

Standards in Education: An IEEE Perspective

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Science, Engineering, and Technology Professional



ABET Engineering Criteria

Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate **engineering standards** and multiple realistic constraints.

ABET Engineering Technology Criteria

Capstone or other integrating experiences must draw together diverse elements of the curriculum and develop student competence in focusing both technical and non-technical skills in solving problems.

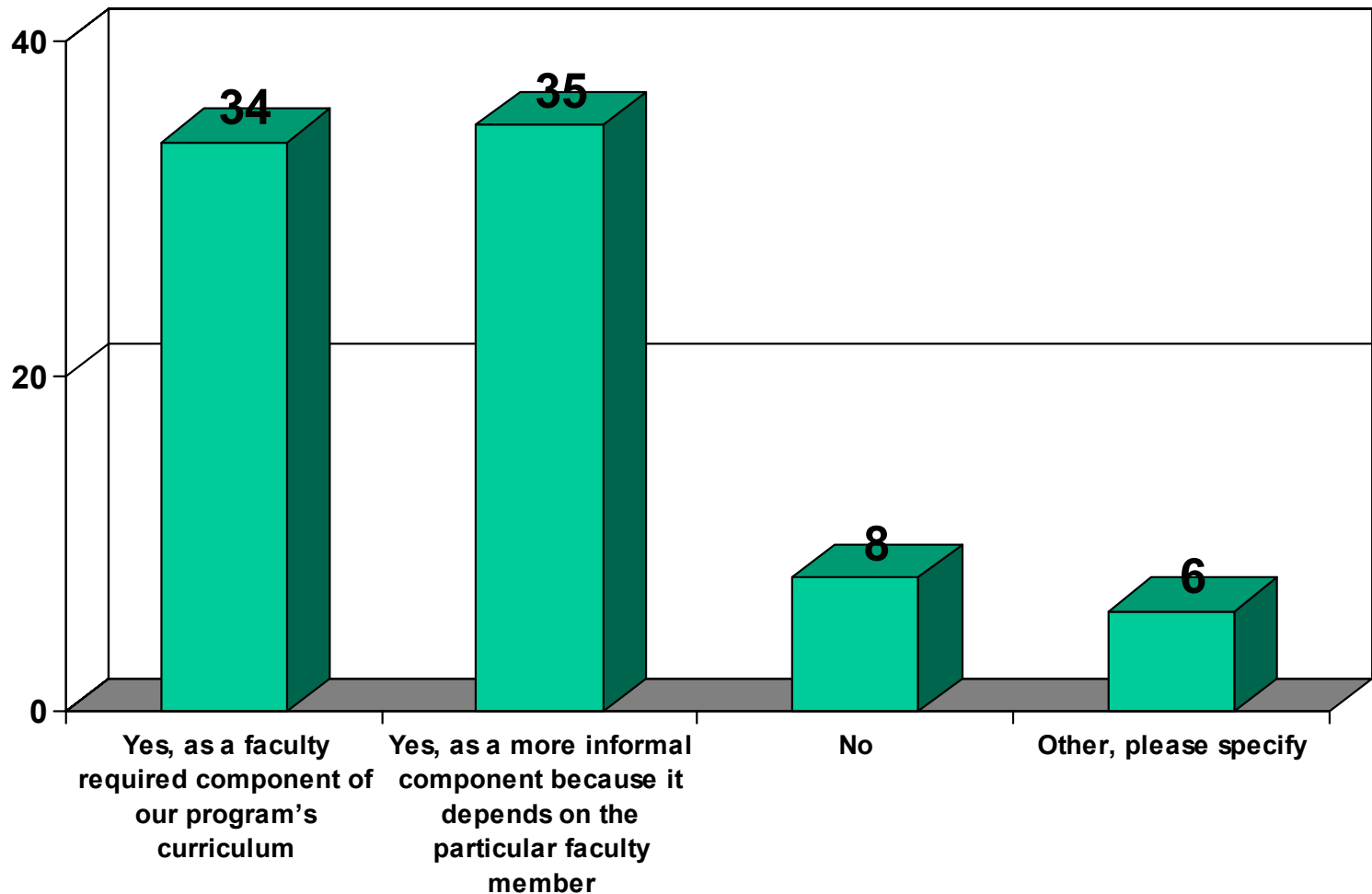
Needs Survey

410 heads of electrical and computer engineering and engineering technology departments received a request to participate in an online (final and pilot) surveys

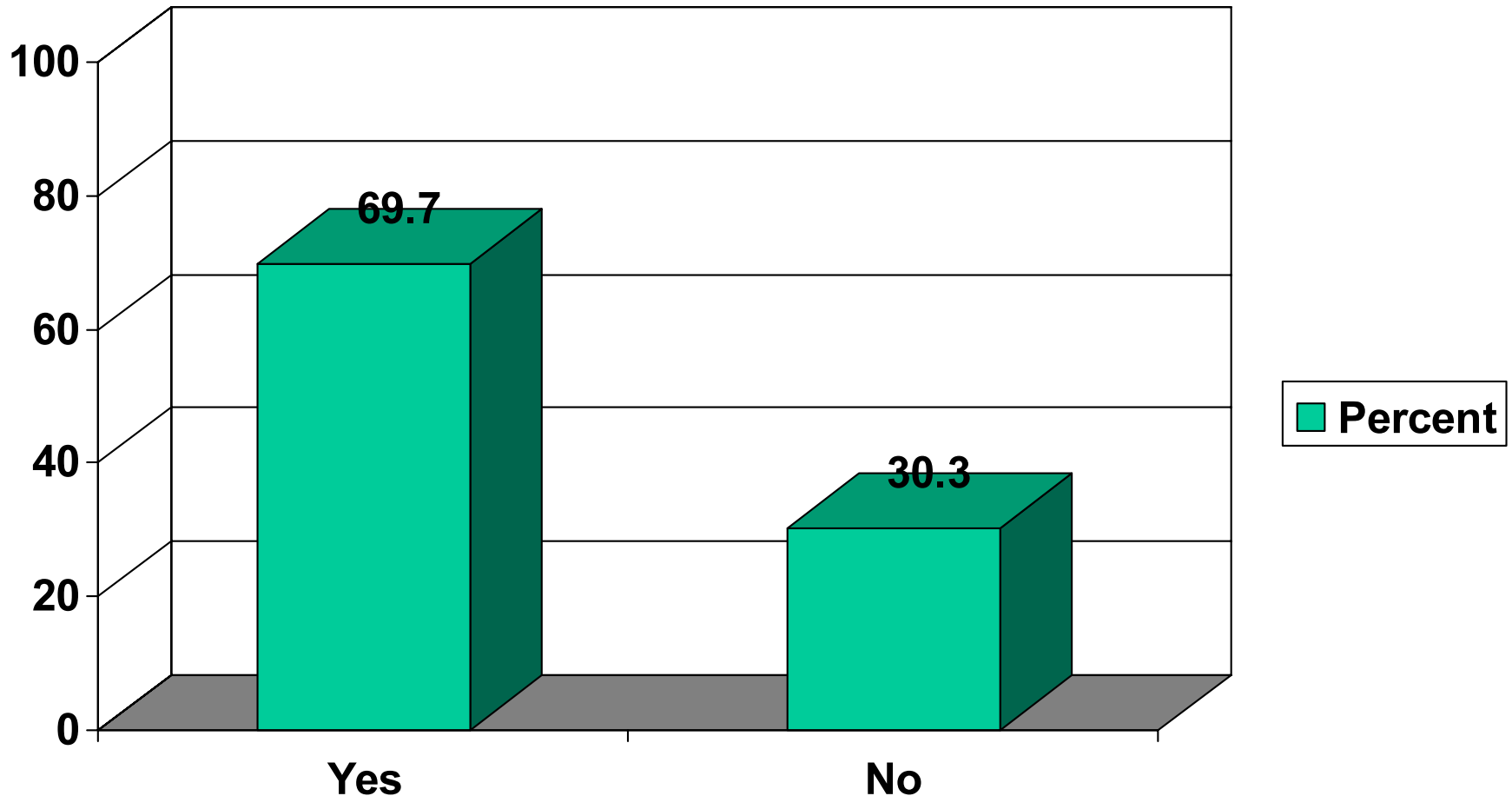
78 responses were received in total from both surveys

