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Initial Study of Information Literacy Content in Engineering and Technology Job Postings

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Abstract—The goal of this research category work-in-progress study is to investigate the information literacy needs and expectations of employers who hire new engineering and technology graduates, through content analysis of job postings. It seeks to answer two questions: (1) Which information sources do employers expect engineering and technology graduates to know and to use on the job and (2) in what ways are new engineering and technology hires expected to interact with information?

A collection of 1502 entry-level job postings aimed at undergraduate engineering and engineering technology students was gathered from a university career center database for the time period May 2017 to May 2018. Three researchers coded a sample of the job postings to calibrate and to develop a code book consisting of the types of information mentioned (journal articles, laws and regulations, technical requirements and specifications, product literature, technical reports, patents, and technical standards and codes) and specific ways of interacting with information (gathering, learning, evaluating, using, managing, creating, and communicating). Next, each researcher utilized NVivo to analyze a subset of the postings using the code book. The researchers will conduct additional analysis in order to make sure the data is reliably coded, but some trends are already obvious.

Preliminary results suggest that employers often place their emphasis on different sources of information than those traditionally emphasized in academic settings. Job postings that deal with information sources list experience with standards and codes, both in general and citing specific organizations or documents, as the most common information source requirement. In contrast, journal articles and conference proceedings, often the focus of IL instruction, are barely mentioned in this data set. These findings indicate the need for a new approach to information literacy by engineering educators and librarians to better align with workplace information use.

Index Terms—Workplace Information Literacy, Undergraduates, Information Skills, Engineering Technology, Engineering

I. INTRODUCTION

Information literacy (IL) is a set of interrelated and interdependent skills, abilities, and practices for gathering, using, managing, and communicating information. The Accreditation Board for Engineering and Technology (ABET) emphasizes these skills in Criterion 3 of their accreditation standards for Engineering [1] and Engineering Technology [2], and specialist librarians often collaborate with engineering and technology faculty to incorporate this vital IL content into their courses. In order to better make the case for information literacy instruction in engineering and technology courses,

librarians have worked to make the case that IL content aligns with ABET requirements. Riley et al. [3] mapped the ACRL/ASEE/STS information literacy standards for science, technology, and engineering to Criterion 3, highlighting the high degree of correlation. Sapp Nelson & Fosmire [4] used the same approach to highlight the connection between information literacy and lifelong learning.

Work has also been done to determine industry expectations facing graduating students as they enter the workforce. Lloyd [5] looked at how information literacy is conceptualized outside of academia, specifically in the workplace, highlighting the gap between the text-based, theory-driven approach to information literacy students get in educational settings with the much broader and more practical information practice they may encounter in the workplace. Jeffryes & Lafferty [6] examined the information needs of engineering students in a co-op workplace setting, showing a mismatch between the information skills the students were learning in school and the information skills they were expected to use as co-op students. As an example, students were comfortable with books and journal articles as a source of information, but not with the industry standards that were heavily used in their co-op workplaces. Phillips et al. [7] compared the information needs and habits of engineering undergraduates and practicing engineers at a major company, identifying similar gaps. The students, while highly confident in their own abilities, were less adept at staying current with new information in their field than the engineers, relying on social media tools to gather information versus the engineers' heavy use of knowledge management systems.

Graduating students often search through job postings to find potential employment. Employers calibrate their postings to filter for the specific skills and experiences they would like to see in new employees, and often these skills and experiences relate to information. An employer, for example, might specify that candidates should be able to use a certain knowledge management tool or have facility with information products like standards, patents, or legal documents.

This is the first study examining information literacy through the lens of engineering and engineering technology job postings. These job postings, in aggregate, can give us critical insight into what IL proficiencies would be most

valuable for students. This has potential impacts in terms of both policy and instructional practice, as it highlights gaps between engineering and engineering technology information literacy curricula and what graduating students are expected to know and do in the workplace. The research questions that guide this work are: (1) which information sources do employers expect engineering and technology graduates to know and to use on the job and (2) in what ways are new engineering and technology hires expected to interact with information?

II. METHODS

A. Data Collection

The authors collected the job posting data from a university career center database at a large, public research institution in the Midwestern United States for the time period May 2017-May 2018. Job posting data targeted at the following undergraduate majors was collected: electrical and computer engineering (ECE), electrical and computer engineering technology (ECET), mechanical engineering (ME), and mechanical engineering technology (MET). The raw dataset consisted of 8,254 total job postings. Next, the authors went through a data cleaning process to remove postings that:

- were multiples within each major (i.e. the same posting advertised multiple times to the same major),
- required a graduate degree,
- required more than 0-2 years of prior work experience,
- were not for full-time, continuous employment (e.g. part-time, internships, co-ops),
- were aimed at “any major” (not specific to engineering and/or engineering technology fields).

1502 entry-level job postings remained at the end of the data cleaning process (418 for ECE, 382 for ECET, 394 for ME major, and 308 for MET).

