Extending the Role of the Library and Librarian: Integrating Alternative Information Literacy into the Engineering Curriculum

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Abstract

Both in coursework and in their future careers, engineering students may work with many different types of information sources beyond books and journal articles, including patents, standards, and technical reports [1]. Despite this shift, which broadens information literacy [2], many undergraduate communication courses continue to narrowly define information sources, prompting students to use bibliographic databases but completely omitting other important databases that can provide students with meaningful and applicable information sources. The aim of this study was to make library resource instruction an integral portion of a required undergraduate engineering communication class to determine if this targeted instruction improved students' understanding of alternative information sources. Specifically, this study integrated standards and the ASTM Compass database into the course through 1) case study assignments, 2) targeted instruction by the engineering librarian, and 3) the integration of standards as information and research sources into both.

The authors presented students in select class sections with a case study lesson dependent on standards. Students were then visited by the Engineering Librarian on two occasions; both sessions were tied directly to the assignment based on the case study. To evaluate student understanding of standards, pre and post-tests were distributed to students in all sections of the course, including the intervention sections, which received standards training, and control sections, which did not. Students in the selected class sections were also asked to complete evaluation surveys after the first librarian in-class visit. In addition, the authors obtained permission to review student assignments related to the standards case study. While the study produced a considerable amount of data to analyze, this paper first explores how the authors' approach lays the foundation for rethinking librarian integration in engineering communication courses.

Introduction

Across academic institutions, the roles of librarians have been variously venerated, marginalized, and complicated by the changing landscape of both higher education and library sciences [3-5]. At the authors' institution, the University at Buffalo (UB), like many academic institutions, librarians are expected to fill many roles by their supervisors and internal units, but the implementation of those roles among faculty, students, and other key actors can be fraught: some faculty see libraries as a service organization and librarians, therefore, as support staff. And yet librarians, when engaged to their full capacity, have much to offer faculty and staff--not as mere service actors but as full collaborators in the collective work of the university: research, teaching, and engagement. This paper explains one approach to integrating library resources and expertise in both research and teaching, providing a blueprint for other engineering faculty, librarians, and instructors who hope to develop a more robust integration of the library.

The collaboration described here includes research and teaching, seeded in the relationships established through library outreach that is regularly expected of librarians. Through a concerted

effort at integrating new library resources, author one helped authors two and three innovate pedagogical approaches to teaching engineering communication and co-designed a research study to assess the effectiveness of the approach. Specifically, the authors look at the way one library resource, the ASTM Compass database, provided the foundation for an ongoing pedagogical innovation, research initiative, and fully integrated collaboration among librarians, researchers, and instructors. This approach challenges us to rethink the role of resources in the library, shifting the view from "mere" service or support, to anchors for innovation, collaboration, and research projects.

This paper begins with an overview of other approaches to integrating standards into engineering classrooms and literature that highlights librarian collaborations across engineering schools, particularly. Then, the authors argue that this case provides an example of the librarian as a resource, a researcher, and an instructor; in narrativizing their approach, the authors provide a case study for expanding the role of the librarian.

Literature Review

Many librarians have incorporated standards into library resource instruction lectures and/or assignments, and more specific to this study, as a means to teach information literacy to engineering students [6-8]. While each case or study varied slightly in how standards were incorporated into engineering curricula or library resource instruction for engineering students, all involved librarians familiar with technical literature who understood the importance of standards in future engineers careers. As Phillips and McPherson note, there are examples of faculty in engineering and engineering technology incorporating standards into undergraduate design courses, but not often in terms of information literacy context. Standards can be a difficult resource for academic libraries from a collections standpoint, typically due to cost [9, 10], therefore it could be surmised that involving librarians in instructional design may ensure instructors and students are working with standards that are accessible and available to them. Further, direct collaboration provides institutional arguments for securing and maintaining standards databases.