19% total response rate

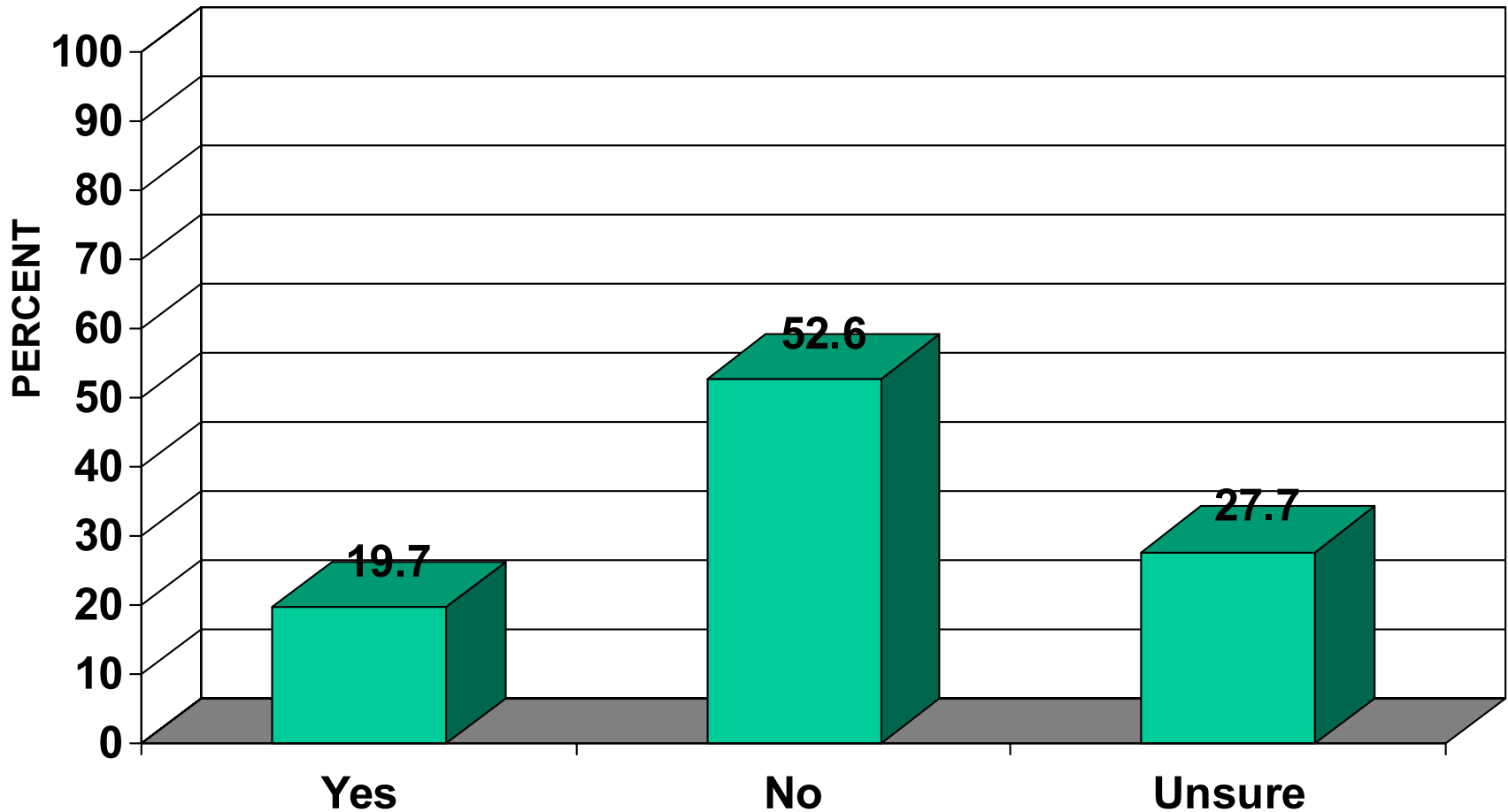
Does at least one course that includes product and process design or development content address standards and their applications? (Check all the apply.)



