Learning From Personal Experience What's Needed in Information Literacy Outreach: An Engineering Student Returns To Her Alma Mater As An Engineering Librarian

ABSTRACT. *An engineering background may not be required for successful outreach projects, however, when coupled with a review of the relevant literature of sci-tech librarianship; it can certainly facilitate "buy in" from the faculty in a way that promotes the American Board of Engineering and Technology mandates to foster lifelong information literacy skills in their students. After having established rapport with the faculty through providing them with specially tailored research and current awareness support, library outreach was then directed towards their graduate students. Success with these two influential groups is now being used to expand both in-person and wireless opportunities to grow the fact-finding confidence and competence of the undergraduates they teach and advise.*

KEYWORDS ABET Criteria, Accreditation, American Board of Engineering & Technology Criteria, Engineering Education, Engineering Information, Information Literacy, Library Outreach, University of Akron Science & Technology Library

INTRODUCTION

In a 1998 survey, Winston (2000) found that less than 4% of academic science and engineering librarians have at least a bachelor's degree in an engineering discipline. An undergraduate or graduate degree in engineering certainly provides a strong technical background that can help librarians serve the needs of that population of library users. In a survey of academic librarians by Mayer and Terrill (2005), 56.55% of respondents felt it is advantageous for a librarian to have an advanced-subject degree for certain positions. Several

survey respondents believe that an advanced-subject degree improves job performance, some specifically mentioned the areas of reference and bibliographic instruction. In a survey of newly hired science librarians conducted by Beck and Callison (2006), several respondents mentioned the critical need for a science librarian to understand the terminology of relevant scientific fields, understand the flow of scientific literature, and have credibility with the faculty. Academic credentials in a subject discipline in addition to a MLIS increases the likelihood that a science or engineering librarian will possess knowledge in all of these critical areas.

Perhaps even more than the subject knowledge, prior experience as an engineering student provides an understanding of the engineering culture. Businesses spend a great deal of time and money marketing their products. There is a cultural facet that determines what entices their target consumers to buy. Similarly, enticing engineering students and faculty to use library services requires an understanding of the engineering culture which informs students' needs and expectations. Engineers often seek information to solve a particular problem and are subject to a looming deadline (Pinelli 2001). The variance in job requirements will effect what information is needed (Pinelli 2001). An engineer working in research and development will use information differently than an engineer in a manufacturing setting. In a similar vein, engineering students use information differently throughout their education due to varying needs driven by the curriculum (Keeran et al. 2007).

In 2008, I assumed the Applied Science Librarian position in The University of Akron (UA) Science and Technology (S&T) Library. The position responsibilities are collection development, reference, and instructional outreach to the departments of computer science, electrical and computer engineering, and mechanical engineering. From the very start, my

director and faculty colleagues put a particular premium on building rapport with the engineering faculty that would translate into successful information literacy programming.

I had the advantage of my own background as an undergraduate and graduate student in the UA College of Engineering (COE) and three years of industry experience as a control systems engineer. Although my experiences as a student do not necessarily mirror every student experience, I believe they have helped.

AN ENGINEEERING UNDERGRADUATE'S LEARNING STYLE & LIBRARY USE, OR LACKOF IT

As an undergraduate engineering student, my coursework focused on applying techniques and theories learned in class. I was unaware of the ways in which knowledge of the library could have helped in my studies; thus, my library use was minimal.

Practice makes perfect, so to prepare for tests, many problems were solved. When the problems from my textbook were exhausted, a quest for additional problems was undertaken in order to prepare for any conceivable question on the exam. Knowledge about library resources would have facilitated acquisition of additional practice problems to reinforce what was covered in class.

Writing was required for my English and engineering classes. The style of writing taught in English was very different from the writing required in engineering. Engineering writing assignments required the preparation of technical laboratory reports. Library resources on technical writing would have aided in writing formal lab reports.

One course elective in microprocessor interfacing required a project that entailed a great deal of computer programming. Programming texts available in the library would have been helpful,

not to mention the advantage of access to technical e-books like those in Safari Online that are available to today's students.