Some scholarship has focused more specifically on understanding what role standards play in engineering students' future careers as engineers. Rodrigues noted the high expectations of new engineers by their employers when it comes to information literacy and advised engineering students should have a basic knowledge of engineering resources when they graduate [11]. Harding and McPherson studied the expectations employers have for new engineers related to standards knowledge [12]. They found that the United States is vastly behind other developed countries in standards education, but also that the majority of standards training is done on-the-job and specific to the types of standards used in that particular industry. This would then explain why Jeffryes and Lafferty discovered numerous other studies that found engineers spend a good portion of their workday on information-related tasks [13]. However, the studies of Jeffryes and Lafferty did not specifically focus or mention how standards are used or retrieved by engineers. King, Casto, & Jones studied engineers' information needs, as well as how they search for and use information, which did include standards [14]. The study reviewed more than 400 literature items published over a 40 year span and found that 40 to 66% of working time was spent related to processing, communicating, and disseminating information. In another study, Napp [15, 16]

surveyed engineers at the top 500 design firms, per Engineering News Record, in 2004 and again in 2014, which found that of information sources most often needed by engineers, 92.4% of respondents indicated standards. Conversely, engineering faculty from a 2011 survey still view journal articles as the most important information source for their students. While engineers in academia certainly cite standards in their own research, as Rowley and Wagner found [17], Cooklev points out a significant challenge concerning standards education is that "in many cases the educators themselves are not familiar with standards and their role" [18]. This disconnect further solidifies the need for additional collaboration between faculty and the librarian, as well as increased integration of the librarian into engineering education courses.

Collaboration between faculty, specifically engineering faculty, and their subject liaison librarian is also an area that has been touched upon in the literature [19-23]. Phillips and McPherson [7] as well as Solomon, Liao, and Chapin [8] specifically emphasized the importance of librarian-faculty collaboration in making standards education and information literacy successful in the classroom. Hrycaj and Russo conducted a survey of faculty in 2006 to better understand faculty perception of library research instruction [24]. While 90% of participating faculty indicated it was either "extremely" or "very" important for students to be able to conduct library research, 42% of respondents were "not interested" or had "no opinion" on jointly designing an assignment with a librarian. However, it could be viewed as a positive result as the majority were supportive or, at a minimum, interested in such an idea of faculty-librarian curriculum collaboration.

This landscape provided the basis for this study and led the authors to the research questions that ultimately drove this study:

1. What are the strategies for more fully integrating library instruction into the communications classroom?
2. What kinds of collaboration, relationships and institutional support are needed to develop integrated, frequent touch approaches to the library?
3. How might other librarians develop these approaches at their institutions?

Methodology

Our research questions were studied over the course of one semester across five sections of a STEM communication class, herein referred to as EAS360, within the School of Engineering and Applied Sciences (SEAS) at UB. This mixed-methods study engaged with a pre-test, post-test study design to understand the ways a focus on ASTM standards within the STEM communication classroom affects student learning. Students who received explicit training in ASTM standards were also asked 1) to participate in a mid-semester assessment survey about their training by the librarian and 2) to provide their ASTM standards reports for analysis. The pre-test, post-test (Appendix A), and assessment survey (Appendix B) were anonymous; the student ASTM standards reports were collected and de-identified, per UB IRB protocol #STUDY00003053. The population included 500 engineering students, and of those, 473 participated in the pre-test, 371 participated in the post-test, and 104 agreed to allow us to analyze their standards report.

Although this paper does not aim to address the findings of all these methods as the primary argument, the authors move into the results of this collaboration confident that students and instructors alike benefited from the project's pedagogical approach. Students in the courses agreed that their knowledge of standards improved, and in their evaluation of the library presentations, were overwhelmingly positive in reporting the usefulness of the integrative measures taken by the research team. Given the success as reported by students and instructors alike, the authors have turned this study into a pedagogical and collaboration case study that can support other collaborative efforts involving standards and librarian integration.

Pedagogical Case Study Approach

The purpose of EAS360 is to provide undergraduate engineers with the fundamental technical communication skills they will need to be successful communicators in their careers, including typical genres, business writing conventions, and information literacy. Where traditional approaches to this class (both at the authors' institution and at other universities) rely on journal databases, the authors' case study replaces journal databases with a standards database to determine how and if students gain more appropriate information literacy.

In the second major unit of the EAS360 course, students were introduced to standards and recommendation reports as essential forms of technical communication. For the purposes of their major project, students were situated as entry-level product test engineers for a fictional company, which had recently been hired by a toy manufacturer to test their prototypes. In short, students were asked to use an ASTM standard for toy safety to construct a recommendation report for their client on appropriate requirements and testing for a given product. As opposed to delivering one writing prompt at the beginning of the unit, the project was delivered via three separate case studies. This case study approach accomplished two important goals. First, it gave students insight into the communicative mechanisms that they will use in the workplace, as each study took the form of professional correspondence delivered between employees, supervisors, and executives. Second, it required that students work on a timeline and within a context they might encounter in their future professions. As opposed to the traditional academic writing prompt – in which all information a student might need is given in a single, comprehensive document at the beginning of the project – the case studies presented new pieces of information throughout the duration of the unit and made new requests of "employees" throughout the course of the project, more accurately mirroring a "real world" experience.

