Using Issues as a Context to Enhance Students’ Three-Dimensional Learning

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NSTA, Atlanta, March 15, 2018

This material is based upon work funded by the National Science Foundation under Grant # NSF DRL 1418235. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.
Implementing New Standards

Curriculum – instructional materials
Classroom Assessment – formative & summative
Instruction – teaching tools
What is 3-D Learning?

Performance Expectations

Science and Engineering Practices

Disciplinary Core Ideas

Crosscutting Concepts

Links to Common Core
What is 3-D Learning?

The practices are the processes of building and using the core ideas to make sense of the natural and designed world, and the crosscutting concepts hold the discipline together.

Core Ideas

Crosscutting Concepts

Practices
Disciplinary Core Ideas (DCIs)

• **Physical Science**
  • Matter and its interactions
  • Motion and stability: Forces and interactions
  • Energy
  • Waves and their applications in technologies for information transfer

• **Life Science**
  • From molecules to organisms: Structures and processes
  • Ecosystems: Interactions, energy, and dynamics
  • Heredity: Inheritance and variation of traits
  • Biological evolution: Unity and diversity

• **Earth and Space Science**
  • Earth’s place in the universe
  • Earth’s systems
  • Earth and human activity

• **Engineering**
  • Engineering design
Science and Engineering Practices (SEPs)

• Asking Questions and Defining Problems
• Developing and Using Models
• Planning and Carrying Out Investigations
• Analyzing and Interpreting Data
• Using Mathematics and Computational Thinking
• Constructing Explanations and Designing Solutions
• Engaging in Argument from Evidence
• Obtaining, Evaluating, and Communicating Information
Crosscutting Concepts (CCCs)

- Cause and Effect
- Energy and Matter
- Patterns
- Scale, Proportion, and Quantity
- Stability and Change
- Structure and Function
- Systems and System Models
Why Issues?

In order for students to develop a sustained attraction to science and for them to appreciate the many ways in which it is pertinent to their daily lives, classroom learning experiences in science need to connect with their own interests and experiences.

*Next Generation Framework*

National Research Council, 2011
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Big Ideas & Phenomena

1. Humans can affect the relationships among organisms in an environment.
2. Natural disasters can affect the transfer of energy and the cycling of matter in ecosystems.
3. The growth of organisms and populations are limited by the available resources.
4. The introduction of a new organism can affect the stability of an ecosystem.
5. Humans are using more resources, causing the need for solutions.
Example Activity

- From a model middle school NGSS-aligned unit on Ecology
- Overarching issue in chapter: invasive species (Zebra mussel in the Hudson River)
- Final activity in the chapter
- Evaluate activity in the 5E cycle
## NGSS Alignment

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PEs: MS-LS2-4 and MS-LS2-1
Where did you see 3-D learning?

• What could you do with your students throughout a unit/school year to make 3-D learning more explicit?
Other *Disruptions* Presentations

Developing Science Practices: Constructing Explanations and Engaging in Argumentation
- Friday, March 16, 11am-noon
- GWCC C209

NGSS@NSTA Forum Session: Disruptions in Ecosystems: An NGSS-Designed Middle School Unit and PD Model
- Friday, March 16, 12:30-1:30pm
- GWCC B102
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- Session Evaluation: www.nsta.org/atlantabrowser
- Thank you to NSF for funding this project!
- Presentation will be available on sepuplhs.org
- Curriculum (2nd Field Test Ed) available on nextgenscience.org (search for Disruptions in Ecosystems)
- Zebra mussel materials (graphing tool, readings) are on www.amnh.org/education/resources/rfl/web/riverecology