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Integrating Technical Standards into Design Courses

Margaret Phillips
Purdue University, phill201@purdue.edu

Michael Fosmire
Purdue University

Paul B McPherson
Purdue University

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ASEE Annual Conference 2017

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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

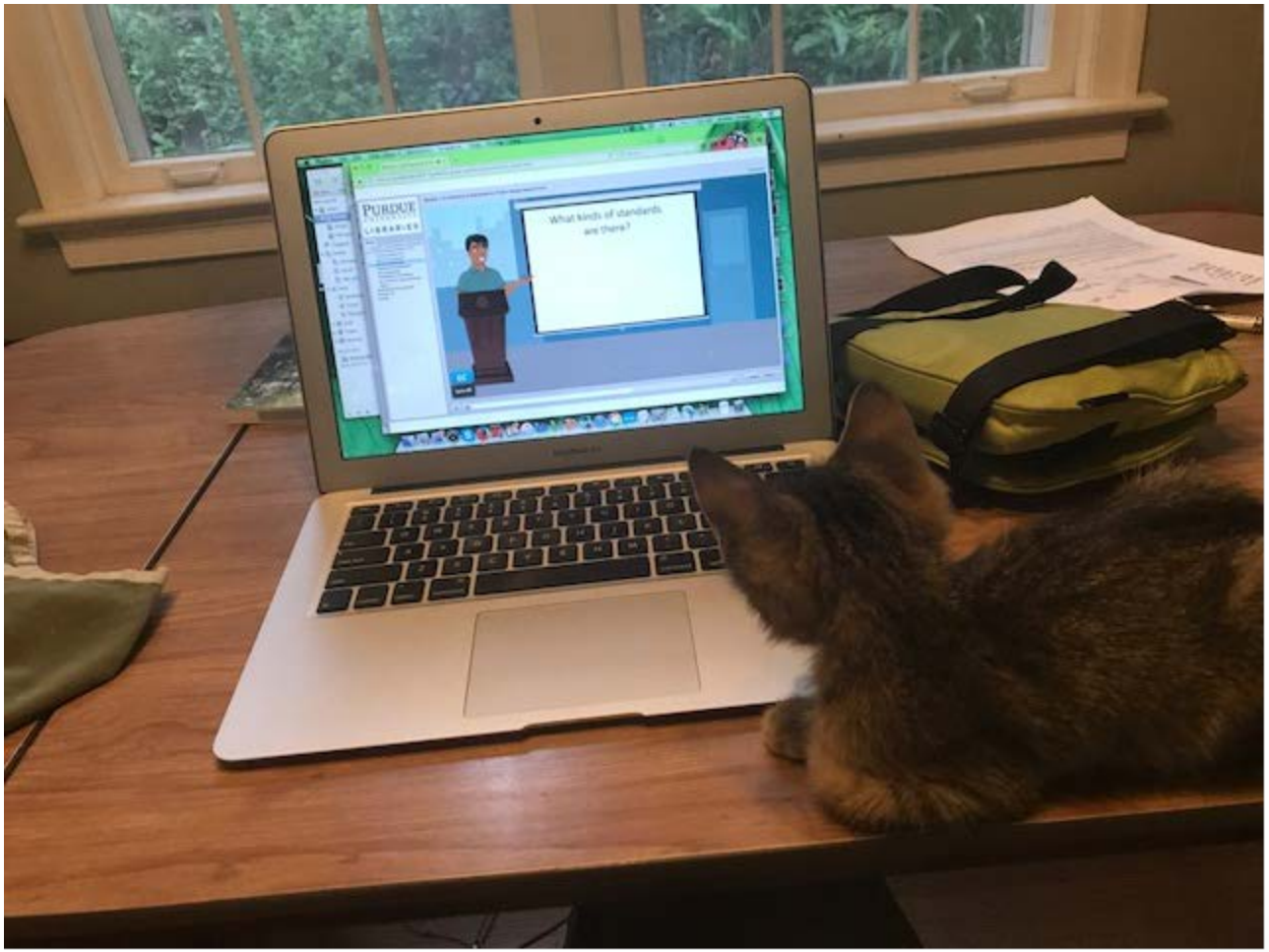
    Paul McPherson – Assistant Professor of Practice of Engineering Technology at Purdue University. Teaches introductory and advanced courses that integrate standards.

