Assessing Students' Prior Knowledge about Engineering and Scientific Concepts

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Session Objectives

- Introduce concept inventories as a means of assessing students' prior knowledge and misconceptions in science and engineering topics

- Explore how you might use concept inventories for assessment purposes
Session Overview

- What are misconceptions and why are they important?
- How can misconceptions be assessed?
- What is a concept inventory?
- How might you use concept inventories for assessment?
- Useful references to get started
“Sometimes the simplest problems in science defy intuition and the most basic technology is surprisingly difficult to grasp. Is it because we weren’t taught? Or is it because of something deeper? Something about the way we think?”
Video Exercise

Why are some concepts in science and engineering so difficult to learn? Is it because students weren't taught? Or is it something about the way students think?

- Think about this and write down some ideas (2 min).
- Select a partner and share your ideas with each other (2 min.)
What is a Misconception?

In terms of a constructivist view of learning and knowledge, students create mental models describing their view of the world.

Models which inaccurately describe phenomena are termed misconceptions or alternate conceptions.
Misconceptions and Prior Knowledge

Students come to your classes with at least partially developed mental models which we may term prior knowledge.

Prior knowledge is often formed using everyday experience and may involve significant, robust misconceptions.
How can misconceptions be identified?

Research methods
- interviews
- “think aloud” problem-solving
- verbal protocol analysis

Concept inventories
- multiple choice instruments with conceptual questions (answer list includes common misconceptions as distractors)
A Concept Inventory Exercise

- Individually, complete the 4 question concept inventory (2 minutes)
- Turn to your neighbor and compare answers; develop a consensus answer for each question (2 minutes)
- Be prepared to report to the full group
How Can CI's Be Used for Assessment?

- List ways you might use a concept inventory in your course or in program assessment (2 min.)
- Be prepared to share with the full group
Available Concept Inventories

- See references on resource page
- In particular, the FLAG website is a repository for many concept inventories:
  www.flaguide.org
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Articles and books


Web sites of interest
CSM Center for Engineering Education (CEE)
http://www.mines.edu/research/cee/

Field-tested learning assessment guide (FLAG)
http://www.flaguide.org/