AC 2012-4295: HOW AWARD WINNING COURSEWARE IS IMPACTING ENGINEERING EDUCATION

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How Award Winning Courseware is Impacting Engineering Education

Abstract

In this paper, we report on a study regarding the impact of the *Premier Award for Excellence in Engineering Education Courseware*. This paper describes the first two phases of the research and findings with implications for engineering education. Research questions focus on, identifying the impact of the award on the courseware authors and developers, their teaching and their students' learning; gathering information on the evolution of the award itself; and, describing the spread of pedagogical innovations across engineering and other related disciplines.

The interviews and content analysis to date have initiated a rich description of the impact on the awardees' careers, especially with regard to their teaching practices and STEM education scholarship. It appears that the *Premier Award* holds some prestige and has been instrumental in shaping the careers of graduate students and young faculty members. Analysis of the awardees' dossiers revealed the challenges associated with evaluating the impact of innovations on teaching and learning as well as issues surrounding the dissemination of innovations in engineering education.

1. Introduction

In this paper we report on preliminary results of a study undertaken to determine the impact of the *Premier Award for Excellence in Engineering Education Courseware* on the culture of engineering education. NEEDS, 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."[14] 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 was an effort to initiate 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 to one that did.

When this research was initiated in 2010, the program had run for 14 years, and the *Premier Award* Review Committee had reviewed over 120 courseware submissions and selected 22 award winners and two finalist candidates. *Premier Award* winning materials have historically been the most frequently downloaded materials on the NEEDS/Engineering Pathway website, and over 40,000 *Premier Award* CDs have been distributed in the engineering education community. Multiple workshops and seminars about *Premier Award* courseware have been presented to engineering educators.

> **Figure 1: Courseware Defined**
> "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."[6, 7]

Study of the type of cultural and environmental shifts envisioned by the award's developers requires that the program have a fairly long timespan and the kind of sustained dissemination efforts described above in order to observe and describe change or impact on a particular culture or environment. The research team determined that a qualitative research approach was the most effective means to gaining insight into the factors that might affect change in an engineering education, particularly those that might indicate a shift in appreciation of innovations involving technology, teaching and student learning. The research questions guiding the study are:

1. How has receipt of the *Premier Award* impacted the awardees' career paths and why?
2. How has the quality of the courseware submitted changed over time?
3. How has the award winning courseware affected student learning?
4. What kinds of dissemination activities and mechanisms are successful in promoting successful adoption and use of courseware?

In this paper we report on the results in the first phases of the study (conducted during 2011), which addresses research questions one, two and four.

1.1 Background of the *Premier Award*

The *Premier Award* competition was instituted with two primary goals: to recognize and reward the efforts of faculty (and students) developing courseware and to provide an external measure of the quality of the courseware.[14] The *Premier Award* was created as a program within the Synthesis Coalition, one of the NSF engineering education coalitions funded in the 1990's, which focused on improving engineering education by designing, implementing and assessing approaches to undergraduate engineering education that emphasized multidisciplinary synthesis, teamwork and communication, hands-on and laboratory experiences, open-ended problem formulation and solving, and examples of "best practices" from industry.[1] The Synthesis Coalition also initiated NEEDs the pioneering engineering education digital library of engineering courseware and NEEDS continued to sponsor the award after the Synthesis Coalition funding ended. NEEDS has since been subsumed by the Engineering Pathway digital library (http://www.engineeringpathway.com/ep/).

The environment in higher education within which the *Premier Award* was implemented, was an engineering education culture where few faculty members were creating courseware materials, and the quality varied widely. Engineering education administrators, promotion and tenure committees, and faculty colleagues did not value nor know how to judge the value of the innovative courseware created or authored by these innovative faculty members.[5, 12] 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[8, 11, 16] so, judging the quality of courseware would become an essential practice of faculty who would use these materials. As part of the development of the *Premier Award,* peer review criteria that could be used both in the judging process for the award and later by faculty members in general, were created.[6]

The award then, would serve to educate others about the qualities and aspects of courseware that made them 'good' as well as to promote excellence by awarding that courseware that met or surpassed the criteria. The goal of raising the visibility of the award and awardees by presenting

the award in a highly publicized manner and broadly promoting the award winning courseware was to make engineering educators more aware of the truly innovative and high quality work of courseware developers and thereby establish this type of work as a valued part of academe and the scholarship of teaching and learning.