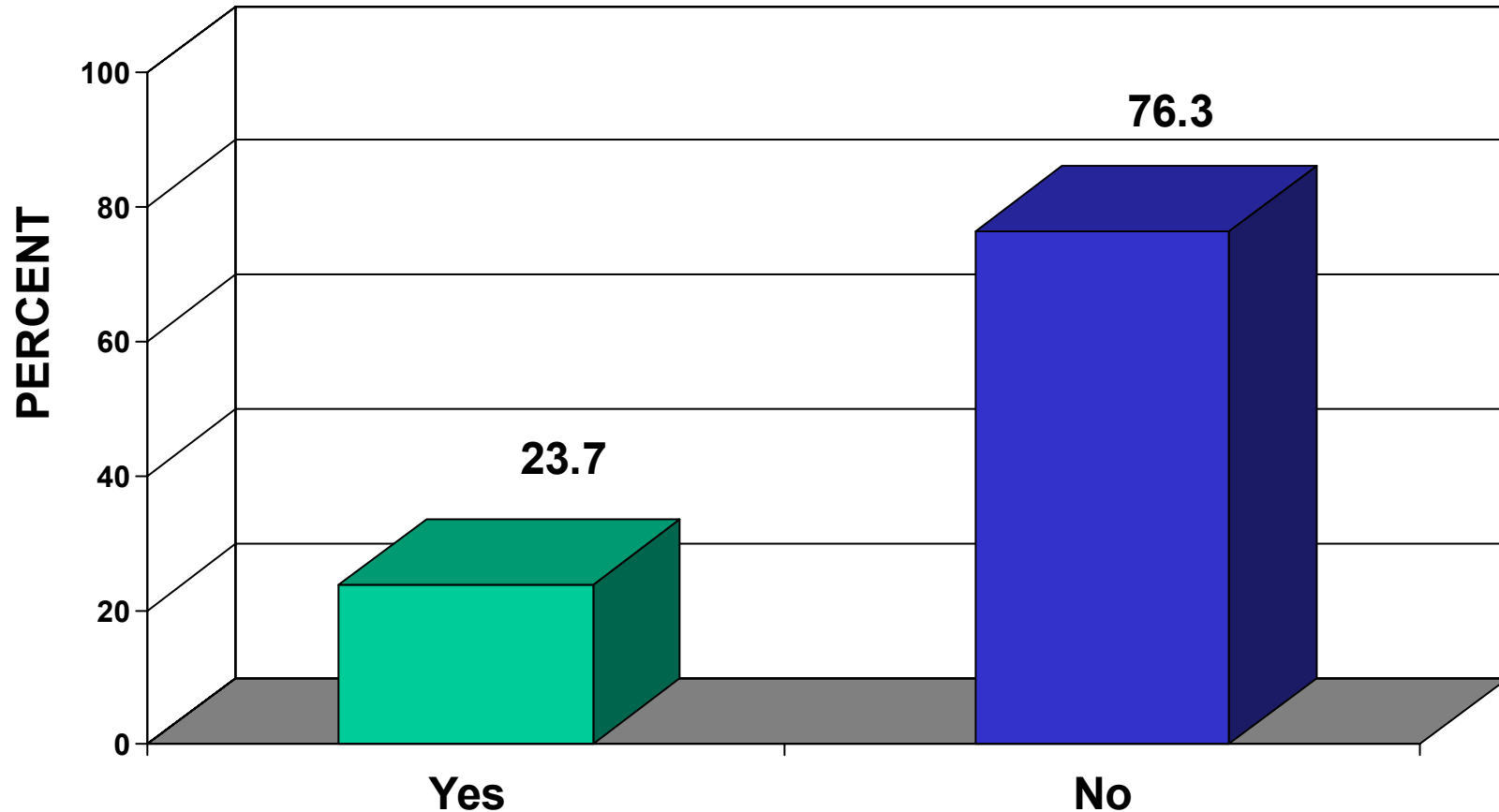
Do you think some courses, not just a capstone course, in your program would be enhanced by teaching more about standards?



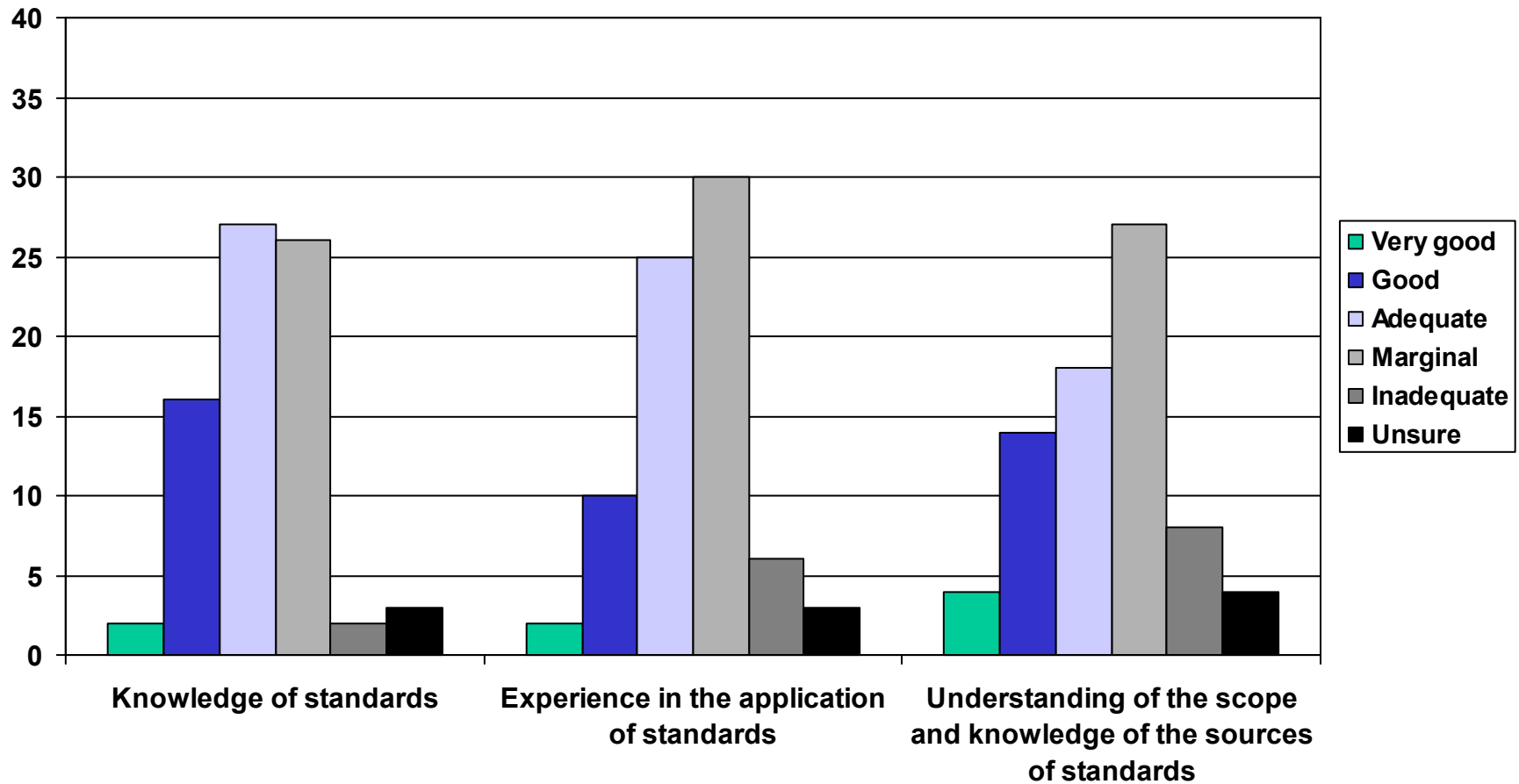
Do you think current textbooks incorporate adequate consideration of standards when relevant?



