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Standards in the engineering classroom: Partnering with your engineering librarian

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Abstract

As a Great Ideas for Teaching – and Talking with - Students (GIFTS) paper, the author asks the reader to imagine a world without standards. It is downright frightening to think about. One take on this imagined world is to think about students not having access over the course of their studies. Not learning and using standards during their education can lead to engineers that do not use them in their professional lives. Through instruction and partnerships, the engineering classroom is the best first step to introducing standards to undergraduate students. ABET includes the need for standards education in their Criteria for Accrediting Engineering Programs, 2022 – 2023 documents. Luckily, engineering librarians make great partners when it comes to standards in the engineering classroom.

Engineering librarians are a great resource when it comes to locating and accessing various standards across the multitude of standards developing organizations. Many academic libraries subscribe to standards content available online through general engineering databases and/or specialized standards databases. Furthermore, librarians may potentially purchase individual standards to meet faculty, staff, student, and researcher needs, depending on institutional funding and collection development policies. Accessing resources, such as standards, is generally a foundational service provided by academic libraries.

Engineering librarians make great classroom instructional partners too. Going beyond functioning as just a collection/access resource, engineering librarians are also educators with specialized knowledge that can enhance the classroom experience. Librarians can develop curricula and learning objects that introduce standards and provide an overview of the development process. Additionally, learning to navigate the parts of a standard can be a barrier that stops many undergraduate users when first faced with using one for the first time.

This paper reviews the roles that engineering librarians take within the field of standards while also providing examples from the engineering classroom. It also shares how librarians and instructors can partner to support the needs of undergraduate students in the engineering classroom.

Introduction

Technical standards are specifications that are developed and agreed upon by industry experts, professional organizations, and governments to ensure that products, processes, and services are consistent, reliable, and compatible with each other. These standards are intended to promote safety, quality, interoperability, and efficiency in various industries, including manufacturing, construction, transportation, and telecommunications. Standards can cover a wide range of topics, including product design, testing, and certification; materials and components; manufacturing processes and procedures; environmental and safety requirements; and information technology and communication protocols. They can be developed by international organizations such as the International Organization for Standardization (ISO), regional bodies such as the European Committee for Standardization (CEN), or national bodies such as the American National Standards Institute (ANSI) or the British Standards Institution (BSI).
Adherence to technical standards can offer several benefits, such as improved product quality and reliability, increased efficiency and productivity, enhanced safety and environmental protection, and greater compatibility and interoperability among different systems and products. They are essential in the engineering classroom because they provide a foundation for teaching students the principles of design, manufacturing, and quality control. Standards help students understand the importance of adhering to industry-recognized practices, specifications, and guidelines when designing and developing products, systems, or processes. ABET began including the need for standards education in their Criteria for Accrediting Engineering Programs, 2021 – 2022 documents, with it continuing into their 2022-2023 documents [1].

Engineering Librarians & Access

Engineering librarians are generally called upon when it comes time to locate and access various technical standards. At Pennsylvania State University Libraries (PSUL), engineering librarians fill in various roles related to standards and as teaching partners. Librarians are faculty, which comes with the need to research and publish to reach tenure. This makes them motivated research partners in the engineering classroom and a source of future collaboration opportunities. They also are experts in finding and acquiring technical standards, as shown in figure one.