The first case study (Appendix C) set the stage for the larger project by introducing students to their role as entry-level product test engineers at the fictional company, ProAssess. Delivered as a set of guidelines from their supervisor, the case tasked the new employees with evaluating toy prototypes for retailer, E&E Toys. The case study introduced the applicable toy safety standard they were to use, F963-17: Standard Consumer Safety Specification for Toy Safety, and was accompanied by a product specification sheet with five separate toy prototypes (foam dart toy gun, crib mobile, toy chest, ride-on toy, and arts and crafts kit). This specification sheet included simple illustrations of each toy, and a partial list of features and functions. Thus, students would need to bring their own technical and consumer knowledge to the analytical process, as they could not rely solely on the information provided. To complete the given task, students needed to assess a specific toy's features, parts, and functions; analyze the standard for relevant tests and

safety requirements; and create a recommendation report that provided both a detailed assessment of the toy and a set of recommendations for applicable tests, as outlined in F963-17. Although students authored individual final reports, they worked collaboratively throughout the course of the unit, with approximately five students assigned to each toy.
The project's second case study took the form of an email from the client, asking for an executive summary of the recommendation report that could be given to the President and CEO of E&E Toys (Appendix D). Students needed to summarize their project in its entirety, while using language that would be intelligible for their professional, yet not necessarily technical, reader. This element of the project gave students an opportunity to refine their skills in concision and readability.

The third and final case study introduced students to budgetary constraints (Appendix E). At this point in the project, students had begun to solidify their final reports, and thus the introduction of new constraints asked them to reprioritize their recommendations and engage in revision. Delivered in the form of email correspondence from their immediate supervisor, students were asked to review an attached price list that corresponded with possible tests and requirements listed in the F963-17, compare it to their previously established list of recommendations, and ensure that the final list fit within a $100 to $150 budget, with limited flexibility. The supervisor's email requested that the engineer provide a low-end and high-end estimate within this range, and include the budget in an appendix to the primary report as well. The limited budget forced students to (in some instances dramatically) reconsider their recommendations, now striking a balance between satisfying their client and meeting ethical obligations to deliver a safe final product to consumers.

The project as whole reflects a number of innovative pedagogical approaches that depended entirely on the full integration of instructors, researchers, and librarians: the entirety of the pedagogical case study, including the syllabus schedule, the assignments, the instructional lesson, and the assessment was developed collaboratively. This unique approach provides the basis for the authors' results and discussion.

Results and Discussion

At the conclusion of the study, the authors had both qualitative and quantitative data to analyze; as reported above and elsewhere, the data suggests positive experiences for students and instructors alike. For the purposes of this paper, however, the authors focused on how the librarian played a role in the academic unit for EAS360 and the way this impacted standards education and information literacy. When reflecting on what was learned, the authors determined that the librarian functioned in multiple roles throughout the course of the study: as a resource, as a researcher, and as an instructor. The standards education unit pilot project was viewed as successful by the authors, as well as students, because the librarian functioned in these three roles, which are elaborated on in the following sections.

Librarian as a Resource

Within the context of this study, the librarian can first be understood as a resource, or as a liaison to resources available from the library. This was demonstrated by the engineering librarian in

several ways: by providing instruction to students on available library resources, by forging and maintaining engineering faculty relationships, and by seeking out and advocating for providing new and useful library resources for engineering students. All of these components were important in the overall success of the study, and they represent the first phase of the collaboration.

The success of this study depends on the long-standing relationship the engineering librarian had established with faculty in the EAS360 classroom. In the years before this study, the engineering librarian acted as a resource to the instructors of EAS360 classes well before this study by providing either in-person lectures or video modules on available library resources. This is how the engineering librarian commonly interacts with faculty from other engineering departments when librarian interaction is requested. However, the standards case study unit in this study was a departure from the traditional EAS360 syllabus, and it was important for the authors to still achieve the agreed upon course outcomes for the sections included in the study. The engineering librarian continued to fulfill her role as a resource to the school of engineering faculty – in this instance, her co-researchers – in this study through her instruction on standards and the library resources available to the students to search and access needed standards. The long-term success of the engineering librarian's work with faculty provided a foundation from which to further develop and deepen collaboration.