In short, the designers of the *Premier Award* saw it as a way to provide much needed recognition to these pioneering educators, disseminate models of high quality courseware as a way to encourage more innovation and development, and interest textbook publishers in digital learning materials. They also believed that in the long run, the *Premier Award* would demonstrate that use of courseware would have a positive impact on student learning, that it would improve teaching practices of engineering educators, which would result in changes in promotion and tenure criteria to value courseware development.

1.2 Teaching Awards

At the outset of this project, we re-read articles written early in the history of the *Premier Award* to remind ourselves of the context in which the Award was created. While the articles (Eibeck's work[6] and Muramtsu's[12] work are prime exemplars) discussed in detail the evaluation criteria and processes, they did not situate the *Premier Award* within the continuum of faculty incentives or rewards within the engineering discipline or within higher education. As a result, we attempted to identify sources that discussed the role or impact of awards on faculty careers (including promotion and tenure); that provided a comprehensive list of awards given by higher education institutions; and that identified the role of awards in changing work culture within higher education.

A preponderance of the literature (i.e., approximately 3,700 citations from the ERIC database) associated with awards and faculty, concerns awards for teaching excellence, the majority of which are conferred at the campus level. Much of literature, especially that during the time framework in which the *Premier Award* was created, focuses on the role of such awards, how to implement them, and how they were intended to impact a faculty member's career. Few if any articles were research based, meaning little empirical research had been done on questions similar to those of this study. Much of the discussion is strongly related to the emerging Scholarship of Teaching and Learning (SOTL) movement that began in the 1990's. SOTL discussions center around how providing rewards might bring into the balance the reward systems for teaching and research that at that time, more heavily rewarded research, with faculty members risking promotion and tenure should they chose to focus on teaching and learning.[4]

Recent studies of the impact of these types of programs show decidedly mixed results suggesting that promotion and tenure was and still is elusive, though not unattainable for those who chose to focus on the scholarship of teaching and learning. [4, 17] These studies also point out the lack of consistency in terms of the criteria used for such review at the department and campus levels as well as regional and national. [2, 3, 5, 17] Hattendorf-Westeney[10] writing in 2000, an early stage of the *Premier Award,* provides some context for how novel it was to use information technology in the classroom and for scholarly publishing, and how this affected faculty in the promotion and tenure process. The result was not positive – those faculty members who were using technology faced views of technology that were fairly benign, i.e., "simply a means for information delivery" to being recognized as a form of scholarship, depending upon the discipline.

Regardless, at that time, most faculty members reported believing that too much focus on technology and teaching would be detrimental to their careers.

The *Premier Award* however, is an unusual award in that it is not focused on teaching per se, but on technology development, that is, the courseware itself. In this case, the focus is on the quality of the learning materials not teaching, and one of the important criteria for the award is its potential for use by other faculty members, not just the person who design and used it. We found a decidedly large gap in the literature (no results) when searching for awards associated within this type of category. When established this type of award was unique. It should be noted that since then, other digital libraries most notably, MERLOT (www.merlot.org), have instituted similar awards.

2. Research Methods

The research design of the study relies upon collecting and analyzing data from a variety of sources including: content analysis of the dossiers submitted for the award (winners and non-winners), interviews with the lead authors of the award winning dossiers, secondary authors, and citation analysis of articles associated with the authors and developers. Glaser and Strauss's[9] content analysis methods associated with theory building guide the content analysis.

2.1 Citation and Dossier Analysis

For the first phase of the research, we focused on addressing questions: how has receipt of the *Premier Award* impacted the awardees' career paths and why? How has the quality of the courseware submitted changed over time? And, what kinds of dissemination activities and mechanisms are successful in promoting successful adoption and use of courseware? Content analysis was conducted on primary source material, the dossiers submitted by award applicants, supplemented with secondary sources such as applicants' teaching or personal websites and websites created specifically for the courseware.

Since 1996, *Premier Award* applicants have prepared a dossier that includes a narrative (Figure 2) and that addresses the PA Evaluation Criteria (Appendix A). From 1996 to 2010, 120 dossiers were submitted. From this group 22 award winners and two finalist candidates were selected for analysis.

The dossiers contain a trove of semi-structured data that, while not always consistent in level of detail, provide a foundation for

Figure 2: Outline of Dossier Contents
- Description of the impact of courseware;
- Description how the courseware is used by learners and include supporting materials;
- Description of activities used to assess student learning through use of the courseware;
- Statements of Reference from instructors other than the author(s);
- Journal or conference papers describing the courseware and its use;
- Evaluation instruments and results;
- Supporting materials to assist the judges in evaluating the courseware.

identifying changes over time in such areas as: courseware development (i.e., pedagogical design and technology platforms); strategies used to disseminate innovations in engineering education; and, methods to assess courseware impact in the classroom.