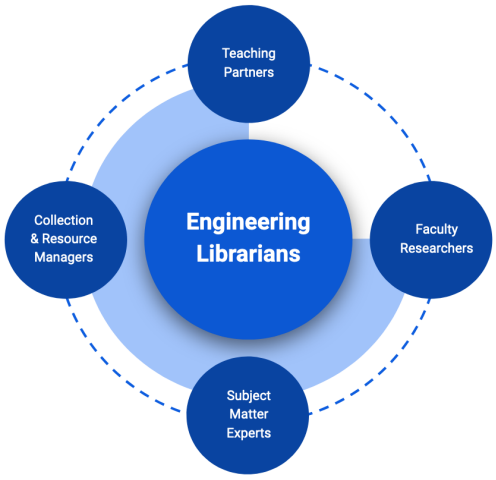

Figure 1: Engineering Librarians as Partners

Engineering librarians are generally called upon when it comes time to locate and access various technical standards. Many academic libraries subscribe to standards content available online through general engineering databases and/or specialized standards databases. Through PSUL, researchers have easy access to industry specific standards databases, such as ASTM Compass, Society of Automotive Engineers (SAE) International, and American Society of Mechanical Engineers (ASME); and they have access to general research databases with standards, such as the Institute of Electrical and Electronics Engineers (IEEE) Xplore database. These databases provide instant access and generally a friendly user interface for researchers.

In the cases where academic libraries do not have access to electronic standards through a database, libraries will use online standards stores to purchase print or electronic copies of single standards. For PSUL, there is a preference for using stores such as IHS Markit Standards Store and Techstreet Store to purchase print standards. AT PSUL, only print standards are purchased to conform to the Standards Collection Development Policy and to adhere to the land grant nature of Penn State. The Standards Collection Development Policy provides guidelines on the scope of purchased standards, the format of purchased standards, and the acquisition limits of purchased standards. Many libraries will have collection development policies in place related to standards and/or other collections. Like many libraries, PSUL purchases and maintains a standards collection purchased from various standards, such as ISO, within the PSUL collection for use by all researchers.

Ideas for Partnership Opportunities

Idea #1

An easy way to partner with librarians is through the development of research guides for use within course management systems, such as Canvas, that share collected knowledge and information in an organized manner [2]. Research guides are online web pages and instruction tools, such as the example in figure two.

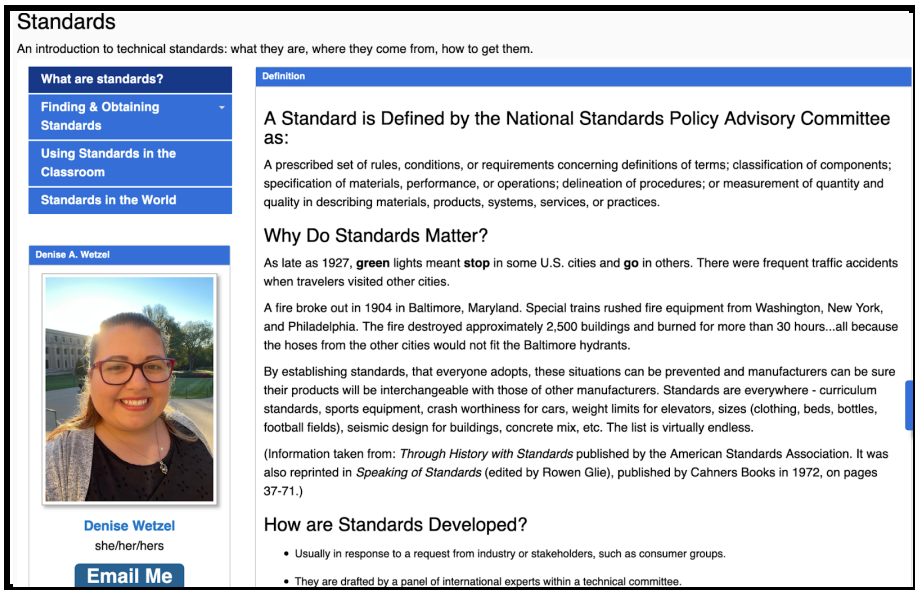

Figure 2: Example of a Standards Research Guide

Through collaboration, engineering faculty and librarians can create dynamic guides that are responsive to changes in course curricula, include interactive social learning components such as RSS feeds and videos, and even can embed themselves within a course management system for linking to content, finding library help, or even the administration of quizzes and/or surveys [3]. These research guides are highly customizable and share a wealth of information. They can be developed and updated throughout a course to easily integrate with activities during the semester. As specifically related to standards, a research guide linked with senior engineering design courses allows groups working on projects with easy access to PSUL resources.