Another example of the librarian acting as a resource was exhibited in the relationships between the engineering liaison librarian and SEAS faculty. Creating and maintaining relationships with SEAS faculty is a vital part of the engineering librarian's position at UB. In the context of this study, it was important for two reasons. First, and perhaps most obvious, it was imperative to establish a collaborative relationship with her co-researchers, the engineering education faculty members, to ensure a successful research experience. Second, it was important to maintain existing relationships with other engineering faculty teaching EAS360 courses to ensure one group of students was not favored over the other in terms of access to the librarian for help. In addition, the authors asked these other EAS360 instructors to request that their students (in the other course sections) complete the pre- and post-test surveys. These surveys were a significant portion of the study, and therefore the existing relationships between the authors and other engineering faculty teaching EAS360 was extremely helpful.

Last, in the first of two in-class visits to the engineering faculty members' EAS360 course sections, the engineering librarian aimed to introduce the topic of standards (what they are, who creates them, etc.) and also to demonstrate the ASTM Compass database. This example goes beyond the concept of library resource instruction, in terms of how the librarian functioned as a resource. ASTM Compass, at the time of the study, was a new resource still in a trial period at UB. Previously ASTM standards were only accessible to students in print form in the reference area of the Libraries. Having worked alongside engineers in industry prior to her academic position, the engineering librarian was well aware of how important electronic access was for students and faculty alike. The engineering librarian advocated to trial the resource based on this knowledge and understanding. The ASTM Compass database then became a crucial component in this study as the entire case study and subsequent assignments were designed with electronic standards access in mind. Had electronic standards access not been available, it might not have been feasible for the academic unit in this study to be completed.

Based on the collective experiences of the authors, often times the librarian acting as a resource is the end of the interaction between liaison librarian and faculty for the faculty member's library needs. In many cases, course syllabi are so carefully scheduled it leaves no time for a class session dedicated to library resource instruction, let alone multiple class sessions. Further, while liaison librarians are frequently informed of a specific assignment or project that relates to the library resource instruction lecture (and hence the need for the lecture in class), the librarian does not always participate in the development of these assignments. In the case of this study, however, the librarian acted not only as a resource to teaching faculty, but as a co-researcher and co-instructor, which is further detailed in the subsequent sections.

Librarian as a Researcher

The relationship between the librarian and faculty in this study started with a traditional and formulaic outreach technique that many other librarians are familiar with. One of the engineering faculty authors was a new Associate Professor in the Department of Engineering Education (DEE) at UB in the fall 2018. As the faculty liaison librarian, the engineering librarian reached out via email to welcome her and provide her with some basic information about the UB Libraries, such as interlibrary loan and document delivery services, as well as library resource instruction opportunities. This led to an in-person meeting between the librarian and faculty where the engineering librarian's tenure-track faculty status was discussed. The engineering librarian learned the faculty member would be teaching one of the EAS360 course sections; the same course that she had created library resource instruction video modules for previously. It was exciting for both parties to learn that they shared a research interest in technical communication, and specifically how standards were an important form of technical communication for engineering students to learn as undergraduates.

The conversation (and this subsequent study) developed quickly from this point. The engineering librarian shared how the Libraries had recently started a trial of the ASTM Compass database, a resource the librarian was extremely familiar with from her previous professional position as a corporate research librarian at a consumer products testing laboratory. In explaining how engineers at the company were expected to use and interpret standards, in addition to being responsible for searching and retrieving standards from the very same ASTM Compass database, it became clear to both the librarian and the faculty member that incorporating the ASTM Compass database into class instruction could be very beneficial to students in their future careers as engineers. It was at this point that the engineering librarian and the engineering faculty member viewed themselves as true collaborators and co-creators, not of a one-time library resource instruction lecture topic, but of an entire unit centered on standards. Another important institutional incentive for this project is the role of tenure and promotion within the Libraries at UB. Because the engineering librarian is a tenure-track position, the invitation to collaborate on a research project was welcome and the time spent on the research was easily considered time well-spent from both the librarian and faculty member's positions.

This collaboration was a good fit from the outset as it was clear to both parties how the other was an integral part of the study and the process. While the engineering librarian had piloted library workshops on standards in the past, it was difficult to make the connection with students about

the importance of standards if they did not have an immediate and specific need to seek out information on their own. And while library resource instruction had been a part of the traditional EAS 360 course syllabi for many years, it had not been tied so closely to a particular assignment. Therefore, both faculty and librarian had much to gain from joining forces.