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

ABET ETAC (2015-2016)	ABET EAC (2016-2017) General Criterion 5: Curriculum	ACRL IL Competency Standards (in place when grant application was submitted; rescinded July 2016)
• An ability to ***conduct standard tests and measurements***;... (3.c) • An ability to apply written, oral, and graphical communication...and an ability to ***identify and use appropriate technical literature***; (3.g) • ***Application of industry codes, specifications, and standards***… (MET, h) • The application of circuit analysis and design, computer programming, associated software, analog and digital electronics, and microcomputers, and ***engineering standards***…(EET, a)	• 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 ***incorporating appropriate engineering standards*** and multiple realistic constraints.	• Determine the extent of information needed • Access the needed information effectively and efficiently • Evaluate information and its sources critically • Incorporate selected information into one's knowledge base • Use information effectively to accomplish a specific purpose • Understand the economic, legal, and social issues surrounding the use of information, and access and use information ethically and legally

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:
    - Thompson, DC. 2011. *A guide to standards*. Portsmouth, NH: Standards Engineering Society.
    - Hunter, R. 2009. *Standards, conformity assessment, and accreditation for engineers*. Boca Raton: CRC Press.
- 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

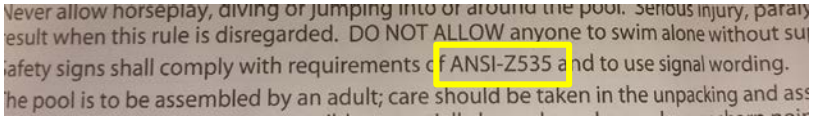
Standards and Everyday Objects

Everyday Objects and Standards – Why they exist

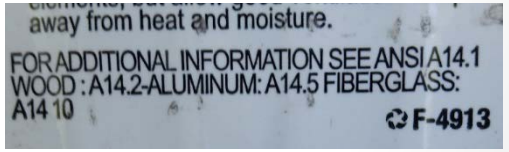
- Interchangeable parts
- Safety
- Design
- Manufacturing/processes
- Testing/performance

Standards in Plain Sight

User manuals



Boxes & Labels



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

Design:	**Aspect where standard might apply**	**Possible SDO**	**Standard**
	Steps (vertical spacing and width)	ALI (American Ladder Institute)	ANSI A14.2
	Angle of opening	ALI	
	Warning labels (symbols and layout)		ANSI Z535
	Rivets	ASME	ASME B18.7

Manufacturing/ Processes	**Aspect where standard might apply**	**Possible SDO**	**Standard**
	Material compound	ASTM/company	
	Extrusion process	Internal Company	
	Assembly process	Internal Company	

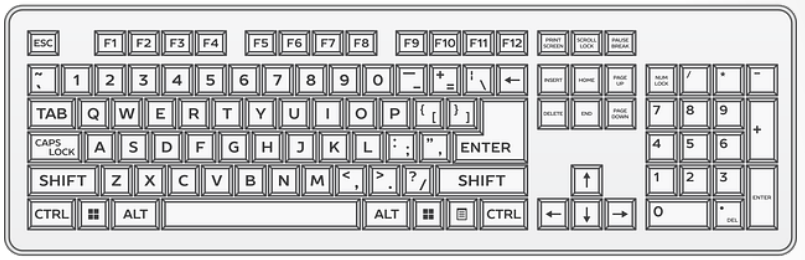
Testing/ Performance	**Aspect where standard might apply**	**Possible SDO**	**Standard**
	Coating	ASTM	
	Loading Classification (Weight limit rating)	ALI	ANSI 14.2
		SEI (Safety Equipment Institute)	

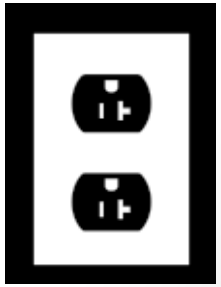
Group task (15 minutes)

- 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/2slXcUj**
  - 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

