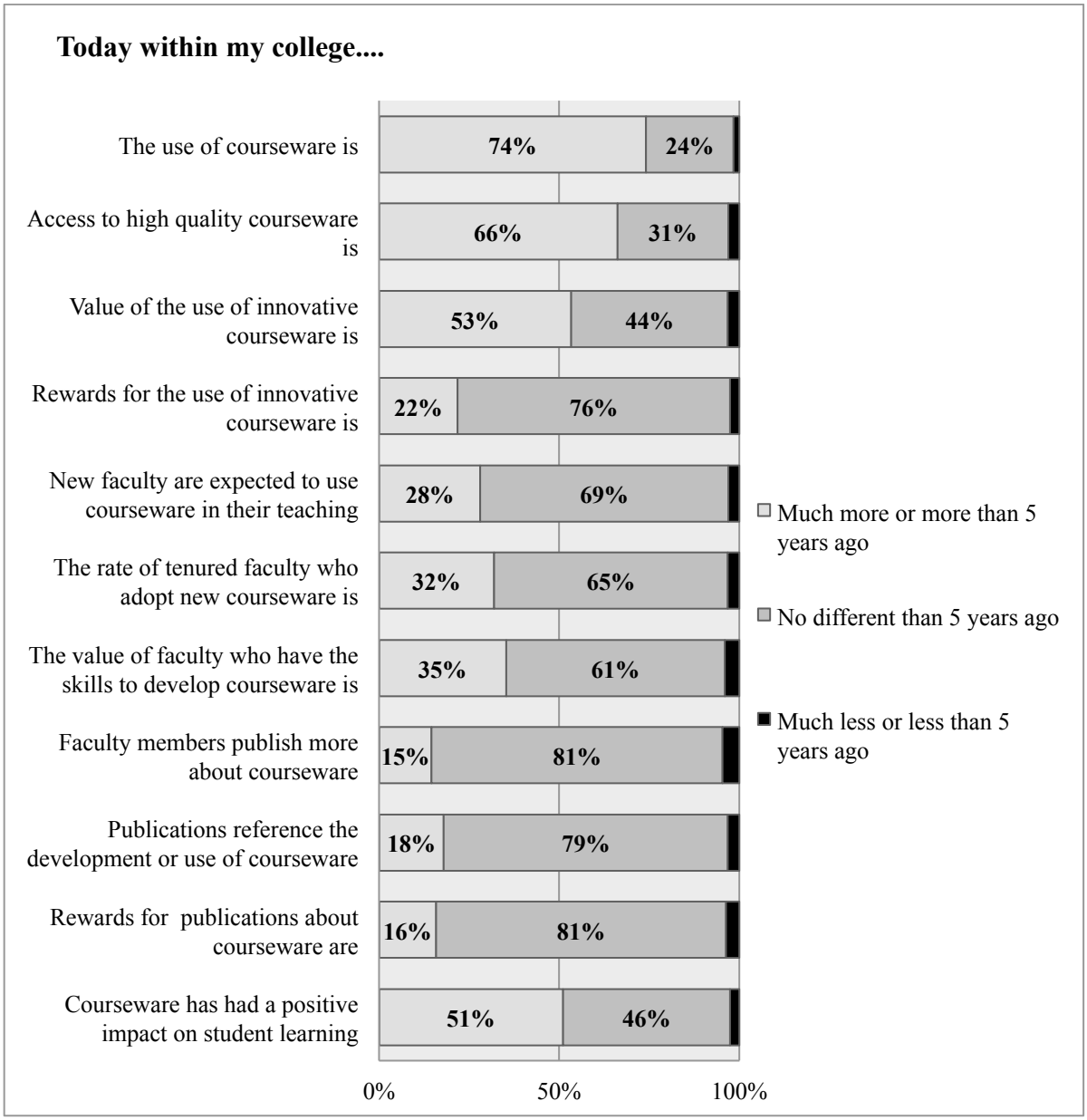
Overall Perception of…	1 Little or No Value	2	3	4	5 Very High Value
…how courseware for teaching and learning purposes is valued (N = 196)	7.1%	8.7%	43.4%	30.6%	10.2%
…how the development or creation of courseware for teaching and learning purposes is valued (n = 196)	9.7%	14.8%	43.9%	26.0%	5.6%

3.2.6 Extent of Change in Value and Use of Courseware in Teaching and Learning

To put these results in some context, respondents were also asked to rate to what extent they thought change had occurred with regards to the use of courseware and technology in teaching and learning. The question asked respondents to state for each item if it was more, the same or less than five years ago (Figure 3). The time period was chosen because significant technological changes had occurred during that period (e.g., the rise of social networks; the use of instructional videos on YouTube; the implementation of MOOCs) but was short enough that respondents would be able to adequately judge the level of change. Respondents reported that courseware is

used much more than five years ago, there's more access to high quality courseware, and it is more valued. And, slightly over 50% of the respondents noted that the use of courseware has had a positive impact on student learning.