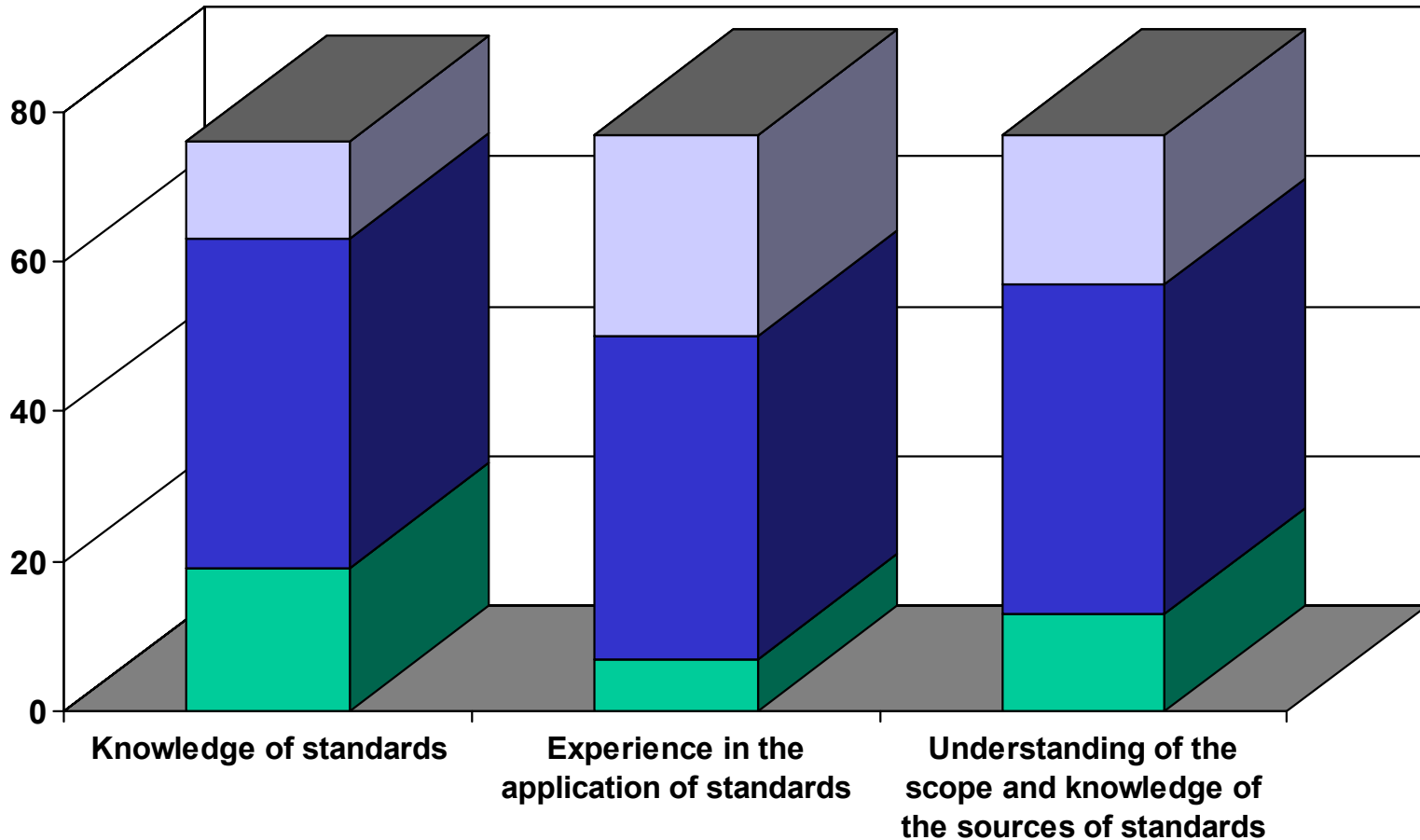
Is the identification of relevant standards by students a requirement in all design and/or development activities?



At the time of graduation from your program, please indicate how well students have the following. (Check one for each item.)

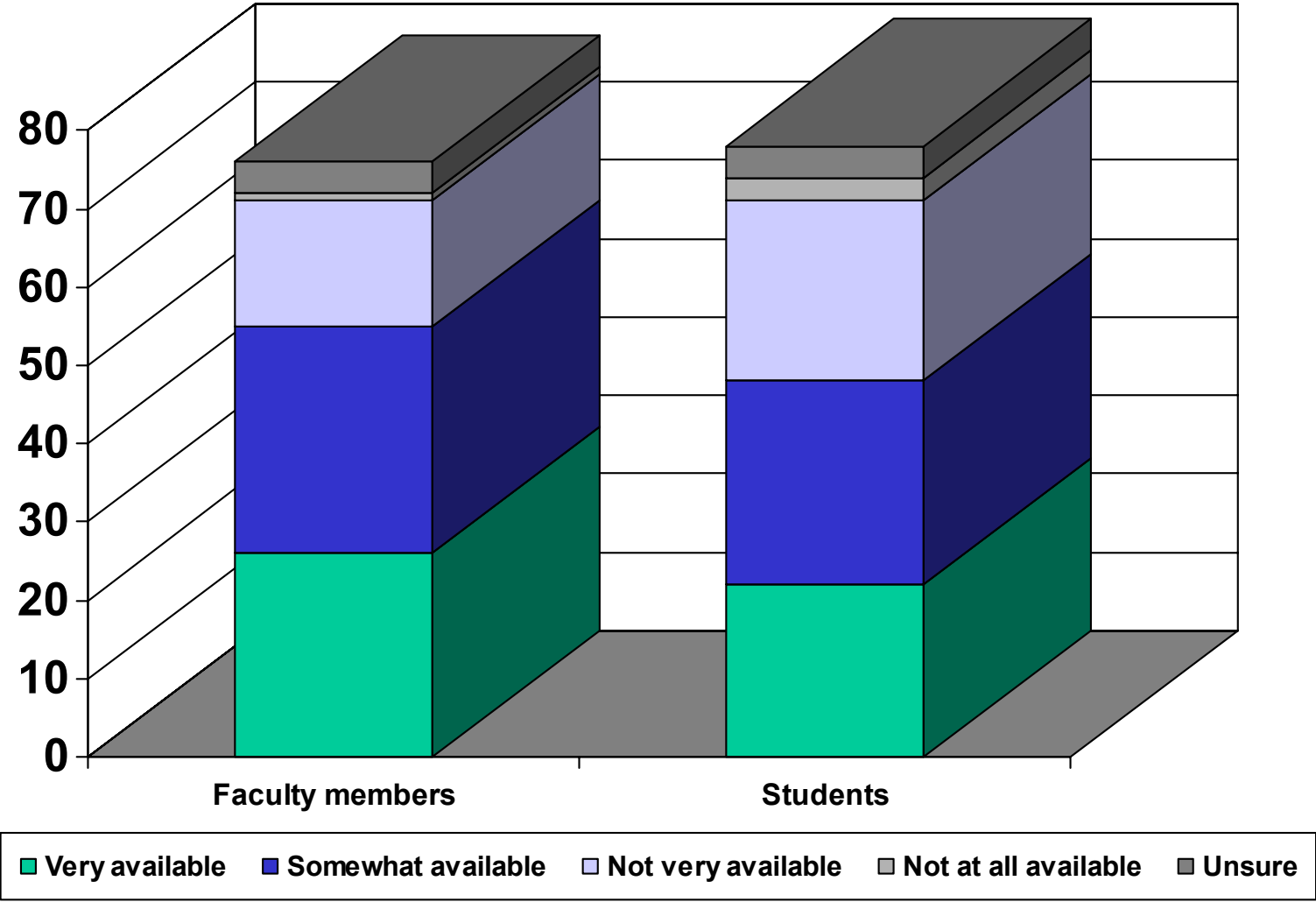


Please indicate how important you think each of the following are in undergraduate education. (Check one for each item.)