Specifically, the engineering librarian hoped the study would create a more meaningful relationship between the students and herself. She also anticipated the study would lead to a strong partnership between herself and the faculty member, but also the department in general and other faculty members from other engineering departments in the future. Lastly, she expected that this study would be a great opportunity to introduce a large number of students to the ASTM Compass database trial and would help make a case to subscribe to the resource at the conclusion of the trial.

Unlike other resource-based approaches to the work of a librarian, both the librarian and faculty understood that the upending of a course like EAS360 could provide meaningful, generalizable knowledge to others in their respective fields. As such, the co-designed research project sought data that could inform the field of LIS, Technical Communication, and Engineering Education alike. The need to speak to these different fields shaped the design of the quasi-experimental study, but it also impacted the way the authors developed the project: because the authors were all working as researchers, they understood the importance of engaging their differing areas of expertise. This augmented the pedagogical case, as discussed below, as well as the study itself.

Librarian as an Instructor

In addition to being involved in the research process in terms of determining the methodology of the project and providing access to the resources themselves (i.e. the ASTM Compass database), the engineering librarian also assisted in the development of the pedagogical unit, not just as a consultant but as an active designer of assignments, schedules, and so on. This level of collaboration between teaching faculty and librarian was a completely new venture for the engineering librarian, as she had not been involved in such an integral way before this opportunity. The collaboration involved the three team members meeting multiple times to determine the course schedule in the syllabus, including the timing of the librarian visits. EAS360 is a required course for all engineering majors at UB, therefore it was extremely important for the course outcomes of the five selected sections to align with the desired course outcomes of the remaining EAS360 course sections. The authors aimed to ensure the library resource instruction concerning standards still accomplished the task of making students aware of resources available to them while pursuing their degree and in their future engineering careers.

The engineering librarian continued her role as a collaborative instructor by actively co-creating the assignments in the “Standards as Technical Communication” instruction unit. The engineering librarian’s prior professional experience working alongside engineers in a consumer products testing laboratory allowed her to draw upon several real-life workplace scenarios to create the case study used in the study of the entry level engineer advising a client which portions of the mandatory toy standard, ASTM F963, to follow for the newly envision sample toy product (Appendix B).

At the conclusion of the study, the authors were able to review the course assignments of the students who consented to be part of the study. Usage statistics from the ASTM Compass database were also used as a means to explore the impact of the assignment. The engineering librarian's guest lectures in the selected EAS360 section were conducted at the very end of February and in March 2019. There was a considerable jump in access to standards during the month of March in comparison to January and February (see Figure 1). Usage dropped in April 2019, but not to the levels in January and February, indicating it is likely the students continued to access the database as additional components to the teaching unit, such as the follow up memo, were introduced.

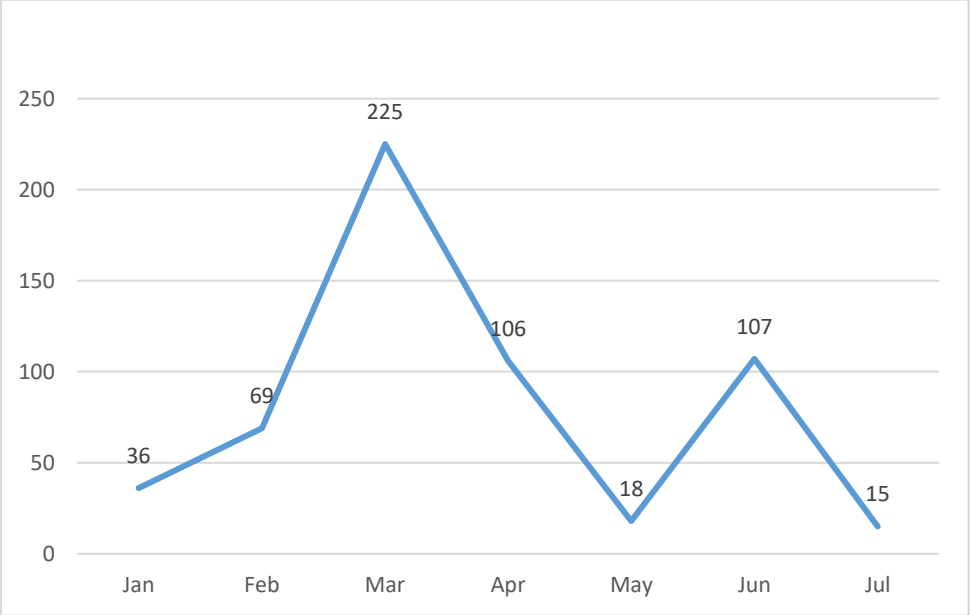

Figure 1. ASTM Standards Access Statistics 2019

Usage statistics from ASTM Compass do not detail specific standards that were viewed, although data is available on whether a standard is viewed in the HTML or PDF version. The data also differentiates if "active" or current versions of standards are accessed versus historical, withdrawn, or redline versions of standards. As the usage statistics data does not specify individual standards, it is possible that some of the usage of the ASTM Compass database during the months of March and April 2019 was not directly related to this assignment (though that seems unlikely, given the timing of the assignment and the increase in usage).