GRADUATE SCHOOL INFORMATION-SEEKING: MORE AWARE OF THE LITERATURE BUT STILL NOT EFFICIENT AT FINDING IT

My graduate coursework differed from my undergraduate coursework in that nearly all my courses required a project. These generally consisted of searching for and reviewing a paper. This was my first realization that I must make use of the library. Initially, I thought that literature could be found without any assistance. Many engineering students are independent learners (Hsieh and Knight 2008; Williamson 2003). Unfortunately, technical know-how can be mistaken for information literacy (Nerz and Bullard 2006). Finding a paper to review was more difficult than initially assessed and some direction was needed. When asked, the engineering faculty recommended several relevant journal titles. Literature supports that this scenario is not uncommon (George et al. 2006; Keeran et al. 2007). With faculty direction, my research was underway. I remember sitting on the floor in the stacks browsing journals to find papers to evaluate for my projects. Additional literature on my topic was found by using the references in the articles at hand. Using the references was a great idea; however, more papers on my topic would have been located with the use of the appropriate subject indexes and databases.

Like many graduate engineering students at UA, I took the thesis option. Writing a thesis requires thorough research of the existing literature on a topic. As a starting point for my thesis research, my advisor directed me to a book containing a collection of articles from a prolific author in a topic related to mine. As in the case of my course projects, more references were found from references of relevant papers. I learned of electronic indexes and databases late in the process of writing my thesis. Initiating a comprehensive search at that time delayed the

completion of my thesis and degree, which was very stressful. I also faced the serious concern that published material could have been uncovered that rendered my topic unusable. Fortunately, no such information was found in my case. As is clear from my narrative, library instruction would have greatly reduced my time in learning the library system, and would have helped me use these resources at the appropriate stage of my research. More thorough searches could have been produced in less time and awareness of current literature in my topic could have been achieved more efficiently.

ACCREDITATION STANDARDS & THE PROFESSIONAL LITERATURE OF SCI-TECH LIBRARIANSHIP MANDATE DEVELOPING COMPETENCE IN INFORMATION SEARCHING

In addition to reflecting on my own ignorance of library resources during my student days and with the benefit of graduate work in library science, a review of recent literature on library instruction for engineering students was conducted as part of my preparation for developing an outreach plan.

As a student the influence of accreditation standards on the engineering curriculum was unknown to me. As a librarian I now know the important influence of accreditation. My literature review began by looking at the accreditation standards for engineering programs. The Accreditation Board for Engineering and Technology's (ABET) *Engineering Criteria 2000* now includes a criterion for lifelong learning (Nerz and Bullard 2006; Oxnam 2003; Williams 2001). This criterion reinforces the need to teach engineering students about the variety of information resources available to them, and about research and searching skills. Williams (2001) discusses how the ABET criterion for effective communication has lead to an increased integration of writing into the engineering curriculum. Writing assignments often require a search of the

relevant literature including technical reports, patents, journal articles, and conference proceedings. In addition to curricular changes encouraged by ABET, Rodrigues (2001) points out a corresponding increase in industry expectations. The newly employed engineer is expected to "hit the ground running," which is not possible without the ability to locate accurate information quickly.

Recent library literature on outreach to engineering students suggests that thorough, organized, and practical instruction will be the most effective (Williamson 2003). Several studies investigate the personality of engineering students and conclude that the most prevalent personality type prefers active learning and competition, as well as logical explanations for observed behavior (Hsieh and Knight 2008; Williamson 2003). Engineering students frequently want logical explanations of why they are seeing a behavior, why a theory is valid, and why it is important to them. Because engineers are often independent learners (Hsieh and Knight 2008; Williams 2001), marketing a seminar for this group would benefit from an approach that emphasizes the idea that seminars develop skills more quickly, even if the material could be learned independently. Being a former engineering student and of that mindset, the value of attending training was realized over time. Often the lesson learned was that I was doing something the hard way!

Quigley and McKenzie (2003) suggest using "hooks" to get the students' attention. The hooks should be related to what is important to students, such as how the instruction will aid in research, and how the instruction will save time. Practical-minded engineers want to find the necessary information in the least amount of time possible. Project deadlines and workload necessitate rapid acquisition of information for students and working engineers alike (Keeran et al. 2007; Rodrigues 2001).