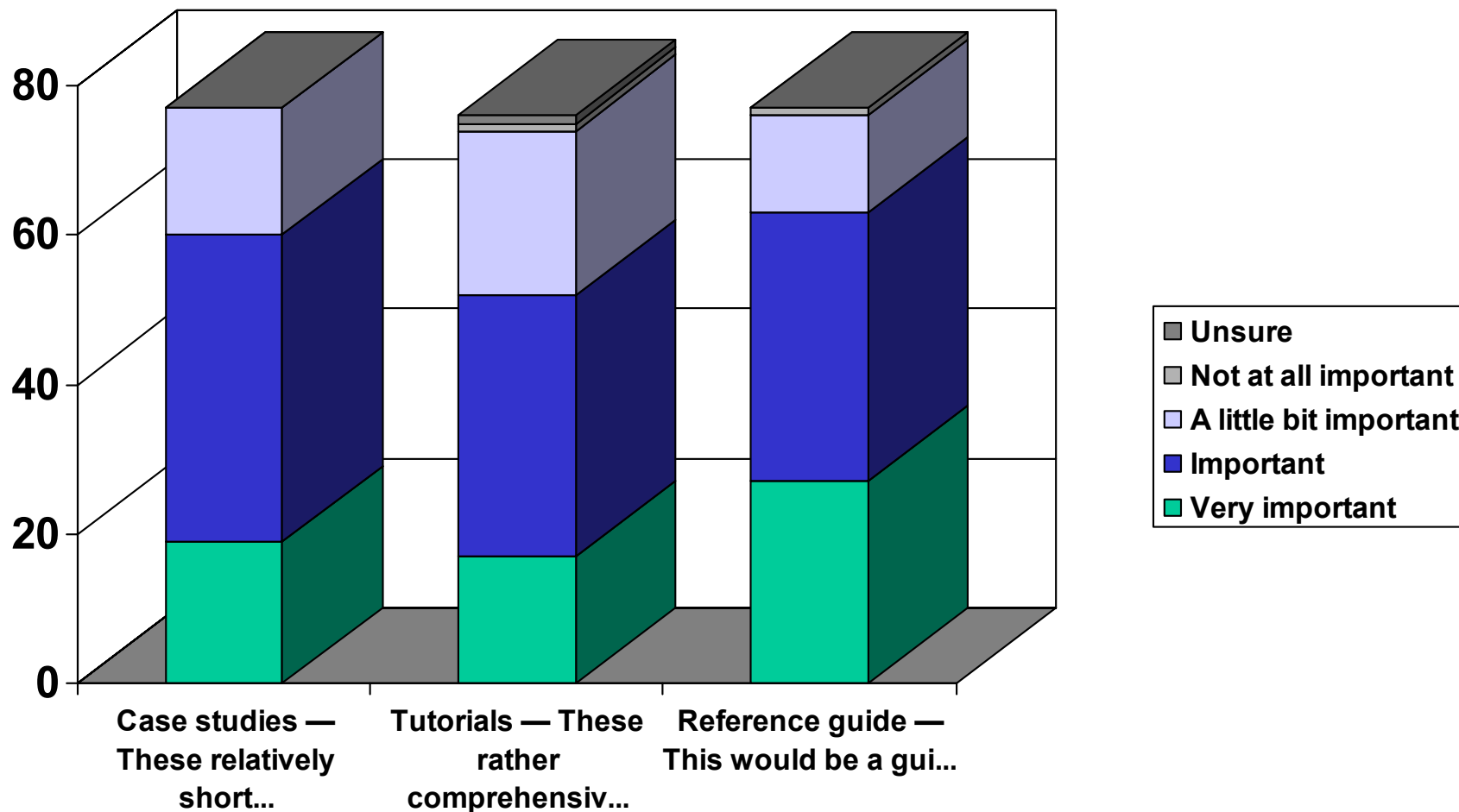


Very important Moderately important A little bit important Not at all important Unsure

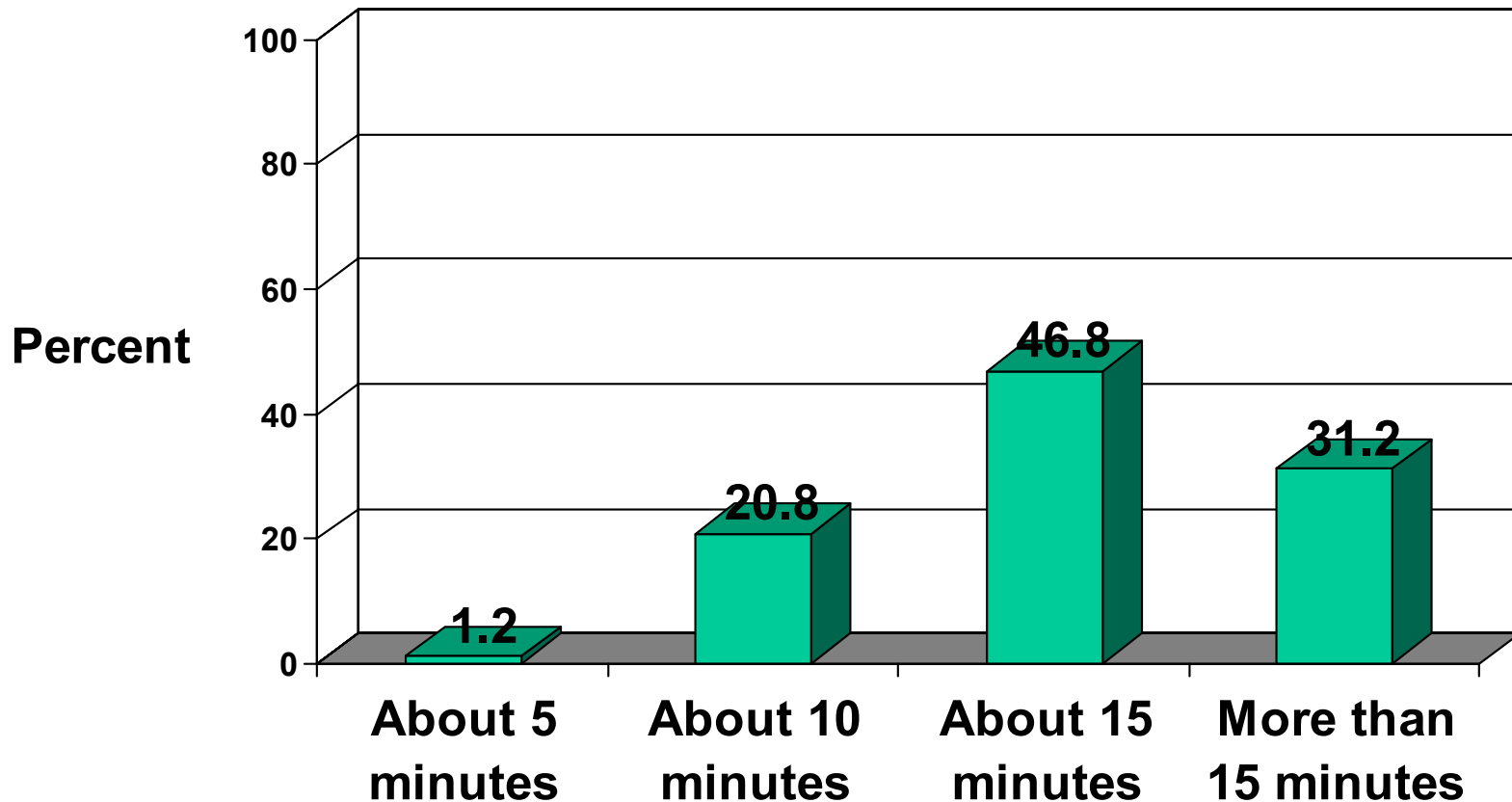
How available are standards to students and faculty members at your institution?