The authors found it useful, in this instance, to have usage statistics tied to such a new and specific resource in order to understand how often the students interacted with standards for the case study assignment. Had she not been involved in this study, the engineering librarian would have viewed usage statistics for a resource like ASTM Compass database at the conclusion of a trial or during an annual collections budget review process. Collaborating with faculty on the actual academic unit presented to students provided additional context into how and why library resources, particularly standards, could be incorporated into the curriculum as well as the value of having access to such information sources in the UB Libraries collection.

Recreating the Experience

The authors felt that the study and the collaboration between faculty and librarian was successful. In such cases, the next typical question is "how can this experience be recreated so that this type of collaboration can be achieved between the librarian and other faculty?" At the outset, it's important to note that it was crucial for the librarian to be viewed by the faculty as more than a resource--though successful resource development was an important basis for the study. The librarian being viewed as a fellow researcher and as a co-instructor was a large part of why the authors learned so much for the study.

As previously mentioned, this study originated from an initial meeting between the engineering librarian and engineering faculty member. A set of heuristic questions were developed by the authors that can provide entre into these fully integrated collaborations. Heuristics, rather than directive or restrictive approaches, provide a flexible format for implementing similar (not identical) collaborative research and pedagogy.

Questions asked by faculty

- Are you working on any research currently? What have you researched/published on in the past?
- What library resources could be useful for my teaching that I might not be aware of?
- How have you worked with other engineering faculty in the past?

Questions asked by librarian

- What are your research interests?
    - Are there any key journals or resources that you need (or that you have already observed that the Libraries does not have access to)?
    - Can I assist you in any way with your research (i.e., helping to construct search strings and establish alerts in key databases)?
- Are you teaching any courses this semester?
    - Do you need any specific books for supplemental reading purposes?
    - Would the students benefit from a librarian coming to class to provide a lecture on library resources, citation management software, or general information literacy?
- Is there an opportunity to include other, non-traditional library resources, like patents, technical reports, or standards in your classes? Do you find that students need that information for your particular course?

Conclusions and Future Work

The authors learned a great deal from this study: first about integrating standards into an undergraduate level technical communication course for engineering students, and second about the use of faculty and librarian collaboration to achieve course outcomes and improve the learning experience of students. The authors plan to share additional insights in future papers from the teaching faculty perspective, concerning engineering education and also English and technical communication.

The study produced a considerable amount of data from the pre- and post-test surveys, library instruction assessments, and student assignments, but when reflecting on this data, the authors felt the experience of the collaboration was the first story that needed to be told. The goal of the study had initially been focused on how standards could be integrated into a communication course for engineering students, but shifted over time, to how this level and approach to faculty/librarian collaboration could positively impact information literacy instruction in other engineering courses. The authors hope that this study can promote more collaboration projects between faculty and librarians of this scale within SEAS at UB and beyond.

Acknowledgements

The authors would like to thank Bureau Veritas Consumer Product Services (BVCPS) for their input on the budgetary portion of the standards case study assignment. The information shared was incredibly useful to the authors, as well as the students.

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Appendix A

EAS360 Student Pre-Test/Post-Test Survey

Do you identify as [select one]:

- □ Female
- □ Male
- □ Transgender
- □ Different gender identify (specify)
- □ Prefer not to answer

What category below includes your age? [Select one]

- □ 17 or younger
- □ 18-20
- □ 21-29
- □ 30 and older
- □ Prefer not to answer

How would you describe yourself? [Select all that apply]

- □ White
- □ Black or African American
- □ Latino (any race)
- □ Asian
- □ Native American or Alaska Native
- □ Native Hawaiian or Other Pacific Islander
- □ White
- □ Other (Please specify): _____
- □ Prefer not to answer

What is your country of birth?