Figure 3: Level of Change in Last Five Years Related to Use or Creation of Courseware



Given the relatively high value that respondents noted and the upward movement with regards to use of and access to courseware it was somewhat surprising that respondents also noted little change in the past five years with regards to activities associated with encouraging more wide-spread use such as,

- Rewarding faculty members for using courseware,
- Expecting new faculty members or instructors to use courseware in teaching,
- Expecting an increase in the adoption and rate of use by tenured faculty members and

- Demonstrating a higher value for faculty members and instructors who have the skills necessary to develop courseware.

The strongest 'no change' ratings were associated with faculty publications regarding courseware use or development of courseware, which also suggests that being involved in development, use and educational research, is not valued even though the outcomes of that work (e.g., more accessible courseware that is used more or improved student learning) are valued more.

When asked in an open-ended format to describe the one change in the last five years that has had the greatest impact on the use of courseware in engineering education, the majority of respondents replied: increased access to and availability of courseware (and technology). Other categories of responses worth noting included: changes in pedagogy to include more active learning, collaboration, and hands-on learning. Others noted that faculty members knew more about, and therefore used more, technology and that there was more institutional support for technology especially with regards to learning management systems, training for faculty members, and improved access to technologies such as smart classrooms.

Table 4: Level of Change in Last Five Years Related to Use or Creation of Courseware by Type of Institution

	4 Year College (n = 72)	**Research Institution (n = 117)**
	Mean	Mean
The use of courseware is	3.45	3.88**
Access to high quality courseware is	3.34	3.75
Value of the use of innovative courseware is	3.10	3.63**
Rewards for the use of innovative courseware are	3.07	3.18
New faculty members or instructors are expected to use courseware in their teaching	3.02	3.31
The rate tenured faculty members adopt new courseware is	3.02	3.25
The value of faculty members who have the skills to develop courseware is	3.06	3.36
Faculty members publish more about courseware	3.03	3.10
Faculty members' publications reference the development or use of courseware	3.02	3.15
Rewards for faculty publications about courseware are	3.0	3.09
Courseware has had a positive impact on student learning	3.13	3.54**

Scale: 1 = Much less than 5 years ago, 3 = No different than 5 years ago, 5 = Much more than 5
** Indicates a significance at a $p<.01$; NOTE: in this case an alpha of .01 was use to help correct for unequal sample sizes across the two groups which can heighten type 1 error.

When testing for significance between the types of institutions (Table 4) we took a conservative approach using a higher alpha (99% confidence interval) to help adjust for the unequal numbers of institutions in each category. Testing at this level showed that respondents from research

institutions differed significantly from those at four year colleges in reporting more change in the last five years in the following areas: use of the courseware, value of the use of innovative courseware and courseware has had a positive impact on student learning. Beyond strict significance testing however, it appears that a pattern exists regardless of type of institution: that even as use and value for high quality courseware seems to be on the rise, the activities associated with these changes (e.g., rewards, expectations, adoption by others) are less likely to have changed.

4.0 Virtual Focus Groups

4.1 Methodology

As the survey results indicate, the topic of rewarding faculty members for their efforts to use or create innovative teaching and learning materials, such as courseware, is nuanced. The research design included focus groups, which were designed to encourage participants to discuss in more depth the topic, generate discussion around issues associated with the future of technology use in general, and looking forward, suggest effective methods for motivating faculty members to continue or expand their involvement in the use and creation of innovative teaching materials and methods.

Prior efforts to conduct focus groups with engineering deans, department chairs and faculty members during annual engineering education meetings did not prove successful because of the compressed schedules that accompany such meetings. The research team hypothesized that focus groups held online might involve more participants. Two virtual focus groups were conducted on November 1 and 7, 2013. Approximately half of the respondents who completed the survey indicated a willingness to participate in an online focus group to discuss the survey results. The focus groups were organized using a WebEx webinar coupled with the web-based idea-management site, Ideascale. The online sessions were modeled on face-to-face focus groups: we alternated presentations of survey results with opportunities for participants to respond in writing using the Ideascale website features.

Ideascale is a web-based system that supports individuals or groups as they generate ideas for subsequent voting or commenting. This interface rapidly displays new ideas and vote tallies to show ideas that are popular or controversial or might require follow up discussion. The Ideascale service was chosen because its interface features several functions that are already familiar to users who have used blogs or social media sites.

To initiate the conversation, researchers seeded the Ideascale space with four comments (based on the survey findings) that were deemed controversial enough to generate responses and would also provide participants with a model for generating their own comments. Example seeding comments included:

- Rewards play no role in promotion at my University. People typically get promoted based on dollars and publications. This should change
- Good teaching comes first. Even the best courseware can’t replace a good teacher.
- Courseware vs. pedagogy: You need training in both. Courseware is ineffective if it's not used well.

- Meaningful rewards are needed for real change on my campus. My institution needs to recognize the time that it takes to create and test innovative courseware and reward that effort...somehow.