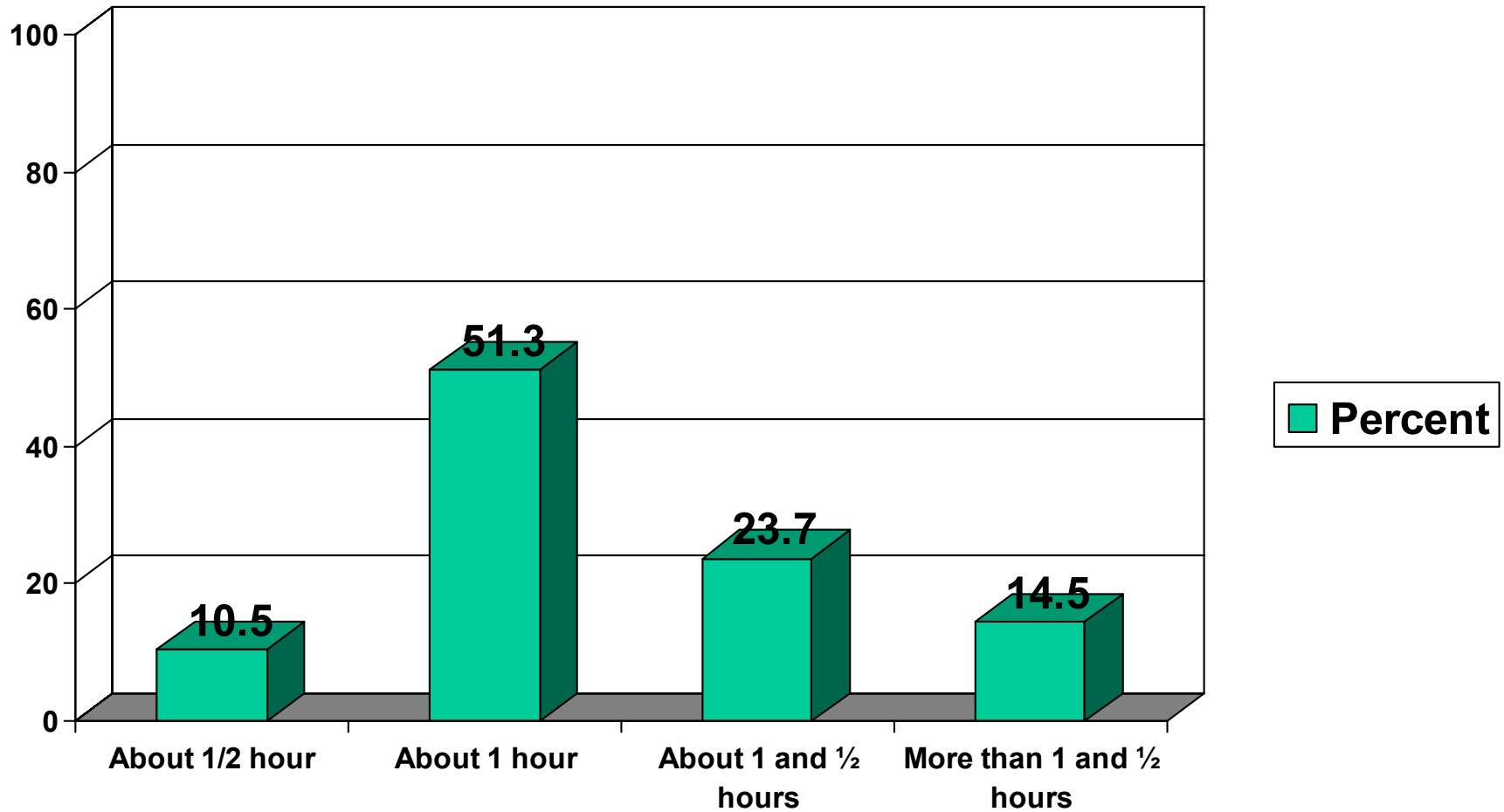
Please indicate how important you feel it is that students have access to the following types of teaching tools.



How long do you think a well-designed case study should take a student to review?



How long do you think a well-designed tutorial should take a student to review?



What are the impediments? What do the programs need?

Impediments

- knowledge
- availability
- cost



Needs

- learning modules
 - tutorials
 - case illustrations
- glossary
- reference guide

Standards in Education: An IEEE Solution



**Tutorials, Case Illustrations,
Reference Guides, and ...**

Tutorial

This comprehensive learning module provides information about standards:

- **How they come about.**
- **How they are classified.**
- **How they impact the development of a product, process, or service.**
- **How they benefit the economy.**

It will have links to a Glossary of words and phrases in common use by standards developers and users.

Domain Tutorial

This learning module provides information about standards in a technological domain:

- **What is their history.**
- **What are the issues that they address.**
- **What is their impact on the design and development of products, processes, and services.**
- **What is the potential impact on the economy.**

Case Illustration

This learning module describes the application of standards from the antecedent domain to a realistic problem:

- **Product, process, or service expectations.**
- **Identification of relevant standards.**
- **Determination of design and development constraints imposed by the standards.**
- **Statement of design or development task.**

Reference Guide

This resource will be a reference guide to standards, grouped in categories, with each reference including:

- the title of the standard or category,**
- a brief description of the content of the standard or coverage of the category, and**
- a URL to the full text of the standard or full body of information on the category.**

The reference guide will also have commentary on and links to other materials on standards.

Gateway to SDO Sites

This resource will be an annotated index of Standards Development Organizations (SDOs) with URLs linked to their web-sites.