B. Data Analysis

The authors used a combination of deductive and inductive content analysis [8] to analyze the job postings for information-related content. First, they read and re-read a sample of the job postings multiple times to calibrate and to develop a code book consisting of the types of information sources mentioned (journal articles, laws and regulations, technical requirements and specifications, product literature, technical reports, patents, and technical standards and codes) and specific ways of interacting with information (gathering, learning, evaluating, using, managing, creating, and communicating). Next, each author utilized NVivo 12 Pro [9] to analyze a subset of the postings using the established code book. They noted areas where the codebook may need to be updated if some data does not fit into the pre-established categories. At this point, the authors have made a single pass through the “information sources” coding, and are partially through the “ways of interacting with information” coding. They will make multiple passes to ensure the data is reliably coded.

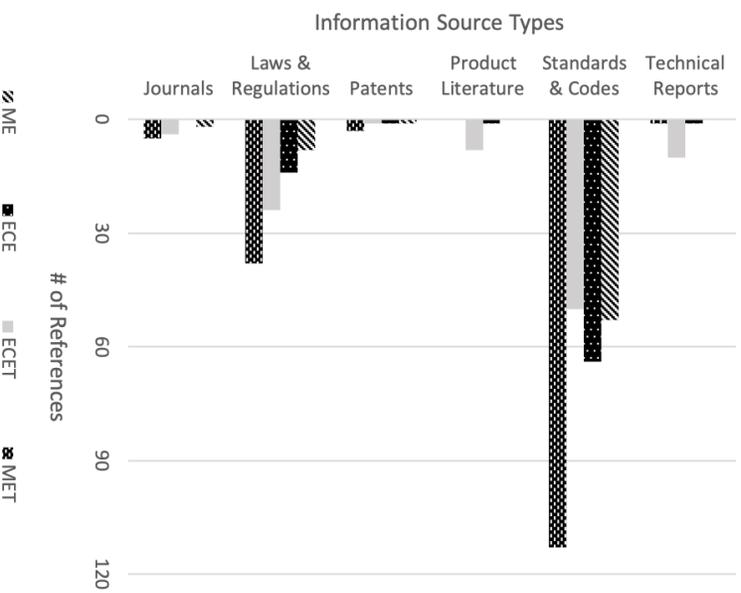


Fig. 1. Information Sources Referenced, $n = 402$

III. INITIAL RESULTS

While the authors will conduct additional analysis in order to ensure the accuracy of the data, some trends are already obvious. The preliminary results suggest that employers often place their emphasis on different sources of information than those traditionally emphasized in academic settings. As shown in Fig 1., across all majors, job postings that reference types of information sources list standards and codes, both in general and citing specific organizations or documents, as the most common information source requirement or type of information source that new entry level hires will be using on the job. In total, 280/402 (70%) of all of the information source references pertained to standards and codes, followed by 84/402 (21%) of references relating to laws and regulations. Tables 1 and 2 show examples of how standards and codes and laws and regulations are integrated into job postings:

This high level of standards and codes references is consistent with the on the job experiences of engineering co-op students reported by Jeffries & Lafferty [6]. In contrast, journal articles, often a focus of engineering information literacy instruction [10], [11], are barely mentioned by employers in the job ads collected for this study, only appearing in 3% (11/402) of the total information source references.

IV. CONCLUSION

These work-in-progress results are suggestive of the need to recalibrate the focus of information literacy instruction in the engineering and technology libraries setting, in order to

TABLE I
EXAMPLES OF STANDARDS & CODES REFERENCES IN JOB POSTINGS BY MAJOR

Major	Examples
MET	“utilization of engineering standards,” “compliance with applicable codes,” “understanding of ISO 9001”
ECET	“experience with CAN communications protocol and the J1939/ISO11783 standards,” “knowledge of NEC and electrical code standards”
ME	“knowledge of SAE J1939,” “familiar with National Fire Protection Association (NFPA) Standards”
ECE	“maintain compliance with all applicable policies, procedures, and global standards,” “...regulatory standards (UL, etc.)”

TABLE II
EXAMPLES OF LAWS & REGULATIONS REFERENCES IN JOB POSTINGS BY MAJOR

Major	Examples
MET	“familiarity with 14 CFR Part 27 and Part 29 for commercial and military qualification and certification of aircraft systems is preferred.”
ECET	“reviewing proposed product changes for impact on regulatory status of the product”
ME	“interpreting and applying FDA regulations”
ECE	“maintains basic level awareness of both foreign and domestic regulations”

better prepare students for the information challenges they may face in the workplace. Journal articles, often the default information source discussed in the college classroom, were referenced in the job postings, but at the same relatively low level as technical reports, patents, and product literature. All of these information sources, though, were referenced at a much lower level than technical standards and legal and regulatory information. While more work needs to be done in order to clarify the exact parameters of the demand, the obvious takeaway from this preliminary data is that a focus on journal articles at the expense of other information sources is not meeting the needs of engineering and technology students or their employers. Therefore, this can make the case for breadth in the information sources discussed in information literacy instruction in engineering and technology classrooms, with a particular emphasis on technical standards, laws, and regulations.

A. Next Steps

The next steps for this project will involve further calibration between the investigators in order to better capture accurate data, with a goal of a Fleiss’ kappa inter-rater reliability rating of 0.75 or above. The investigators will also assess the data set for specific information literacy skills (locating information, presenting information, etc.), potentially highlighting additional areas of workplace information literacy expectations for libraries and librarians to incorporate into their curricula.

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