All survey respondents who listed their email addresses in the survey were also sent a summary of the survey findings after the webinars and invited to add their comments or observations about the findings at the same Ideascale website used for the focus groups. A content analysis of the Ideascale site was conducted once the comment period was closed.

4.2 Focus Group Results

Ninety-two respondents to the survey indicated they would like to participate in an online report out and discussion of the survey results, and they were subsequently invited to do so. Approximately 10% of the group of potential respondents logged in to the webinars but fewer actively participated in the online discussion. Most participants did not add new comments or comment on existing comments. They did, however, vote on ideas. The most popular idea was "Good teaching comes first" with eight votes. The next most popular ideas receiving six votes each were "Courseware vs. pedagogy" and "Meaningful rewards are needed for real change on my campus."

Two participants participated more heavily in the focus groups than others. One participant did not attend either online focus group, but did provide an idea and commented on the seeded and focus group comments, showing that they returned to the site more than once to check on the discussion. Another participant contributed four ideas, commented on the seeded comments, and voted on various ideas. This individual was a recipient of the *Premier Award* and is an active innovator in engineering education, experiencing the 'highs and lows' of developing courseware. As a participant committed to changing the system to give faculty members more recognition for this work, one of his comments was particularly telling of the challenges:

> *"Such a broad landscape - if a young faculty person asked you whether they should get involved with developing courseware what would you say? My answer would be no as it will not help get you promoted and that has not changed. Also if you want to publish in the engineering education arena one must be fluent in cognitive development and other areas of Psychology."*

5.0 Online Discussions as a Research Method

We anticipated that online focus groups might attract a broader cross-section of participants than previous face-to-face sessions that were conducted at conferences, where attendees' time is compressed, and they often have competing events if they attend at all. We also hypothesized that the Ideascale features, which promote asynchronous, written responses, would support participants who might not speak in face-to-face focus groups.

However, we also anticipated that the structure of the online focus groups might be a barrier to participation because the data were presented in the WebEx environment, while generating new ideas, comments and votes took place in Ideascale. This required the participant to have two windows open in their browser, one for WebEx and one for Ideascale. Participants also had to log in twice, one for each environment. Log in was required for Ideascale to suggest an idea, make comments on others' ideas or vote on a comment or idea.

Based on our experience, the WebEx/Ideascale combination may have proved to be too large a barrier to those who were not familiar with participating in online discussions. One participant for example, commented they he just wanted to make comments in WebEx's chat window. Voting in Ideascale proved to the be easiest task for participants to complete, perhaps because it required less time to think about a new idea or to react to an existing one. It is also possible that the participants who logged in expected a more passive experience, much like a face-to-face presentation of data at a seminar or conference session where questions are asked of the presenter at the end of the session.

In other Ideascale discussions run by members of the research team using similar strategies, it appears that participants need more time to develop a sense of trust with their group members before sharing ideas. The topic itself, 'Rewarding Change' may have been too conceptual or undefined for the group of attendees to participate. The Ideascale website supports yes/no voting without provide a space for middle ground.

In the future, if we persisted in conducting online focus groups to generate discussions, we would: identify a service or tool that combined phone conferencing with idea management and commenting; reduce the amount of new material covered in a session; provide more time for reflection before writing; and, set high expectations for participating in an activity before the focus group convenes to acquaint participants with the online environment and session topics.

6.0 Discussion and Implications for Future Research

The aim of this phase of this research was to determine whether changes had occurred in the engineering education environment with regards to rewarding faculty members for their innovative use of courseware or their development of it. We attempted to determine *if* the engineering education environment has changed to being one that rewards faculty members for their innovations associated with courseware, and if it has changed, *how* so and *to what extent*?

Based on the survey results, and to a much lesser extent the online focus groups, we can report that learning tools (i.e., computers, mobile devices, software, courseware, etc.) are nearly ubiquitous in engineering education. Respondents reported the use of courseware is up; access to courseware has increased significantly; and, courseware is highly valued. These results suggest that engineering education has been positively affected by the accessibility and availability of courseware; and, its use is increasing, as is the use of mobile and computer technologies in general. However, the rewards system for faculty members who innovate in this area of engineering education seems to have shifted little. Rewards, when given, are awarded at the campus level. Stipends, release time, praise, or recognition were the only rewards noted at the department or campus level. In promotion and tenure processes, the use and development of courseware was most closely associated with teaching practices, not research. Survey and focus group comments noted that awards, at whatever level, are still necessary for changing the valuation of the scholarship of teaching with technology in general, and courseware in particular.

The findings raise several new questions for further research, such as, has the rise in the ubiquity of technology in the teaching enterprise masked the need for training faculty members to use such tools in support of effective pedagogy? What are effective means for motivating faculty

members to innovate (or adopt innovations) in engineering education? And, how and to what level might this type of work be integrated more effectively into the promotion and tenure process as part of the research enterprise?

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