Integrating Technical Standards into Design Courses

Margaret Phillips  
*Purdue University, phill201@purdue.edu*

Michael Fosmire  
*Purdue University*

Paul B McPherson  
*Purdue University*

Follow this and additional works at: [https://docs.lib.purdue.edu/lib_fspres](https://docs.lib.purdue.edu/lib_fspres)

Part of the Information Literacy Commons

**Recommended Citation**  
[https://docs.lib.purdue.edu/lib_fspres/155](https://docs.lib.purdue.edu/lib_fspres/155)

This document has been made available through Purdue e-Pubs, a service of the Purdue University Libraries. Please contact epubs@purdue.edu for additional information.
Integrating Technical Standards into Design Courses

Margaret Phillips
Paul McPherson
Michael Fosmire

ASEE Annual Conference 2017
Welcome!

- Who we are
  - Engineering Librarians
    - **Margaret Phillips** – Assistant Professor of Library Science, Engineering Librarian at Purdue University. Provided instruction in standards and other areas of engineering & technology information literacy for seven years at Michigan Tech, Saginaw Valley State University, and Purdue.
    - **Michael Fosmire** – Professor of Library Science, Head Physical Sciences, Engineering, and Technology Libraries at Purdue University. Twenty years of experience looking at information use of scientists and engineers. Editor of *Integrating Information into the Engineering Design Process*.
  - Engineering Technology Faculty
    - **Paul McPherson** – Assistant Professor of Practice of Engineering Technology at Purdue University. Teaches introductory and advanced courses that integrate standards.
Why we’re here

• Share development of a practical, integrated standardization education project
• Focus on understanding, locating, analyzing, and applying standards as an information source in the context of engineering and technology product design.

• Thanks to the generous support of NIST, #70NANB16H261 [Sidebar: Apply for these awards!]
  • NIST Standards Services Curricula Development (SSCD) Cooperative Agreement Program
Kittens like standards learning too!
Agenda

• 1:30-1:55 Introduction
• 1:55-2:20 Standards in Everyday Objects
• 2:20-2:45 Discovering and Locating Standards
• 2:45-3:10 Anatomy of a Standard
• 3:10-3:30 Reflection
Activity 1: Welcome

- Divide up into groups of 5
- Introduce yourselves to your team (10 min)
  - Name, institution
  - Position
  - Background with technical standards
  - Access to standards
  - Learning goals for this workshop
  - Identify a spokesperson for your team!
Internet Access

ASEE Conference Wireless Access

• Select network “FreeInternet”
Learning Objectives - Workshop

Participants will be able to:

• Identify types of technical standards that relate to a variety of everyday objects
• Efficiently locate and access technical standards
• Determine relevance of standards for a particular design scenario
• Integrate standardization into their own courses
How Did We End Up Here?

- Development of grant project
  - Saw need for students to use standards in industry (Harding and McPherson, 2010)
  - Lack of standards experience among many faculty (Harding, 2011)
- Need for resources that can be easily adopted, open to all
Gaps

- Tutorials/OERs do exist (including sponsored by NIST), but some combination of...
  - Not free
  - SDO-centric
  - Institution or Discipline specific
  - Not at the level of undergraduate students
  - Not interactive
  - *Not include information literacy components*
## Why it matters

<table>
<thead>
<tr>
<th>ABET ETAC (2015-2016)</th>
<th>ABET EAC (2016-2017) General Criterion 5: Curriculum</th>
<th>ACRL IL Competency Standards (in place when grant application was submitted; rescinded July 2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• An ability to <em>conduct standard tests and measurements</em>;... (3.c)</td>
<td>• Students must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier coursework and <em>incorporating appropriate engineering standards</em> and multiple realistic constraints.</td>
<td>• Determine the extent of information needed</td>
</tr>
<tr>
<td>• An ability to apply written, oral, and graphical communication...and an ability to <em>identify and use appropriate technical literature</em>; (3.g)</td>
<td></td>
<td>• Access the needed information effectively and efficiently</td>
</tr>
<tr>
<td>• Application of <em>industry codes, specifications, and standards</em>... (MET, h)</td>
<td></td>
<td>• Evaluate information and its sources critically</td>
</tr>
<tr>
<td>• The application of circuit analysis and design, computer programming, associated software, analog and digital electronics, and <em>engineering standards</em>... (EET, a)</td>
<td></td>
<td>• Incorporate selected information into one’s knowledge base</td>
</tr>
</tbody>
</table>

### What we want students to know

- Describe the purpose, structure, and process of creating technical standards
- Identify Standards Development Organizations who create standards commonly used by product designers
- Determine what kinds of standards might apply to an artifact, either as a whole, or specific components of the object.
- Develop appropriate vocabulary (keywords and synonyms) to search for standards
- Determine appropriate databases and web sites to discover topic-appropriate standards
- Utilize effective strategies to refine searches for appropriate standards
- Select two standards that relate to the design, manufacture, or testing of an everyday object (either to the object as a whole, or to a component of the object)
- Locate and access the full-text versions of identified standards
- Analyze and articulate the role of standards in the functioning or structure of an everyday object.
Content Development Process

• Literature review (of course!)
  • Two books very helpful to our work:
• Interviewed 5 faculty who teach (or want to teach) standards (ECET, ME, MET, LIBR)
  • How standards used
  • Frustrations/struggles of students
  • Understanding/importance of specific topics
  • Other topics that are important
• Reinforced main concepts of proposal...
Content Creation