WHEN INITIATING A PROGRAM, START WITH FACULTY BUY-IN

My experience and reports in the literature confirm that engineering students consult with the faculty when seeking information (George et al. 2006; Keeran et al. 2007), but if the faculty does not communicate the important role of the library in providing assistance and access to research content, the students are not likely to discover it for themselves.

Sometimes it is difficult to get "buy in" from the faculty. However, many of the faculty knew about my academic performance as a student in the Department of Electrical and Computer Engineering (ECE). A librarian without this connection can certainly develop a successful faculty outreach, but I feel that my technical background made this initial outreach easier. This assumption has support in surveys of academic librarians who have indicated that subject-specific background increases a librarian's credibility with the teaching faculty (Beck and Callison 2006; Mayer and Terrill 2005).

A very short survey was e-mailed to the faculty in order to determine a level of interest consisting of the questions below.

1. What are your research interests?
2. Do you use Springboard for your classes?
3. Do you think online tutorials or a class visit from me would be helpful to your students?
4. Are there particular services or databases that you would want your student to know?
5. Any other comments or suggestions?

The responses revealed that the faculty members had an interest in improving information literacy instruction. All respondents wanted online tutorials, while half of the respondents were

already using Springboard, the web-based learning management system. Two faculty members showed interest in a workshop on conducting a literature review. The survey indicated a strong interest by one faculty member in receiving "table of contents" (TOC) alerts for his research group which consists the professor and his numerous graduate students.

For these TOC alerts, members of the group provided me with a list of the most relevant journals from IEEE, ACM, Elsevier, and Springer. A listserv was configured and subscription instructions were e-mailed. The easiest solution was to create TOC alerts for the relevant journals and have them delivered to my email account. Upon receiving them, extraneous matter was removed and the TOC alert was forward to the listserv.

REACHING STUDENT LEARNERS IN THE VIRTUAL WORLD IN WHICH THEY LIVE

Since the faculty survey respondents wanted online tutorials, several were created that offer assistance in finding articles in specific subject databases and tools available when keeping current with literature on a research topic. The design was influenced by lessons learned from literature about student learning styles (Hsieh and Knight 2008; Quigley and McKenzie 2003; Walker 2006; Williamson 2003). Examples were chosen based on my knowledge of the engineering curriculum and my industry experience. Active learning was integrated by providing real research questions at the end of each tutorial. The students could view hints if they chose. In the tutorial, it was stressed that the hints contained some of several possible solutions, which reflects real life situations (Hsieh and Knight 2008). Structured and logical explanations of tasks were provided whenever possible (Williamson 2003). Information that would be known by some library users and not by others was included in popups in order to

provide the information to those who needed it without distracting those who did not. Distractions and boredom could inhibit use of the tutorial or future learning resources. Springboard Learning Objects were created to enable professors to collocate the tutorials with their course information.

MORE THAN JUST ANOTHER AVATAR: GETTING BOOKED AS A LIVE PRESENTER TO GRADUATE STUDENTS

A discussion with the departmental liaison to the library about ECE students' library use and faculty member interest in a literature review workshop lead to the possibility of library instruction for graduate students. It was decided that the rest of the faculty should be consulted in selecting the best forum to maximize student attendance. Due to the full agenda of ECE departmental meetings, my presentation was scheduled several meetings ahead and limited to less than ten minutes. After the brief presentation proposing graduate library instruction based on my experience as a student, the findings from my literature search, and the faculty responses to my initial survey, the faculty discussed experiences with advising students on conducting a literature review. The faculty agreed that a library instruction session for graduate students on conducting a literature review would be beneficial. The faculty agreed that both they and graduate students would use research time more effectively and efficiently if students were made aware of appropriate resources and research skills and tools as they began their thesis research.

A forty-five minute seminar style presentation directed to graduate students was developed and then fine tuned with a faculty member to fit the faculty's expectations for student research. The goal of the presentation was to inform ECE graduate students about the resources available to them that can support their literature review. In a live demonstration, searches based on a

specific topic were performed in *IEEE Xplore*, *ACM Digital Library*, and *Web of Science*. The students were also shown how to use the Web site to find other databases relevant to their subject area. B*ibTeX*, *RIS*, and *RefWorks* were introduced.