2.1.1 Citation Analysis
One of the first data collection activities for the project was gathering citations for an analysis that would contribute to our understanding of how the courseware was disseminated and used by other instructors. The goal of this effort was to determine if applicants continued to publish about their courseware after receiving the *Premier Award* and if those articles were further cited by other authors. Active and continued publication records by applicants would demonstrate continued involvement in teaching innovation and scholarship as well as help determine how adopters found the courseware and learned how to use it.
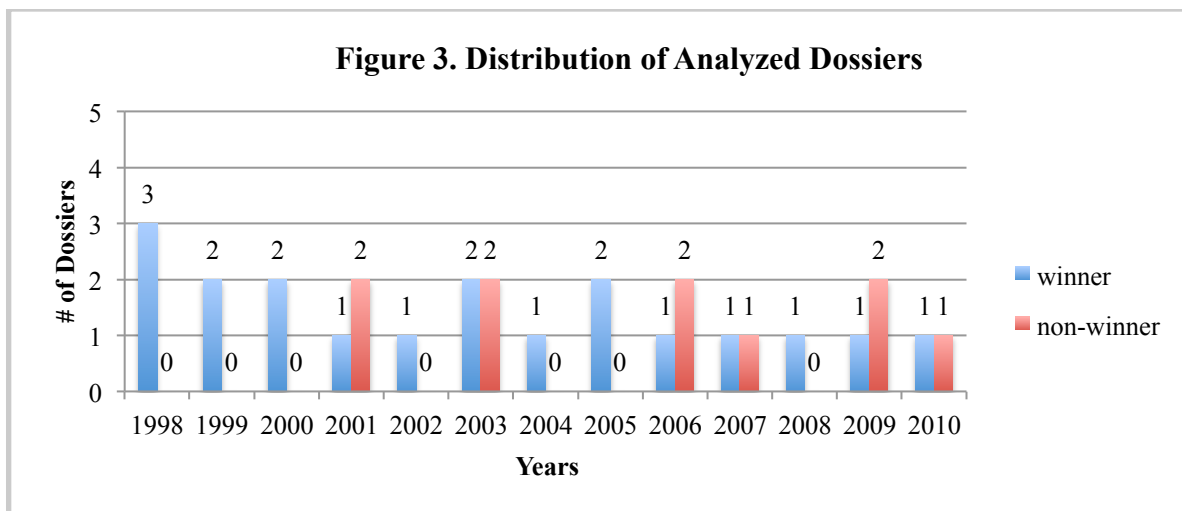
Beginning with citations listed in the dossiers of award-winners, we searched the ISI Web of Science, a database that indexes over 8,300 major journals across 150 disciplines in the sciences beginning in 1900 and that indexes conference proceedings since 1990. Many of the journals in Web of Science "count" for tenure and promotion. However, searches for applicant's names, article titles, and courseware name yielded zero results. By cross checking the ISI journals and conferences list, we determined that many publications about courseware are not indexed in ISI Web of Science. That the publications were not catalogued in the ISI suggests that faculty members' perceptions about scholarship in this area not being recognized in promotion and tenure processes may be correct. This perception will require further checking with the next round of interviews. Further citation analysis is in progress, with the citations being checked by hand; the goal being to create a complete record of publications/presentations that more clearly outlines dissemination paths and efforts.

2.1.2 Content Analysis
In conducting the in-depth analysis of the dossiers we examined a sample that included the majority of winning dossiers and a subset of non-winning dossiers. All 19 award-winners from 1998-2010 were included in the sample. The three first-year awardees were eliminated from the review since it was the first year of the award, still a pilot program and two of the winners sit on the project's Advisory Board. The 2011 submissions were not analyzed because they were under review by the judging committee at the time of the analysis.

We included a subset of 10% of the non-winners to ensure that findings were indicative of the broader field of engineering courseware applicants and to test the coding scheme for future review of all dossiers. To generate the sample of non-winners, we submitted an alphabetized list of the 100 author surnames to random.org, which put the names in a random sequence. We then took the first 10 names. As a result, some years were not represented while other years included two non-winning applicants. One possible reason for this is that some years had more applicants than others.

Two researchers on our team divided the total pool of 29 dossiers and iteratively developed a *Premier Award* Dossier Codebook. Prior to coding all dossiers, both researchers read and coded one dossier to test the reliability of the coding and Codebook. Figure 3 shows the distribution of dossiers in the sample.

