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**AC 2011-2139: GAUGING WORKPLACE READINESS: INFORMATION BEHAVIOR AND PREPAREDNESS OF ENGINEERING STUDENTS IN COOPERATIVE EDUCATION PROGRAMS**

**Jon N. Jeffryes and Meghan Lafferty, University of Minnesota, Twin Cities**

# **Gauging Workplace Readiness: Information Behavior and Preparedness of Engineering Students in Cooperative Education Programs**

## **Abstract**

In Spring 2010 we surveyed undergraduate students majoring in computer science or civil, electrical, or mechanical engineering participating in the cooperative education program, a semester-long work placement for academic credit. We wanted to compare the information-related skills they had with those they needed during their co-op assignments as a proxy for workplace expectations. We identified gaps in student preparedness which we are using to work with faculty and staff to address those needs strategically. This paper details three ways in which we are making use of what we learned: development of a teamwork workshop and a portfolio program as well as furthering integration of information literacy into the curriculum.

## **Introduction**

As is true for many engineering librarians, we see a role for ourselves in producing workplace-ready engineering graduates. We focused our attention on students participating in the cooperative engineering program. Based on the similarities between new engineers' and co-op students' work environments, we hoped to extrapolate how ready the average engineering student is for the information-seeking skills and tasks required in their first post-graduation job. The Association of College and Research Libraries' Information Literacy Standards shaped our framework, specifically the standard addressing students' ability to "[a]ccess the needed information effectively and efficiently".<sup>1</sup> Using an online survey to learn more about the necessary information skills and tasks, we asked students whether they felt adequately prepared for on-the job information retrieval. This paper details our use of those findings to support the development of initiatives and projects intended to improve student learning that we began as a result of our work.

## **Survey of Engineering Co-op Students**

We conducted a survey of College of Science and Engineering students participating in the cooperative education program during the spring semester of 2010.<sup>2</sup> We initially assumed that at least 100 students participated in the program, but we learned that there were only 42 students enrolled in co-op. Of the 42 who received the survey, we were pleased that 86% responded. Nearly all of the students were junior or senior mechanical engineering majors; we suspect that the assistance of the Mechanical Engineering Department's Co-op Program office with a dedicated staff member contributes to the disproportionate representation.

All respondents were required to perform at least one type of information seeking task during their co-op semester. Of our respondents, nearly all had needed to find a specific fact and more than half had conducted a literature review. The fact that all students had to engage in at least

some information seeking for their co-op employer reinforced our assumptions about the importance of these skills as a component of a comprehensive engineering education.

We asked students about their use of and comfort with five different types of information sources: books, industry standards, journal articles, patents, and technical reports (white papers). A majority had at least needed to find books, industry standards, or technical reports; industry standards were the most frequently required information resource used, followed by books and technical reports. Less than half had been asked to find either journal articles or patents during their co-op experience.

### **How We Are Using What We Learned**

The survey responses and related literature review informed or led to three major Science and Engineering Library initiatives: the creation of a library-sponsored portfolio program, the development of a teamwork workshop for students across campus, and the strategic integration of information literacy skills in the engineering curriculum. The literature review indicated gaps in entry-level engineers' preparedness for the workplace, and the survey gave us data on our own students' information-related needs and behaviors.

### **Portfolio Program**

The Science and Engineering Library was considering creating a voluntary portfolio program for College of Science and Engineering students when we began our survey project. We envisioned the program as a series of workshops, online tutorials, or a combination of both that students could complete, using online portfolio software to collect work objects and other evidence of their achievements. We wanted to address skills in areas ranging from information literacy to technical writing to multicultural awareness. Our goal was to respond proactively to gaps we perceived in the engineering curriculum, ensuring the graduation of well-rounded engineers prepared for the 21st century workplace. Student participation in the portfolio program could occur throughout their entire university career. Upon completing the requirements, a student would have a portfolio highlighting this skill set that they could include in their resume to help set them apart from other new graduates.

Both the literature review and survey results determined potential content for the program. The literature provided data on professional engineers' information usage<sup>3, 4, 5</sup> and gaps in new engineering graduates' skills.<sup>6, 7, 8</sup> The survey informed our understanding of the information-seeking skills in which University of Minnesota students had the least confidence and which currently were not getting addressed, by either instructors or librarians, in the students' courses. We shared a proposal for the portfolio program and our preliminary survey results with college administrators and staff relatively early in the process in order to get their feedback and buy-in. The meeting included the Associate Dean for Undergraduate Programs, the Director of Academic Advising, the Director of Student Programs, the Director of the Career Center for the

College of Science and Engineering, and a new liaison to industry for the College. The survey data provided concrete data on gaps in students' skills and a rationale for developing the program. Overall response to the presentation was positive, and we will keep them abreast of our progress as part of our plan to gain endorsement of the program at the College level.

