Environmental Literacy and Inquiry: A Geospatial Curriculum to Support Middle School Teachers and Students

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Middle school science teachers
ELI middle school curriculum

- Energy (40 days)
- Climate Change (21 days)
- Land Use Change (20 days)
- Tectonics (6 Web GIS investigations forthcoming)
ELI middle school curriculum

- Geospatial curriculum approach:
  - Curriculum framework
  - Design principles
  - Instructional model for the development of learning activities with GT
  - Educative materials to support teacher enactment

- Align instructional materials and assessments with science and environmental literacy learning goals.

- Use geospatial technology as a tool for learners to explore and investigate problems.

- Iterative stages of development: Prototype, pilot test, and field test with diverse 8th grade urban classrooms.
1. Design curriculum materials to align with the demand of classroom contexts.

2. Design activities to apply to diverse contexts.

3. Use motivating entry points to engage learners.

4. Provide personally relevant and meaningful examples.

5. Promote spatial thinking skills with easy to use geospatial learning technologies.

6. Design image representations that illustrate visual aspects of scientific knowledge.

7. Develop curriculum materials to better accommodate the learning needs of diverse students.

8. Scaffold students to explain their ideas.
Energy is an interdisciplinary technology-supported middle school science inquiry curriculum. This curriculum focuses on the world’s energy resources. Students use geospatial information technology (GIT) tools including GIS (My World GIS or Web GIS) and Google Earth, and inquiry-based lab activities to investigate energy sources, production, and consumption. Energy is aligned to national science and environmental education standards.

Energy has been field-tested in both urban and non-urban middle schools. Materials best used with the Firefox Web Browser and Google Earth version 5.2 or higher.

ELI is sponsored in part by the Lehigh Environmental Initiative. This material is based upon work supported by the Toyota USA Foundation.
Where is the best place to locate a new wind farm?

http://gisweb.cc.lehigh.edu/energy/

ArcGIS viewer for Flex
“Educative” Support Materials

- Pedagogical and content support for teachers
- Instructional Web GIS handouts: teacher guide, student handout, investigation sheet, assessment information
- WebGIS video tutorials

**Wind Energy**

**Definition of Wind Energy**

Wind energy is energy from moving air.

Air has mass. When it moves, it has kinetic energy. Kinetic energy is the energy of motion.

How does wind form?

Wind forms when the sun heats one part of the atmosphere differently than another part. The heat warms the air causing it to expand. The heated air has less pressure than cooler air. Air always moves from high pressure to lower pressure. The movement of air is wind.

What is wind energy used for?

Wind energy can be converted into mechanical force or used to generate electricity.

[Interactive content]

http://www.ei.lehigh.edu/eli/energy/support
Energy Culminating Investigation: Island of Navitas

http://gisweb.cc.lehigh.edu/navitas/

ArcGIS viewer for Flex
Investigating Future Worlds with Google Earth

http://www.ei.lehigh.edu/eli/cc/sequence/day18.html
Investigating Future Worlds with Google Earth

http://www.ei.lehigh.edu/eli/cc/sequence/day19.html
Where is the best place to locate a new Wal-Mart Supercenter in the greater metropolitan Lehigh Valley area that has minimal impact on the environment?
Some Recent Findings

- Increased student geospatial thinking and reasoning skills related to content areas increased (Bodzin, 2011; Bodzin, Fu, & Peffer, 2012)

- Geospatial technologies are more effective than business-as-usual methods at promoting spatial thinking and mastery of content (Bodzin, Fu, & Peffer, 2012).

- Educative curriculum materials are an effective form of support for teaching with a geospatial-integrated curriculum (Bodzin, Peffer, & Kulo, 2012).
Concluding Thoughts

- WebGIS and other geospatial technologies are accessible in today’s classrooms.
- User-friendly interfaces
- Effective curriculum approach for learning with geospatial technologies
- Adopting a new reform-based science curriculum that use geospatial leaning activities is a significant change from the types of classroom learning that typically occurs in science classrooms.
Abstract and research papers available at:

http://www.ei.lehigh.edu/eli/research/pubs.html

ELI curriculum:
http://www.ei.lehigh.edu/eli

To access assessments, use:
Login: eliteacher
Password: 87dja92