Figure 3. Distribution of Analyzed Dossiers

A bar chart titled "Figure 3. Distribution of Analyzed Dossiers" with the y-axis labeled "# of Dossiers" (0 to 5) and the x-axis labeled "Years" (1998 to 2010). Blue bars represent "winner" and red bars represent "non-winner."

Year	winner	non-winner
1998	3	0
1999	2	0
2000	2	0
2001	1	2
2002	1	0
2003	2	2
2004	1	0
2005	2	0
2006	1	2
2007	1	1
2008	1	0
2009	1	2
2010	1	1

2.2 Interviews with Awardees

The second phase of the research (currently ongoing) consists of conducting telephone interviews with award-winning applicants to examine the impact of the award on their careers and the impact of their dissemination efforts. To date we have conducted 14 interviews with dossier applicants, with one applicant declining to be interviewed. Interviews are semi-structured, one-on-one conversations between a researcher and an applicant. The interviews are retrospective in nature and cover: the motivation for creating the courseware; efforts and strategies used to disseminate or share it with others; success of dissemination efforts to date; and awardees' impressions of the impact of the award on their careers and engineering education. A major section of the interview consists of discussing the level to which receiving the PA supports awardees' teaching and educational research. The interviews are recorded and transcribed, and coded using the coding software, NVIVO 9.2.

3. Summary of Preliminary Results

Our analysis has focused on learning about the awardees' perceptions of the impact of the award on their career paths, the kinds of dissemination activities they have undertaken and how the courseware has changed over time. Though data collection and analysis are not yet completed, trends are emerging. In the following sections we expand on our understanding of these early results.

3.1 Impact of Receiving the Award on Academic Career Paths

To examine the impact of the award on careers, we focus on data from the interviews. The participants in the interviews conducted to date represent a range of possible faculty career paths (Table 1). Several interviewees who received the *Premier Award* over a decade ago are now retired, nearing retirement, or have assumed administrative leadership positions. Other interviewees are at an early- to mid-career stage because at the time of the award, they were graduate students members of the development teams. Even as graduate students, they often led the development and research associated with the courseware.

One emerging pattern reflects how the award has been used to shape an awardees' career. A number of interviewees suggested that for them, the award represented "outside" confirmation of

their teaching ability. The award also gave them what we have come to call: 'street cred', meaning that their work had been deemed credible by experts in their field. Respondents deemed having this kind of credibility bestowed upon them regarding teaching, amongst peers or employers, with peer review committees, tenure and promotion committees, or in the case of graduate students, hiring committees was extremely important. One professor noted:

> *"…it is really nice to be able to…mention the Premier Award. Like if you're proposing a workshop to a conference... you can put that [winning the PA] right in there [the presenter's qualifications], and it is clear that it is directly tied to the content you're proposing. I believe it helps."*

This interviewee then went on to describe how important it had been in his tenure case.

> *"You needed external recognition of the value of your work in order for people to take it seriously. If you wanted that to be an important part of your record….And so from that point of view, I saw winning the Premier Award as one important piece of evidence in showing external recognition of the value of my education work."*

Table 1: Career Stages of Interviewees at time of Award and Interview

Previous Position (from Dossier)	Current Position (2011)
1998: Assistant Professor	Associate Professor & Associate Dean
2000: Professor	Professor and Department Chair
2000: Professor; Department Chair	Professor
2001: Professor	Professor Emeritus
2003: Graduate Student	Associate Professor
2003: Graduate Student	Associate Professor
2005: Assistant Professor	Associate Professor
2005: Professor	Professor
2006: Assistant Professor	Associate Professor
2009: Associate Professor	Associate Professor

One graduate student described his submission of the dossier for the award and follow-up scholarly activities (he wrote several articles and did his thesis concerning the courseware) as part of his plan to highlight his expertise in the area to future employers.

> *"Here I am a graduate student….it would be nice to have someone who knew something about education and treated that as kind of their subject matter of expertise to look at this and say: … it actually has educational value in and of itself….It actually served to legitimize some of the this stuff in academic circles….I got a job."*

While another graduate student said that working on the courseware and winning the award helped direct a research path in graduate school and ultimately his career:

> *"I can say in working on this particular project, and when I went to graduate school at [University] out of undergrad, I hadn't solidified what part of [the discipline] I was interested in. ...through working with [Professor] on this project and the recognition that came from the Premier Award, in my head it got me thinking this is actually the kind of field... I'm most passionate about."*

Interviews also reveal the award is used as a means for making change at the department or campus level with regards to the scholarship of teaching. These interviewees tend to have won the award in it early years. One interviewee described the use of the award for this purpose in this way:

> "...a motivation for applying for the Premier Award was an attempt to put forward the software itself as a scholarly product independent of any publications about the software....my intent here was to show that the software itself should be counted as scholarship because it was in itself a scholarly product ... vetted with respect to legitimate scholarly criteria by an external agent...I wanted to make that point in having the Premier Award as an external validation of the scholarly caliber..."