(Please specify): _____

What Department are you in? [Select all that apply]

- □ Biomedical
- □ Chemical and Biological
- □ Civil, Structural, and Environmental
- □ Computer Science and Engineering
- □ Electrical
- □ Industrial and Systems
- □ Materials and Innovation
- □ Mechanical and Aerospace

What is the language you are most comfortable speaking? [Select all that apply]

- □ Cantonese
- □ English

- French
- Guyanese
- Indian Languages (Hindi, Bengali, etc)
- Italian
- Mandarin
- Russian
- Spanish
- Other Please specify): _____

Are you a Transfer Student? [Select one]

- Yes
- No

Enrollment: What is your enrollment status? [Select one]

- Part-time
- Full-time

Class Standing: What is your class standing? [Select one]

- Freshman
- Sophomore
- Junior
- Senior
- Masters/Doctoral
- Professional Student
- Continuing Education Student
- Non-degree seeking

Have you taken either of the following tests: SAT & ACT? [Select one]

- Yes, SAT only
- Yes, ACT only
- Yes, both SAT & ACT
- No, neither test
- Prefer not to answer

If you took the SAT, what was your score for the Evidence-Based Reading and Writing (EBRW) section? [Select one]

- 200-299
- 300-399
- 400-499
- 500-599
- 600-699
- 700-800
- Don't remember
- Prefer not to answer

- I did not take the SAT

If you took the ACT, what was your raw score for the English section? [Select one]

- 1-9
- 10-19
- 20-29
- 30-36
- Don't remember
- Prefer not to answer
- I did not take the ACT

Question	Agree	Somewhat Agree	Neutral	Somewhat Disagree	Disagree
I understand the complexities of the work of engineers.					
I believe writing is important for my future as an engineer.					
I understand how I will use writing in my career as an engineer.					
I have been taught how to write as an engineer.					
I have been taught how to read as an engineer.					
I am confident that I can perform effectively on many different writing tasks.					

What kinds of written genres will be important for you as an engineer: [Select all that apply]

- Memos
- Emails
- White Papers
- Technical Reports
- Standards & Technical Specifications
- Proposals
- Text Messages
- PowerPoint Slides/Slide Decks
- Internal Policy and Protocol

How prepared do you feel to READ each of the following genres?	Very well prepared	Prepared	Neutral	Unprepared	Very unprepared
• Memos					
• Emails					
• White Papers					
• Technical Reports					
• Standards and Technical Specifications					
• Proposals					
• Text Messages					
• PowerPoint Slides / Slide Decks					
• Internal Policy and Protocol Documents					
How prepared do you feel to WRITE each of the following genres?	**Very well prepared**	**Prepared**	**Neutral**	**Unprepared**	**Very unprepared**
• Memos					
• Emails					
• White Papers					
• Technical Reports					
• Standards and Technical Specifications					
• Proposals					
• Text Messages					

• PowerPoint Slides / Slide Decks					
• Internal Policy and Protocol Documents					
How prepared to do you feel to USE each of the following genres as an engineer?	**Very well prepared**	**Prepared**	**Neutral**	**Unprepared**	**Very unprepared**
• Memos					
• Emails					
• White Papers					
• Technical Reports					
• Standards and Technical Specifications					
• Proposals					
• Text Messages					
• PowerPoint Slides / Slide Decks					
• Internal Policy and Protocol Documents					

Do you understand contexts in which writing will shape your work as an engineer? Circle one: Yes / No

If yes, briefly describe by completing this sentence:

When I am an engineer, I know I will use writing when my boss asks me to:

_____

_____.

Appendix B

Standards Post Test Follow Up

Question	Agree	Somewhat Agree	Neutral	Somewhat Disagree	Disagree
I understand what a standard is.					
I know where to find information on what standards we have access to at UB.					
I feel confident that I can search for ASTM standards.					
I understand generally how to read through a standard.					
I believe standards will be important in my future career as an engineer.					

Do you have any additional questions about standards searching that were not addressed?

_____

_____

Appendix C

Writing Challenge: Standards Case Study

Who you are: An entry-level product test engineer at a mid-sized consumer products testing laboratory, ProAssess.

The Situation: Your supervisor assigns you to a special case for a high priority client, a toy retailer called E&E Toys. The client has designed a new toy and has come to your company to have it tested, as the law requires, to ensure if meets applicable toy safety requirements. While you have only worked at ProAssess for about 18 months, your supervisor says she trusts your judgement to review the toy in question based on your stellar track record.

The Client & the Product: The toy has gone through several phases of design, but they don't quite have a functioning sample yet. However, they have detailed drawings and pictures of the prototype to share. They also have a list of the toy features, but your supervisor warns you that the feature list is from the client's marketing department, and therefore may not be a complete list of technical functions.