### **Teamwork Workshop**

Our literature review on engineering students' workplace readiness identified explicit instruction in teamwork skills as an unfulfilled need.<sup>9, 10</sup> Although our survey did not specifically ask about teamwork, we acted on this trend in the literature. One of the survey authors worked with the Science and Engineering Library's instruction coordinator to develop a workshop, *Team Skills: Library Tools for Collaboration*, to address this deficit.

The workshop covers "soft" team skills like meeting facilitation (*e.g.*, effective and energizing ice breakers and brainstorming); project and time management resources and best practices; and tools and techniques to support collaborative research. The workshop developers analyzed syllabi from several engineering design courses that included a team component in the class project. They determined the key tasks students had to complete in order to succeed and organized the workshop around them. The workshop incorporates active learning techniques, using a group project simulation to critically interact with the identified team skills. The workshop requires students to explore different tools, both provided by the Libraries or University and freely available online (Google Docs, Google Sites, Assignment Calculator, various citation managers) and report back to their fellow workshop participants on the benefits and costs of using a particular tool. Librarians also created an accompanying Google Sites website<sup>11</sup> as both a base for the in-person workshop and a post-workshop resource for students. The class website also acts as a stand-alone learning object for students unable to attend in person.

In the fall of 2010, they presented the workshop for Science and Engineering Library staff in order to get feedback. They revised it and offered it officially to students, faculty and staff across campus in January 2011. Although they created the class with engineering students in mind, anyone on campus could register and attend. They promoted the class specifically to those classes where they'd identified group work as a key component in the workshop development stage, mostly the engineering design classes. The strongest response came from the Mechanical Engineering Design class where the professor "highly recommended" that a representative from each team attend; the instructor attended the workshop as well. After the class the faculty member spoke with the instructors about customizing the presentation to include as part of a pre-existing library lecture in the design class curriculum the following semester. Another attendee who worked for the Office of Equity and Diversity on campus requested that the librarians share the content to her staff during a future brownbag session. The library instructors surveyed student attendees as to which skills and activities resonated most with them and will use this

feedback to further refine the workshop. They will continue to market it to research groups, design classes, and cooperative education students. It will also be incorporated into the planned portfolio program, making it the first piece of new content developed in response to our research findings.

### **Information Literacy Integration**

With this study we attempted to provide a good foundation for introducing information literacy into discussions with course instructors, using the data to support our assertions of the information literacy skills' importance in the science and engineering curriculum. The Science and Engineering Library has long been interested in integrating information literacy skills into the engineering curriculum. This level of integration has not been an easy sell with engineering faculty. Overall our results bolster the argument that information seeking and evaluation skills are important to engineering education, as all respondents mentioned having to do at least some information seeking in their on-the-job activities. This study provides us with new information to bring to faculty and administrators that demonstrates the information-seeking activities that students encounter in the workplace

Through the survey findings and our literature review, we identified when and where students are introduced to different information types. Consistent with our previous assumptions, our results did not indicate any kind of systematic introduction to information-seeking skills. Although many students reported that they were introduced to scholarly journal articles during their sophomore year, no other compelling trends or patterns in the undergraduate experience emerged from the survey results. This information reinforces our earlier assumptions but also gives our assertions more weight as they come directly from student reporting. In future discussions with faculty responsible for developing curricula, we can point out the unevenness of the current approach.

We observed that students relied on the mentorship of co-workers and supervisors for initial introductions to some types of literature. Knowing which resources are not currently addressed in undergraduate classrooms helps us focus more narrowly on information-related resources and skills that are falling through the cracks. This information will allow us to use our time more effectively in creating supplementary learning objects for students.

The act of administering the survey led to some unexpected conversations with students and instructors. A former co-op student who responded to our pilot survey mentioned a particular mechanical engineering class, Introduction to Engineering, as a possible entry point where this type of information would be beneficial. This suggestion was valuable for the mechanical engineering liaison as the libraries have primarily focused on junior and senior level design classes in engineering departments.

As previously mentioned, we shared our preliminary findings with a group of College of Science and Engineering faculty and staff in the college who focus on undergraduate education: directors of undergraduate studies, administrators of co-op programs, and related groups. This presentation is a first step toward getting instructors involved.

## Conclusion

Our investigation of the information seeking behaviors of students participating in the cooperative education program in engineering provided evidence on the information-related skills students will need in their everyday work-lives as engineers. We gained insight into how to better support undergraduate engineering students in general, and, specifically, the types of support useful to cooperative education students both during and prior to their work placement semesters. This work will help support our educational mission.

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  - 2 The survey can be viewed at <https://umsurvey.umn.edu/index.php?sid=12164&lang=um>.
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  - 10 Varma, V. K. (1998). Applying the rigors of internship principles to a successful co-op design. *Proceedings of the 1998 Annual ASEE Conference, June 28, 1998 - July 1, 1998, Seattle, WA*.
  - 11 <https://sites.google.com/a/umn.edu/teamworkshop/>