In contrast, a number of the more recent awardee's described their campuses as being schools where, in comparison to other institutions (particularly research institutions) teaching is more valued. Here again the award gave them or added to their credibility in the field and they saw it as a culmination of their efforts.

> "...at the University...and my department, there was a lot of recognition for doing this type of work around education and [name of department] and technology development....I would attribute it to an enlightened attitude in the computer science department and in the engineering college at [the] University... I don't know if I would have been able to do as well at other universities doing the types of things that I've done around educational technology."

The award also seems to provide faculty members with a symbol of prestige. Those faculty members more advanced in their careers have so far expressed that they were proud of the award and have over the years, displayed it prominently. –

> "...from a personal point of view, I'm proud of it, very proud of it. In fact, I still have the award in our display case…. It's been in there for what, 12 years now…. It is something I'm fairly proud of...."

Others gave credit to graduate and undergraduate students who worked on the project. In several cases, the project work was conducted by graduate students who also did educational research on the project as part of their thesis work or dissertations.

However, some award-winning faculty experienced negative reactions regarding their approach to educational scholarship as research. One was encouraged to pursue working on courseware by a supportive administration. However, when the administration changed, the work not only was discouraged, but the faculty member seemed to have been penalized. One other interviewee confirmed having this type of negative response to his work. Both noted however, that it felt good personally, to win the award, but it was neither acknowledged nor rewarded by their campus or the department. The faculty member pursued it as a labor of love, but would not recommend others pursue this path in engineering education:

> "...but I still think that if I were going to suggest a student's research area as an untenured faculty member, I might say, 'you might do a little bit of work in education, but it's probably not where I would hold my focus,' at least…. and again, that's from an older

faculty member, 'unless you can find... those specific universities to hire you because of that activity."

3.2 Changes in the Quality of Courseware

To determine if there were changes in the quality of the courseware, the dossiers were examined to identify the type of courseware submitted and to categorize the evaluation activities that applicants undertook. Interviewees were asked to describe subsequent evaluation activities and results, especially with regard to student learning.

3.2.1 Courseware Types

The classification scheme (see Figure 4) that was used to code the courseware was based on categories suggested in previous research on digital resources[13] combined with the cataloging scheme used by the Engineering Pathway.[7] The courseware analyzed covers a range of types and often could be classified as more than one type, e.g., an animation might also be categorized as a game or tool. We observed that applicants from 1998-2003 created courseware materials that were whole Curricula, ranging in length from a whole semester to a few weeks. These modules were self-contained environments with the courseware and all content delivered on a CD-ROM. One possible reason for this is that the Internet was still not a primary distribution channel for education materials and that the pedagogical style involved going "to" a place to learn.

Figure 4. Types of Courseware Submitted
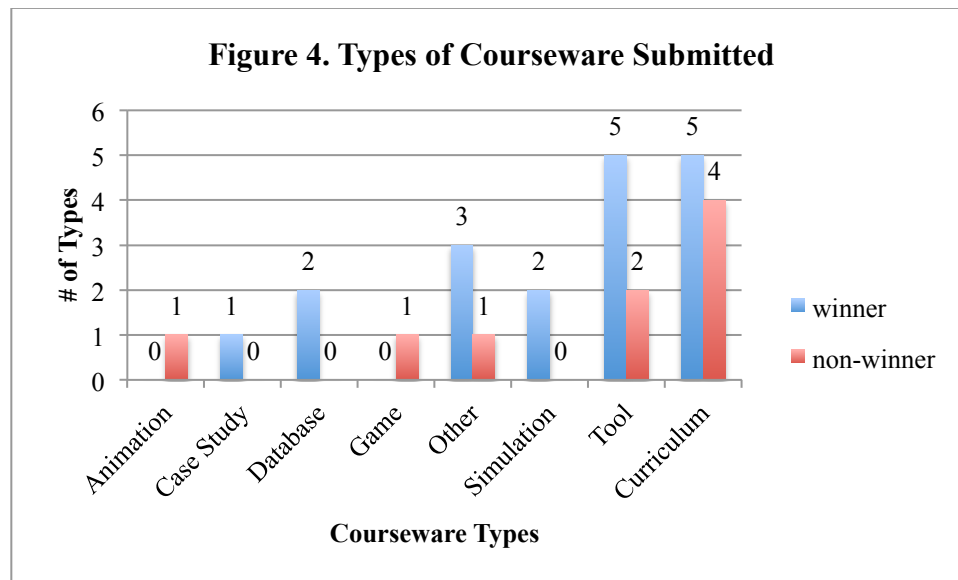
Dossiers from 2002-2003 were online courses or "learning hubs" and are represented as "Other" in Figure 4. From 2004 until 2010, courseware types shifted towards Tools (i.e., software), Games, and Simulations. This shift is perhaps indicative of multiple factors including: new or better understanding of pedagogical approaches, growing programming skills of the developers of the courseware or that the software used to create courseware was becoming more flexible. During this timeframe, the technologies available for faculty to use to develop courseware and pedagogical approaches changed rapidly – for example, use of video in the early years was quite cumbersome, but by 2008 YouTube made it significantly easier to link multimedia with courseware. Regardless, by 2009, it appears that courseware submissions that tended to be more traditional curriculum were reviewed less favorably than in previous years. At this stage in the