Idea #2

Moving beyond the course management system, engineering faculty and librarians can partner to create innovative classroom instructional opportunities for students. Bringing in a librarian to talk about standards provides an opportunity to share the librarian's knowledge on finding and accessing, while also giving students the chance to recognize resources available to them outside of the classroom. These talks on a particular topic, such as "How to Read a Standard," do not need to be long and can take the form of presentations or interactive learning opportunities. The use of game-based learning within the lesson (Kahoot! or AhaSlides, for example) create a fun experience that also helps learners retain what was just covered.

Idea #3

When looking for even more in-depth classroom instructional opportunities for students, engineering faculty and librarians can partner to develop group work that meets learning outcomes. In October 2022, PSUL celebrated World Standards Week around the theme, "Imagine a World Without Standards" [4]. During this celebration, librarians across multiple Pennsylvania State University campuses collaborated with groups of students to identify standards necessary for the functioning of daily activities, like buying a coffee or using transportation to reach class. After a short presentation about technical standards and how to find/access them, the groups engaged in an activity to imagine their world without standards. Figure three shares a slide on the group activity steps.

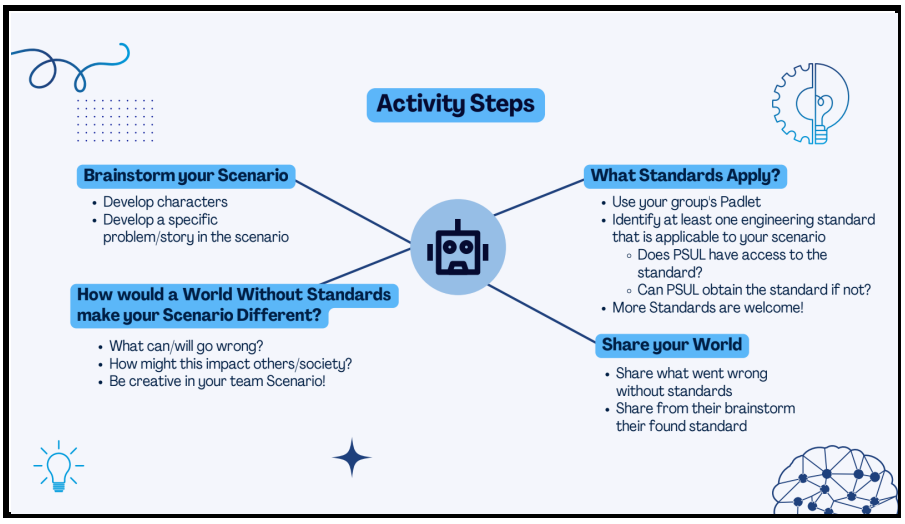

Figure 3: Activity slide from PSUL's World Standards Week presentation.

Over the course of the activity, the ubiquitous nature of standards in daily life were made clear and students seemed to have a much better picture of standards roles in their everyday lives. From spoilt milk, to engines not working, to even a mountain climbing fall due to manufacturing errors, students truly engaged in this activity. One engineering student group wrote a haiku based on their imagined scenario!

Idea #4

Looking outside of the classroom space, but still in support of the engineering classroom is an example from Purdue University. Librarians there received a National Institute of Standards and Technology (NIST) Standards Services Development Cooperative Agreement Program award to develop the Standards are Everywhere: An Information Literacy Approach to Standards Education project [5]. This project uses a research guide to integrate a series of videos and case studies for students to learn how standards are all around them. This idea can easily be adapted to similar engineering topics and it shares a framework of how to develop in-depth activities.

Conclusion

Engineering librarians and faculty are two key collaborators in an undergraduate student's technical standards education. Students learn the importance of standards in ensuring product quality, reliability, and safety, and develop the skills needed to apply these standards in their future careers. Additionally, exposure to technical standards in the classroom can help prepare students to work with a wide range of industries and sectors that rely on technical standards. Using research guides and classroom instructional activities, standards can seamlessly fit within the engineering curriculum in order to meet all accreditation and educational priorities.

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