You have worked with this client before, but this is the first new product you have reviewed. However, based on your past experience with the client, you know that E&E Toys does not have a large product testing budget, and prefers to test for only those requirements that are truly necessary.

Other Details: ProAssess purchases industry standards and test methods from various standards organizations in order to conduct business. In addition, you company subscribes to the ASTM Compass database, which provides electronic access to all current and past versions of ASTM standards, which are extremely important to the consumer products testing industry.

Based on your past work experiences, you know that you will need to consult ASTM F963-17, Standard Consumer Safety Specification for Toy Safety. However, you no longer have a copy, so you will have to locate this current version of the standard using the ASTM Compass database.

Testing Details: Per the US Consumer Product Safety Improvement Act of 2008 (CPSIA), all sections of ASTM F963 are mandatory. However, not all toys possess all the various features and functions that are detailed in the test standard.

While you have not been given a specific budget to work with for this assignment, as far as what the client is willing to pay, your supervisor reminds you that each test method listed in ASTM F963 would be a separate line item on the bill to E&E Toys. She understands the client does not like to spend money on product testing, but wants to ensure that ProAssess is not held liable for failing to recommend potentially appropriate tests.

Your Challenge: Write a technical report that contains the following sections:

- A written assessment of the product, that includes product features and functions;
- A recommendation of tests and other requirements from the applicable toy test standard, ASTM F963, as well as your evaluation of the specific toy.
    - Remember to provide reasoning as to why you are recommending specific tests or markings.

Appendix D

Writing Challenge: Executive Summary Case Study

Who you are: An entry-level product test engineer at a mid-sized consumer products testing laboratory, ProAssess.

The Situation: Your completed your review and wrote your recommendation report. You submitted it to your supervisor and it was sent to the client. A few days after it was sent, you receive the following email from the client, with your supervisor copied on the message.

> **From:** Alex Jones, Product Compliance Specialist, E&E Toys
> **To:** Product Test Engineer, ProAssess
> **cc:** Supervisor of Product Test Engineer, ProAssess
>
> **Subject:** RE: Toy testing recommendation report – help needed!
>
> Hello,
> Thanks again for providing the recommendation report for the toy testing we requested. The report looks great. It was exactly what I needed. However, I'm hoping you can help me out. My boss's boss – the President and CEO of E&E Toys, Evelyn Oliver, is really excited about this new toy, but before we move forward with development, she wants an executive summary of the report you sent. Can you accommodate? I would need this as quickly as you are able, as I have a meeting with her next week.
>
> Thanks in advance for your help.
> Alex

Your Challenge: Write an executive summary of the recommendation report. The summary should be professional, but should not contain as many technical details, as the President of E&E Toys wants the summary in plain language that is quick and easy to read.

Appendix E

Writing Challenge: Budget Justification Case Study

Who You Are: An entry-level product test engineer at a mid-sized consumer products testing laboratory, Pro-Assess

The Situation: You are in the midst of preparing a recommendation report for your supervisor, and you have developed a list of tests that are required for your assigned product, the [FILL IN ASSIGNED PRODUCT NAME]. As you began your report, you sent this email to your supervisor, Jamal:

> **From:** Engineering Team
> **To**: Jamal Richardson, Supervisor of product Test Engineers at ProAssess
> **Date:** February 12, 2019
> **Re:** Testing Recommendations and Budget
>
> Hi, Jamal,
>
> My team and I are working on developing the recommendations report you requested. We're wondering if you have budgetary constraints that we should keep in mind as we prepare this report. If you have any budget details from the client, would you send them along?
>
> All best,
> Project Manager

Your supervisor replied in a meeting that he would check on your question, but It's been weeks since you sent the email, and you haven't heard anything from your supervisor. Today, you receive this email:

> **From:** Jamal Richardson, Supervisor
> **To:** Engineering Testing Team
> **Date:** March 10, 2019
> **Re**: Testing Recommendations and Budget
>
> Sorry. Just heard back from the client—our contact was out of town, apparently, and just now is catching up on email. Can we keep the budget between $100 and $150? We have a bit of flexibility, so if you can give us a high end and a low-end recommendation, that'd be great. Oh—and can you include the budgets in an appendix?
>
> Thanks!
> --JR

Your Challenge: Adjust your recommendations per this updated communication and the attached price list and add a section to your final report that addresses these concerns.