analysis, it appears that with the rise of the web, courseware has become less platform-dependent, more tool-like and focused on discrete concepts.

3.2.2 Courseware Assessment Factors

As part of the coding, particular attention was paid to the evaluation and assessment efforts that were reported by applicants. Over the years, it appears that *Premier Award* applicants have become more adept at using assessment and evaluation language and describing their efforts. This may be the result of two factors, applicants are more involved in assessment and evaluation and therefore their change in language reflects a more sophisticated understanding of these activities, or applicants have become more adept at responding to dossier criteria. This later factor may be a result of a 2005 recommendation by the *Premier Award* Review Committee that more emphasis on evaluation and assessment be made in the Award guidelines and judging criteria. Regardless, when analyzing the evaluation methods described in the dossiers, we found that few sophisticated assessments were done, particularly with a goal of identifying changes in student learning. For the most part, applicants relied upon student satisfaction or usability studies as indicators of courseware success (Figure 5).

Figure 5. Courseware Assessment Factors
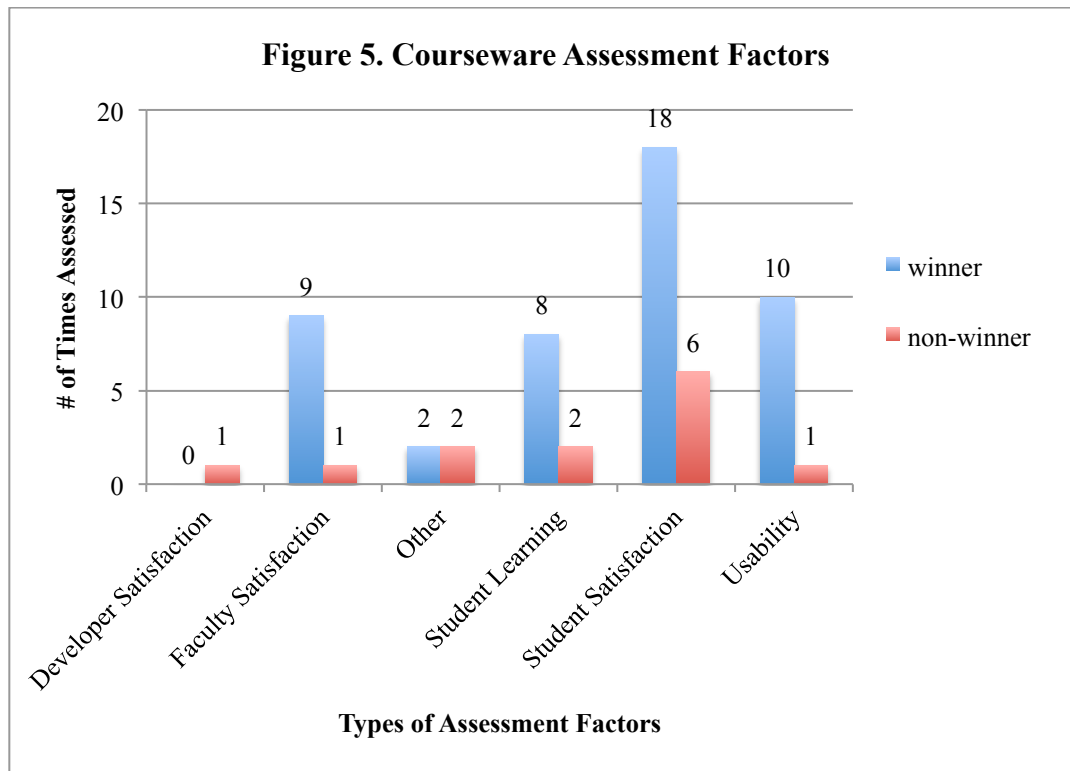
Applicants gathered evaluation and assessment data from students largely through surveys. They also gathered testimonies and anecdotal feedback via informal interviews from faculty colleagues (and their students) who had used and adopted the courseware in their own classes. Some courseware developers conducted usability observations or interviews, but few conducted research on learning using experimental or quasi-experimental methods. It should be noted that a number of the assessment and evaluation efforts were well designed and their results were quite

powerful. But still, a number of interviewees noted a level of frustration with evaluation of such projects, suggesting that they "do what they can."

