Science Misconceptions and Discrepant Events: An Introduction

8th Annual Workshop on K-12 Engineering Education
at the 118th ASEE Conference and Exposition
25 June 2011

Susan K. Donohue, Ph.D.
Assistant Professor
Department of Technological Studies
The College of New Jersey

Christine G. Schnittka, Ph.D.
Assistant Professor
Department of STEM Education
University of Kentucky

Larry G. Richards, Ph.D.
Professor
Department of Mechanical and Aerospace Engineering
University of Virginia

© VMSEEI, 2011
What is a Concept?

• Mental construct, model, or scheme which helps us organize knowledge
• Inductively built from interactions and experiences
  • “Commonsense” conceptual view
• Critical to the development of higher order cognitive skills
  • Analyzing
  • Creating
  • Evaluating

Bransford, Brown, and Cocking (2000)
What is a Misconception?

• Also referred to as
  • Alternative framework
  • Alternative conception
  • Naïve or invented theory
• Develops from a flawed construction/building process
• Typically represents deeply held beliefs
• Can be resistant to change
• Misconception v. mistake

Mestre (2004)
Schnittka and Bell (2010)
One Coping Mechanism

i has two ansers.

which you want?

icanhascheezburger.com
Conceptual Change

• Change will not happen unless there is a compelling reason to do so

• Success in modifying or replacing a misconception depends on the degree to which the replacement concept
  • Is comprehensible and plausible
  • Solves problems consistently
  • Allows learners to add to their knowledge through questioning and experiences

STEM Misconceptions

• Seasons
• Equal Sign

• Science misconceptions
• Technology misconceptions
• Technology misconceptions 2
• Engineering misconceptions
• Math misconceptions
Assessment Strategies

- Concept inventories
  - Foundation Coalition
  - Purdue's Concept Inventory Central
- Directed interviews
- Exposing event creating cognitive conflict
- Strategy writing
- Think-aloud

Hestenes, Wells, and Swackhamer (1992)
Leonard, Dufresne, and Mestre (1996)
Mestre (2008)
Nussbaum and Novick (1982)
Prince and Felder (2006)
Streveler, et al. (2008)
Remediation Strategies

• Bridging

☆ • Discrepant events
  • Goal is to create an opportunity for accommodation
  • Diet Coke example
• Inductive teaching/learning strategies and activities
• Interactive lectures
• Models (visualization)

Bransford, Brown, and Cocking (2000)
Chi (2005)
Prince and Felder (2006)
Questions / Comments?

Thank you!
References


References