- Led to four tutorial modules (Articulate Storyline 2)
  - Introduction to Standards
  - Anatomy of a Standard
  - Discovering and Locating Standards
  - Standards in Everyday Objects
- Database of Case Studies (Homegrown)
- Badge Platform (?)
Timeline

• Start work Sept. 2016
• Interviews/scripting – Fall 2016
• Tutorial/database construction – Spring 2017
• Beta testing – Summer 2017 (including here!)
• Pilot implementation in classroom – Fall 2017
• Revisions/redeployment – Spring 2018
Standards and Everyday Objects
Everyday Objects and Standards – Why they exist

- Interchangeable parts
- Safety
- Design
- Manufacturing/processes
- Testing/performance
Standards in Plain Sight

User manuals

Boxes & Labels

### Activity #2 – Where do standards apply?
**Example: Aluminum Step Ladder**

<table>
<thead>
<tr>
<th><strong>Design:</strong></th>
<th>Aspect where standard might apply</th>
<th>Possible SDO</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steps (vertical spacing and width)</td>
<td>ALI (American Ladder Institute)</td>
<td>ANSI A14.2</td>
<td></td>
</tr>
<tr>
<td>Angle of opening</td>
<td>ALI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warning labels (symbols and layout)</td>
<td>ANSI Z535</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rivets</td>
<td>ASME</td>
<td>ASME B18.7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Manufacturing/ Processes</strong></th>
<th>Aspect where standard might apply</th>
<th>Possible SDO</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material compound</td>
<td>ASTM/company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extrusion process</td>
<td>Internal Company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly process</td>
<td>Internal Company</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Testing/ Performance</strong></th>
<th>Aspect where standard might apply</th>
<th>Possible SDO</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coating</td>
<td>ASTM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loading Classification (Weight limit rating)</td>
<td>ALI</td>
<td>ANSI 14.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SEI (Safety Equipment Institute)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Group task (15 minutes)

• Select one of the objects provided

• Begin identifying where standards apply to the object in each category
  • **Complete first column on page 1 (Handout #1)**
    • Think about the object as a whole **AND** think about the individual components of the object

• Brief report out: What drove your choices?
Discovering & Locating Standards
Discovering & Locating Standards
Directory of Standards Resources

• Does your library subscribe to any standards databases?

• Not sure? Check the database list on your library’s website
Discovering & Locating Standards

Activity #3 (15 min)

• Search for potential SDOs - search tips:
  • Conduct a basic internet search for your object and standards (or its components/materials) and note SDO’s that appear in the results
  • Scan a directory of SDO’s, such as: http://bit.ly/2sIXcUj
  • Perform a basic keyword search in a standards database
• Consider alternative terminology (Handout #1 - Page 3)
• Search a database(s) for relevant standards (Handout #2)
• Note SDOs, terminology, and standards on Handout #1

Spokesperson from each group (others can help!):
• Go to guides.lib.purdue.edu/NIST_standards
• ASEE workshop tab
• Input content for your common place object on Pages 1 and 3
Anatomy of a Standard
Anatomy of a Standard

• Remember: strategies for determining relevance of a standard
  • Read through in a nonlinear order
  • Scope
  • Definitions/Terminology
  • Conditions for Use
  • Requirements
  • Tests
Our Task...

• My friend has a motorboat. He hates it when he falls overboard and wants to install a ladder to help him get back on board.

• He asks you, his librarian/engineer neighbor, what should I consider in building or buying an appropriate ladder? What standards should I make sure the ladder meets?

• He hands you 5 standards he found and asks, which ones are useful, and for what? Do any standards point to other sources that are more relevant, or offer a route to searching for additional information?
Boats and Ladders

Cc: Pete Markham; Flickr.com

Ladders and Boats


Cc: Don Sampson Flickr.com
Boats and Ladders


Cc: Ralph Dally, Flickr
Ladders and Boats

Boats and Ladders

CC: kenneth lu, Flickr

Ladders and Boats

Cc: rachel keeler photography, Flickr
Activity #4: Our Task (10 minutes)

• My friend has a motorboat. He hates it when he falls overboard and wants to install a ladder to help him get back on board.

• He asks you, his librarian/engineer neighbor, what should I consider in building or buying an appropriate ladder? What standards should I make sure the ladder meets?

• He hands you 5 standards he found and asks, which ones are useful, and for what? Do any standards point to other sources that are more relevant, or offer a route to searching for additional information?
Debriefing (10 min)

- BS MA 39 (yellow)
- Pool and Spa Code (blue)
- UL 1116 (brown)
- ANSI A14.3 (green)
- ASTM F840 (white)

For each, what are the limitations? important information?
Reflection
Reflection

(5 min) Complete online reflection: http://bit.ly/2rnRptA

Q1: What is the most helpful thing you learned in the standards workshop?

Q2: How do you plan to incorporate something you learned into your teaching?

Q3: What questions remain in your mind about standards or integrating standards into curricula?
Wrap Up

• Additional standards educational resources will be placed here: guides.lib.purdue.edu/NIST_standsdards

• Thank you for your participation!

• Tutorial module feedback – please give us your thoughts during the pilot period: http://bit.ly/2rYItej

• Questions or want to talk more about standards? Contact us!

Margaret Phillips – phill201@purdue.edu
Paul McPherson – pmcphers@purdue.edu
Michael Fosmire – fosmire@purdue.edu