Our follow-up interviews indicate that evaluation and assessment activities were integral to courseware development, perhaps more than was reported in the dossiers. In one case, applying for the award prompted a round of evaluation that took the courseware "to the next level":

> *And we started to look over the requirements, and, in fact... we saw that we were sort of lacking in a few areas. And, actually, coming up with our submission to Premier Award, we really did refine our materials that we had.*

3.3 Dissemination Activities and Mechanisms

The data from the dossiers used for citation analysis indicates that the web is consistently used as a dissemination mechanism. Every award-winning applicant, save one, included a website. Review of faculty and courseware websites showed that early sites contained only supporting materials for curricula-based courseware, not the courseware itself. (It should be noted that at that time, some materials were only available via CDRom.) More recent award-winners host the courseware itself on their personal or campus supported websites. We were not surprised to find that some of the courseware URLs in the dossiers contained dead or redirected links. But, we were surprised at how recently this occurred – the latest date for a redirected site being 2009, and 2008 for a dead site.

Figure 6. Courseware Dissemination Methods
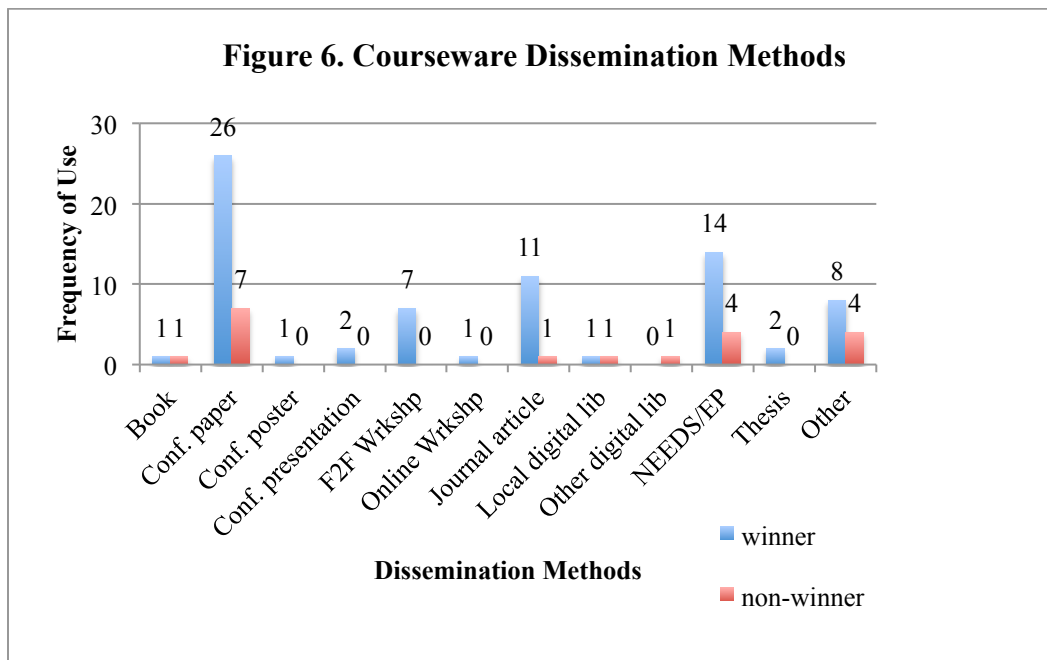
The dossiers also indicate that applicants overwhelmingly employed traditional scholarly dissemination methods such as writing and presenting conference papers and journal articles (see Figure 6). Reliance upon these as the main dissemination activities is not unusual and is consistent with other research on dissemination.[18] There is some irony associated with this reliance on writing for journals, given comments by several of our interviewees, the lack of

highly ranked journals in the ISI Web of Science and the literature, all of which suggest a lack of value for this type of scholarship.