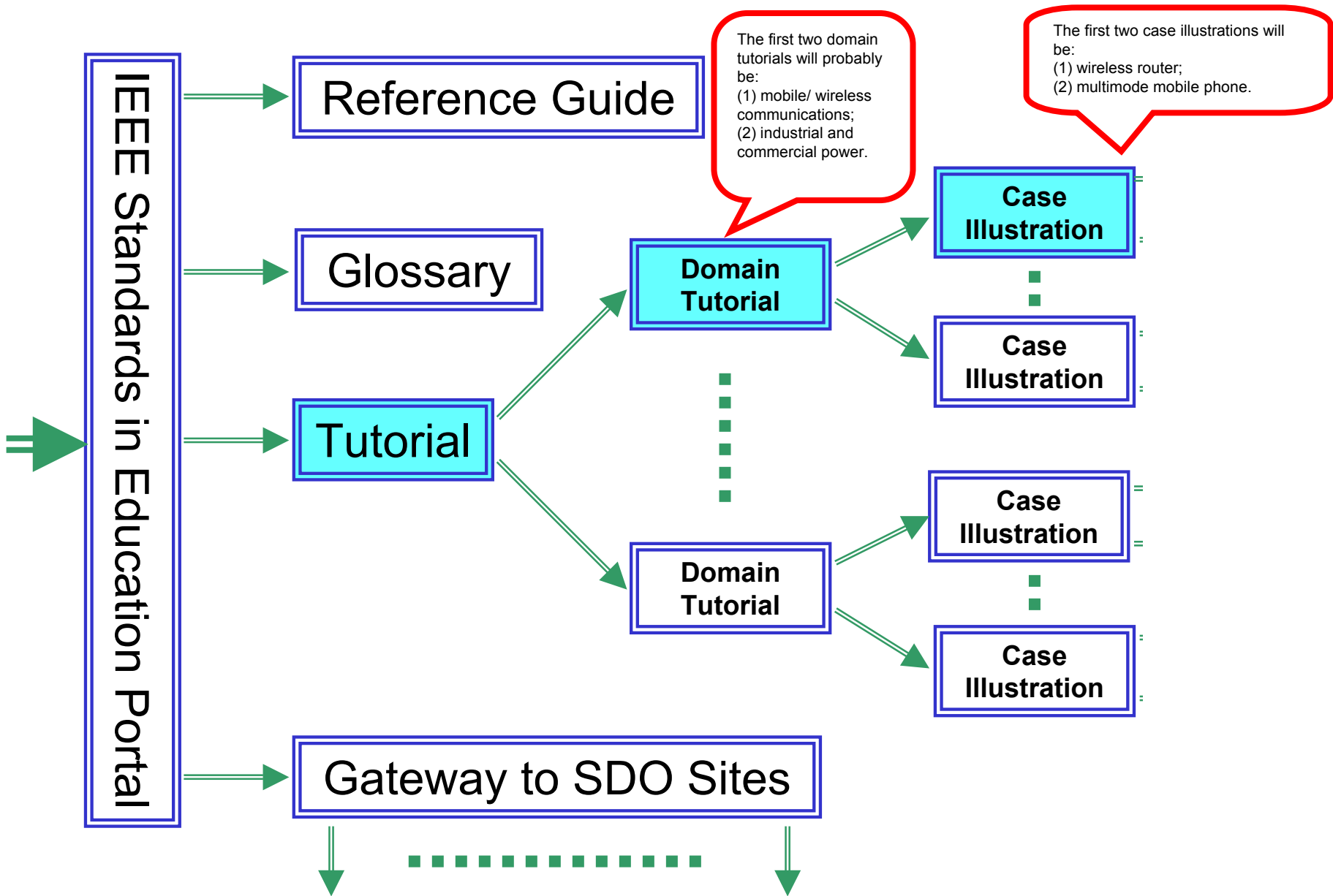
IEEE Standards in Education Portal

The portal will provide (1) a commentary on the IEEE Standards in Education website and (2) links to:

- the Reference Guide,
- the Tutorial,
- the Gateway to SDO Sites, and

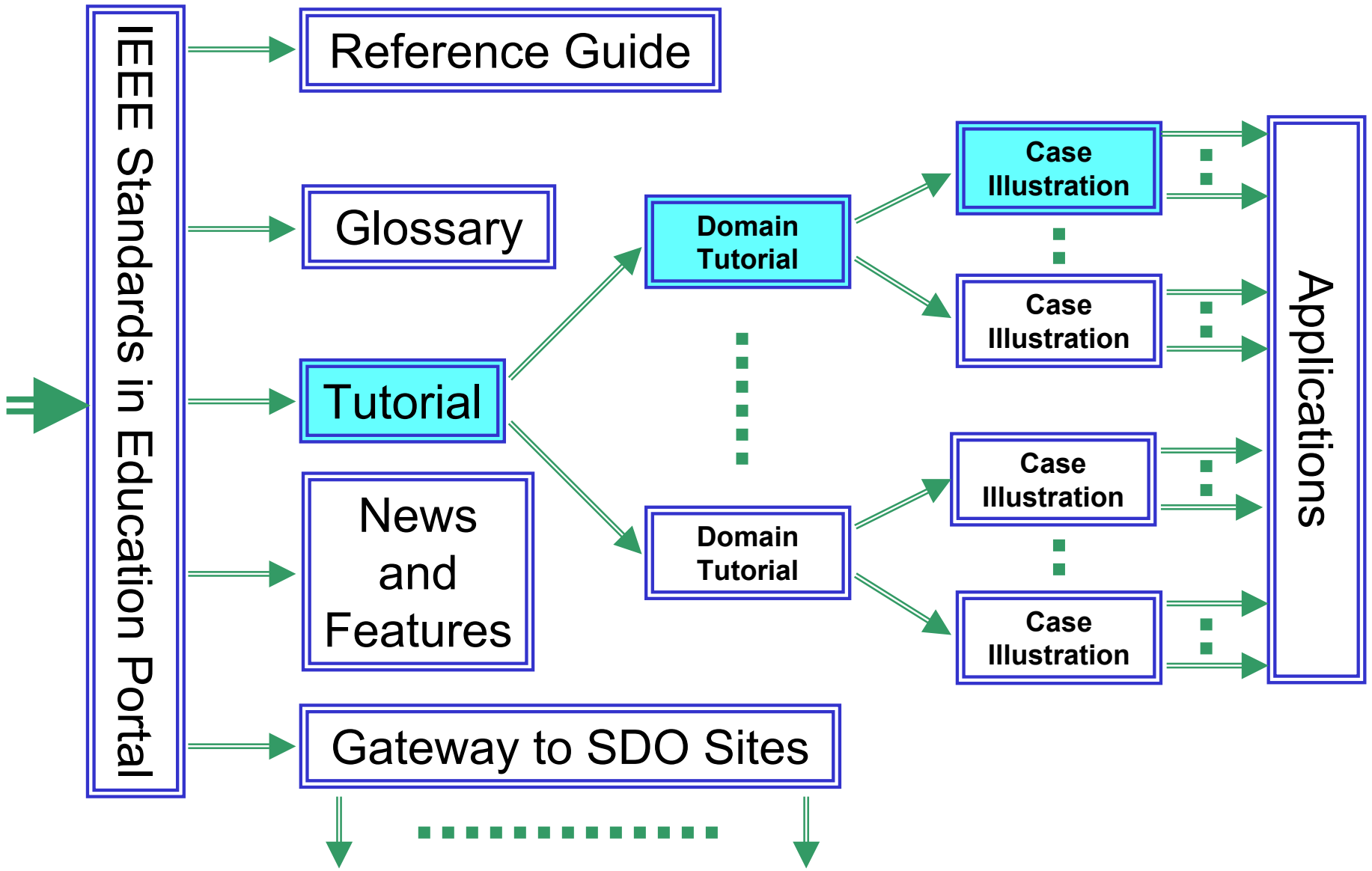
shortcut links to:

- the Glossary,
- the Domain Tutorials, and
- the Case Illustrations.



Applications

The SETF is considering the creation of another class of learning modules. These would be applications submitted to and selected by the SETF from students, or their faculty mentors on their behalf, in design and development. They would highlight specific design choices in the application of various standards. Submission would be encouraged by those who use the IEEE Standards in Education web site. The author(s) would be recognized on the module lead page and would receive a certificate of appreciation.



News and Features

The SETF is considering the creation of another class of references. These would be news and feature articles with a moderate to long period of interest to students and faculty members; for example:

- Erica Vonderdeid, “Standards Hidden in Plain Sight,” *The Institute*, an IEEE publication, March 2004, vol. 28, no. 1.
- Erica Vonderheid, “Nine Standards that Keep Your Computer Going,” *The Institute*, an IEEE publication, March 2005, vol. 29, no. 1.

Tutorial Preview



THE ROLE OF STANDARDS

in engineering and technology



This tutorial addresses the subject of technical standards. These are standards that deal with the physical and electrical properties and dimensions of a product or service. In the body of this tutorial the term "standards" is to be taken as "technical standards," as opposed to standard, such as ethical and business, which are also important but are not covered by this tutorial.

This first publication of 'The Role of Standards in Engineering and Technology' presents introductory material that is applicable to most classes of standards. It then makes use of existing standards from the telecommunications and information technology fields to provide direct examples on how standards and technical developments interact.

Each section in this module is navigated by a toolbar at the top of the page. This toolbar has five choices:

TABLE OF CONTENTS	TOPICS IN THIS SECTION	GLOSSARY	FURTHER READING	INDEX
The Table of Contents listing all the sections in the module.	A list of all topics in the section you are currently viewing.	A list of all terms in the module with their definitions and links to further material, as appropriate.	A reading list for the module, linked to additional material as appropriate.	A full index of content in the module, linked as appropriate.

BEGIN MODULE

A project of the IEEE Educational Activities Board and the IEEE Standards Association through the work of the joint Standards in Education Task Force produced by Unreal Productions

This tutorial is provided as a tool to practicing technologists and for engineering faculty and students in the fulfillment of the accreditation requirement set by ABET that: "Students must be prepared for engineering practice through the curriculum culminating in a major design experience...incorporating engineering standards and [other] realistic constraints..."

Table Of Contents

Please select a section from the list below.

The first time you review this material, we suggest you do so in sequence.



What are Standards?



The Application of Standards



Standards and Markets



Product Design and Manufacture



Summary and Next Step

THE ROLE OF STANDARDS

in engineering and technology



TABLE OF CONTENTS	TOPICS IN THIS SECTION	GLOSSARY	FURTHER READING	INDEX
What are Standards?	Section Learning Objectives			
The Application of Standards	Standards Defined			
Standards and Markets	How Standards are Codified			
Product Design and Manufacture	Consensus vs. Proprietary Standards			
Summary and Next Step	Proprietary and De Facto Standards			
	Key Elements of the Standards Development Process			
	Accredited Standards Development Processes			
	Forums, Consortia and De Facto Standards Development Processes			
	National, Regional, and International Standards			
	Voluntary vs. Mandatory Standards			
	Conclusion: Mastery Exercise			

What are Standards?

LEARNING OBJECTIVES

At the completion of this section, the student will understand:

- The definition of standards
- The different types of standards
- How standards are developed and codified
- The relationship between voluntary and mandatory standards



What are Standards?



STANDARDS DEFINED

In the practice of engineering and technology, the development of technical standards is fundamental to the delivery of products and services to meet design, manufacturing, market, application and other needs and requirements.

All products and services available in the marketplace are assembled/offered based on documented designs and/or processes. This is the only way that the supplier and their customers can be sure that each unit will be a replica of the prototype and other units sold or to be sold. One way to describe this supply is to say that all products and services are created according to one or more standards. Informally, any agreement on how something is done, made, or used can be considered a standard. This definition is explored further in subsequent pages of this section.

The different types of standards we will discuss in this section are:

- Proprietary standards vs. consensus voluntary standards
- Accredited standards vs. forum and consortia standards
- De facto standards
- National, Regional, and International standards

PRACTICE

practice tips

Whenever one makes a local, long distance or international telephone call, many standards are exercised to accomplish the desired interconnection. Next time you make a telephone call, listen to the tones on the hand set: the dial tones (Multi-Frequency signaling, MF signals) and the ring-back signals. These are all realized in compliance with existing standards, and in fact the MF signals are in agreement with international standards, allowing one to send signals from a city in the USA to a city in Europe, for example.



EXAMPLE

applied example

In the United States, standards carrying the accreditation of the American National Standards Institute (ANSI) cover many familiar products



ranging from safety glasses and shoes to how cellular telephones interconnect with wireless base stations, and hence to other telephones. Similar situations exist in other countries of the world, and, in some cases, common standards certified in a 'region' that includes two or more sovereign nations (e.g., in North America both the USA and Canada use many common electrical power and telephony standards.) When many nations/regions of the world agree on a common standard, it is referred to as an international standard. Many examples of the latter type exist for telephony and other subjects.



What are Standards?



MASTERY EXERCISE

Click the box to check the best response to each question.

1. Non-proprietary voluntary standards are codified by _____.
 - a. applying learned skills on work assignments
 - b. individual product suppliers internal processes
 - c. governmental regulatory agencies
 - d. developing a consensus agreement in an open process
 - e. developing product specifications for a new product
2. Proprietary standards are codified by _____.
 - a. not-for-profit oversight organizations
 - b. obtaining a formal agreement among individual companies
 - c. individual companies in a closed process
 - d. developing a consensus standard
 - e. governmental regulatory agencies
3. Regional standards are _____.
 - a. global standards
 - b. standards agreed to by most or all nations
 - c. specific to one national entity
 - d. standards agreed to by more than one national entity

SUBMIT ANSWERS FOR FEEDBACK