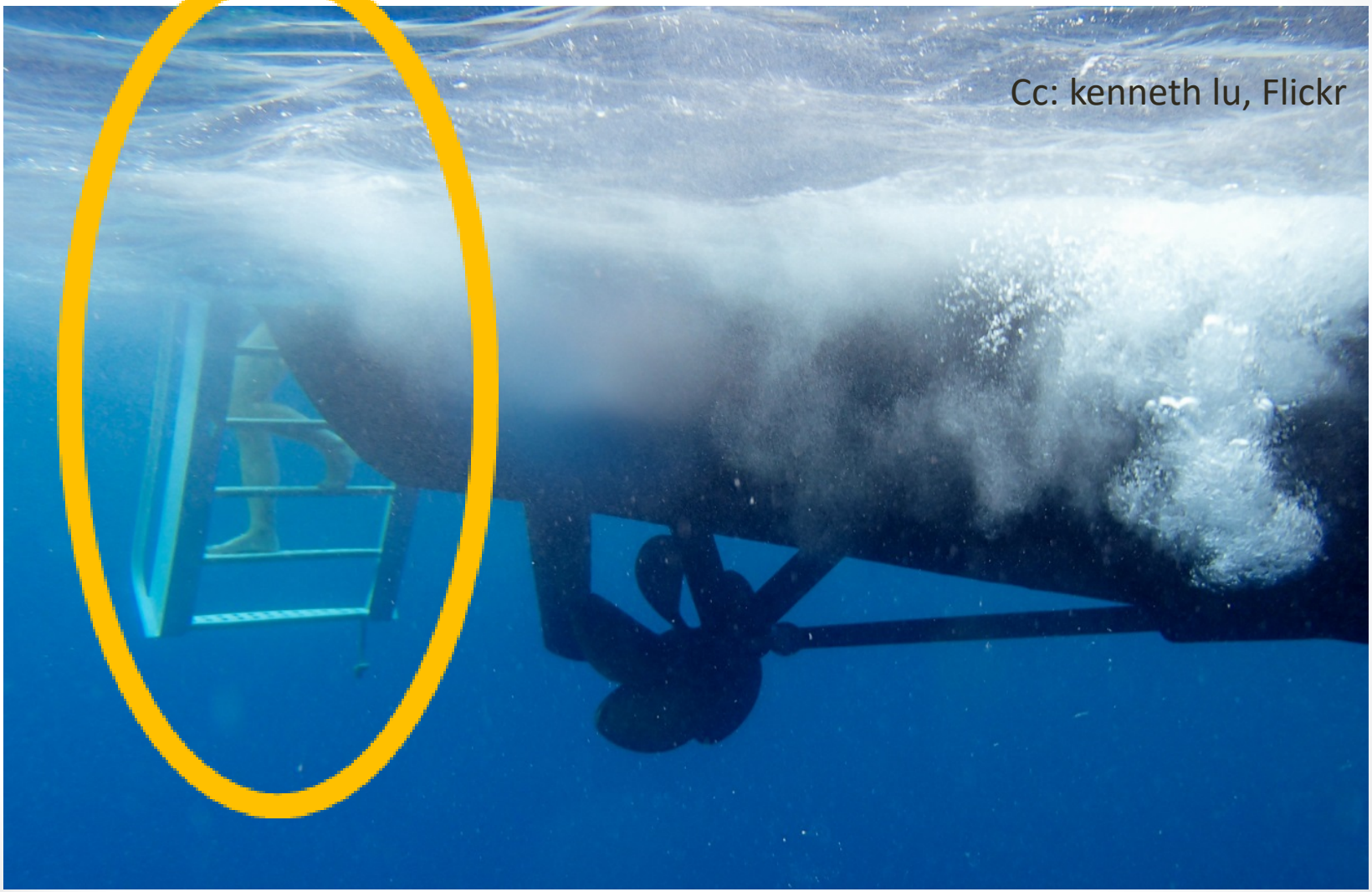
Boats and Ladders

Cc: Ralph Dally, Flickr

Ladders and Boats

Cc: swong95765, Flickr

Boats and Ladders



Ladders and Boats

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_standards**
- 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

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