Like courseware evaluation activities, when discussing dissemination, the interviewees expressed a sense of frustration. One explained to be successful in encouraging adoption of the courseware:

> *It requires continual effort. You basically have to do stuff every year to keep things growing.... One of the things that we tried... was to do things that were different than just ... publish some conference papers. So when we started early on we tried to build a community driven website.... Then we branched out into offering workshops at... education conferences because that would be the main target audience for our particular courseware.*

However, another interviewee said that one of the benefits of winning the award was the assistance in disseminating courseware:

> *I remember thinking it would be nice if we got this recognition and other people heard about [the courseware] through the Premier Award as way to promote the tool use more broadly. I think back in the first... conference I went to [I learned that courseware] copies will be on CD. ...Sending copies to all kinds of places across the country, that in my mind was a really neat advantage and a thing that... you wouldn't get otherwise.*

4. Conclusion

The ultimate goal of this research is to uncover factors affecting the career paths of engineering education innovators in the development use of technology in teaching and to determine how a national award might impact the appreciation of this kind of scholarship and its use by others. Analysis of the dossiers has shown that there has been a change in the types of courseware submitted for consideration and that receive the award – shifting from large modular types of curricular materials to more tool-like applications. This shift seems to be consistent with the use of technology in engineering and science education in general. Based on the analysis of the dossiers alone, it appears that the evaluation and assessment of student learning remains a challenge for developers of courseware, even though there has been a significant focus on this in STEM education over the last 10 years. Dissemination efforts also remain loosely defined and serendipitously implemented, though the literature indicates that several courseware design factors are important in terms of supporting adoption by other instructors, such as including a statement of learning objectives or provision for instructors' manuals as well as that the courseware hold the interest of a diversity of learners.

Initial interviews have revealed some patterns or themes that we believe will persist in the rest of the interviews regarding the impact of the *Premier Award* on applicants' careers. Similar to Turner's[19] study regarding awards, we found that the award provided winners with more opportunities to advance their work, gave them credibility amongst their peers and review committees and may serve to help change perceptions about this work from negative to positive. Based on this initial set of interviews, it appears that the *Premier Award* is viewed as prestigious and has been instrumental in furthering and focusing the careers graduate students and young faculty members. Similar to Orczyk's[15] 1990's examination of critical-career events framework,

the interviews are suggesting some impact in terms of the award opening up doors to new or different opportunities as well as impacting the winners' self-efficacy.

This research will add a rich descriptive component to what is known about the careers and career paths of engineering faculty members who engage in innovating in their teaching both with regards to pedagogy and development of computer-based learning tool development. The final aim of the research is to describe any observable shifts in the value engineering education places on teaching with technology. The *Premier Award* may be only one aspect of that shift, but since it has fairly high visibility within the engineering education and computer science professional societies, it may prove to be a reliable marker for observing new trends on the development, dissemination and use of innovative practices, their acceptance in engineering education and their impact on changing the academic environment to one that recognizes and rewards teaching and the scholarship associated with it.

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Appendix A. Details about the *Premier Award*

Each year since 1996 a call for submissions to the *Premier Award for Excellence in Engineering Education Courseware* has been made through various channels, including the ASEE publication *Prism* and email announcements to Engineering Deans and Department Chairs. Judging is conducted in the summer with the *Premier Award* being conferred during a luncheon at the annual Frontiers in Education (FIE) conference. The Award has also received financial support from various industrial partners including John Wiley and Sons, Microsoft Research, MathWorks and TechSmith.

The *Premier Award* Selection Criteria have been refined based upon the original criteria recommended by the Quality Review of Courseware Committee in 1995. The full criteria can be found at the Engineering Pathway website, www.engineeringpathway.com (see Evaluation Criteria).

Premier Award **Selection Criteria**

1.0 Instructional Design
      1.1 Learning Objectives: Learning objectives and goals are clearly stated and supported by the software and learning experience.
      1.2 Interactivity: The learner is actively involved in the learning process—the interaction enhances learning.
      1.3 Cognition/Conceptual Change: Learning appears to be significant and long lasting—strong and useful cognitive models can be built.
      1.4 Content: The content is well chosen and structured.
      1.5 Multimedia use: Multimedia is used effectively and promotes the learning objectives and goals.
      1.6 Instructional Use/Adaptability: The software can be used in a variety of settings.

2.0 Software Design
      2.1 Engagement: The software holds the interest of a diversity of learners.
      2.2 Learner Interface and Navigation: The software is easy to use.
      2.3 Technical Reliability: The software is free from technical problems.

3.0 Engineering Content
      3.1 Accuracy: The content is accurate and error free.
      3.2 Appropriateness: The content is appropriate for the scope of the Premier Award.