Based on previous experience, the importance of being thorough throughout the process was stressed. For example, the student can produce a more thorough search by using multiple databases and using TOC alerts for awareness of new literature produced while working on the project. A Microsoft PowerPoint presentation was made available on the library's Web site for reference after the presentation. In order to facilitate student attendance, this presentation was included as part of an event that all ECE graduate students were required to attend. A hands-on presentation would have been the preferred instruction method; however, it was not possible within the selected forum.

In order to assess learning and get a snapshot of student response to the event, the concept of the one minute paper used by Quigley and McKenzie (2003) was adapted to create an electronic poll consisting of two questions: "Please describe something you learned from this tutorial" and "Please describe something that could be improved or any other comments." The electronic questionnaire was designed to be convenient and brief with the incentive of possibly winning a gift card in an effort to increase the number of responses (Duke, Hartman, and Locknar 2006; Walker 2006). About forty percent of the graduate students participated in the survey.

The response pool gave a wide variety of responses concerning their current level of library knowledge and how they would like the library information presented. Survey respondents indicated that they learned about new databases, and how to use the library Web site to find databases. In addition, they reported learning how to access electronic resources off-campus.

Those with little previous experience with library databases stated that they learned how to search more effectively. Others learned about ways to use our interlibrary loan system.

Many thoughtful and valuable suggestions for improvement were made. Some students wanted specific in-depth instruction for certain tools, such as how to construct searches in *IEEE Xplore* or how to effectively use *RefWorks*. Others only wanted online help, and wanted the presentation to emphasize locating online help. While existing tutorials are in PDF and HTML format, several students wanted videos. The survey reinforces what the research literature reports (Hsieh and Knight 2008; Quigley and McKenzie 2003; Walker 2006; Williamson 2003). Format preferences and learning styles of our students vary, with many preferring an active learning approach.

Given the success of the presentation, it will continue to be conducted annually. In future sessions, some students will have already seen the presentation. To account for this fact, the faculty and I were considering allowing students to choose from several multiple targeted sessions for the library portion of the requirement.

FACULTY& GRADUATE ASSISTANT REFERRALS + INSTANT MESSAGING BUILDS RELATIONSHIPS WITH UNDERGRADUATE STUDENTS

During my presentation to the faculty, they informed me of an existing undergraduate course that would help me build student usage of the library as well as my own professional services. Based on ABET mandates encouraging the use of published standards, students taking the course were required to reference an engineering standard when writing their paper. Having now met me, and having built some rapport, faculty teaching this course began referring students to me directly with greater frequency and confidence. Some students dropped by my office in the library and others contacted me using instant messaging. My outreach included the teaching

assistants for this course. They had participated in the graduate literature review workshop, and willingly promoted the use by undergraduates in their classes of my instant messaging service for assistance with this assignment. From the mix of personal and wireless contacts with undergraduates, the faculty and the graduate assistants directly contributed to the students completing the assignment in less time than in the past.

ONGOING SUCCESS WITH UNDERGRADUATES REQUIRES ONGOING SUPPORT OF THE FACULTY & GRADUATE STUDENTS THAT MOST CLOSELY INFLUENCE THEM

Expanding the availability of TOC alerts to individual faculty members would increase the use of the service. This will probably require reconfiguration of the current method employed. One idea is to investigate ways to use Microsoft Outlook contact lists along with other, more automated options.

Additionally, the impact of the literature review workshop could be greater for more students by addressing the ideas provided by the graduate students for future targeted sessions. This might entail giving students the option of which session to attend. Some sessions will be video and others will be face to face. Some will focus on particular resources and others will be an overview.

Finally to identify any other classes with library or research assignments, the faculty will be polled. Based on faculty response, online help or seminar presentations will be developed for each class. In addition, library staff will be kept up to date on assignments to ensure that help is always available to students.

CONCLUSIONS

A cultural awareness of the inner lives of engineering students based on personal experience can be enriched by surveying the general literature of sci-tech librarianship as well as by polling engineering faculty and students on campus. Having the engineering librarian build and sustain a relationship with the engineering faculty and their graduate assistants that they find to be in their professional self-interest gives that librarian greater entrée and credibility with the undergraduates in their care, leading to greater in-person and wireless use of the library and its resources. This ultimately furthers the ABET standards upon which the future of engineering and engineering education strongly depend.

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