

Teaching “spatially” with Web GIS

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ELI middle school curriculum

- Align instructional materials and assessments with science literacy learning goals.
- Use geospatial technology as a tool for learners to explore and investigate problems.
- Contextualize the learning of key ideas in real-world problems.
- Support teachers in adopting and implementing GIT and inquiry-based activities.
- Iterative stages of development: Prototype, pilot test, and field test with diverse 8th grade urban classrooms.

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Fossil Fuels

Energy Efficiency and Conservation

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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.

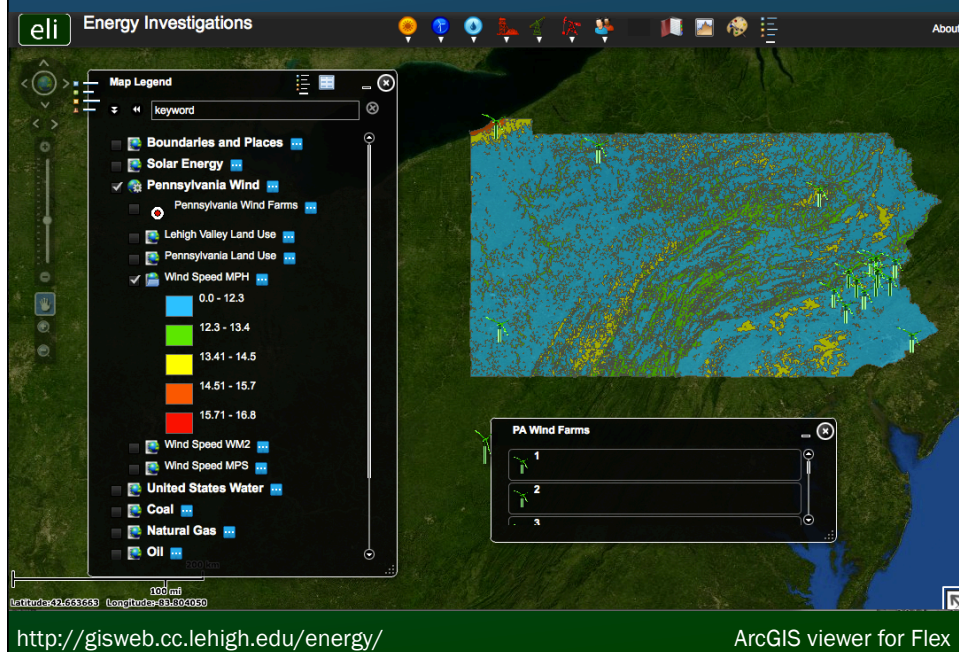
Energy has been field-tested in both urban and non-urban middle schools. Materials best used with the Firefox Web Browser and Google Earth version 5.2 or higher.

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<http://www.ei.lehigh.edu/eli/energy/>

Where is the best place to locate a new wind farm?



Support Materials

- Online reference content for teachers
- Instructional Web GIS handouts: teacher guide, student handout, investigation sheet, assessment information
- Web GIS video tutorials

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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.

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Where is the Best Place to Locate a New Wind Farm?

Wind is moving air and is a locally plentiful source of energy. In this activity, you will use Web GIS to examine wind speed patterns and land use in Pennsylvania to determine the best place to locate a new wind farm. You will:

1. Examine wind speed patterns in Pennsylvania.
2. Examine land use patterns in Pennsylvania and in the Lehigh Valley.
3. Determine the best place to locate a new wind farm in the Lehigh Valley and in Pennsylvania.

Read all instructions and answer each question on your investigation sheet.

Step 1: Download data.

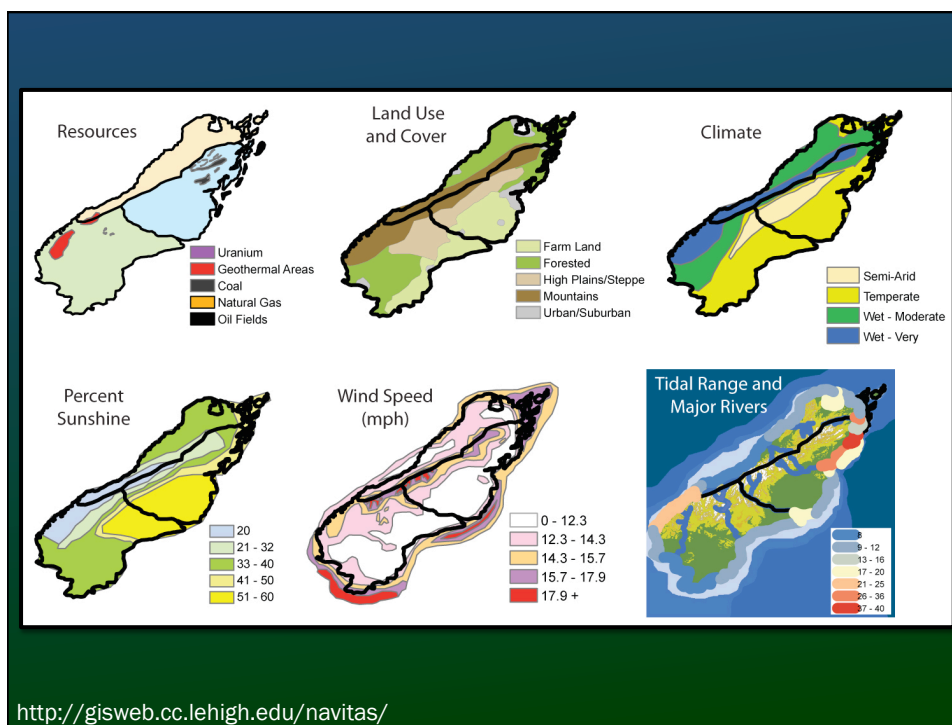
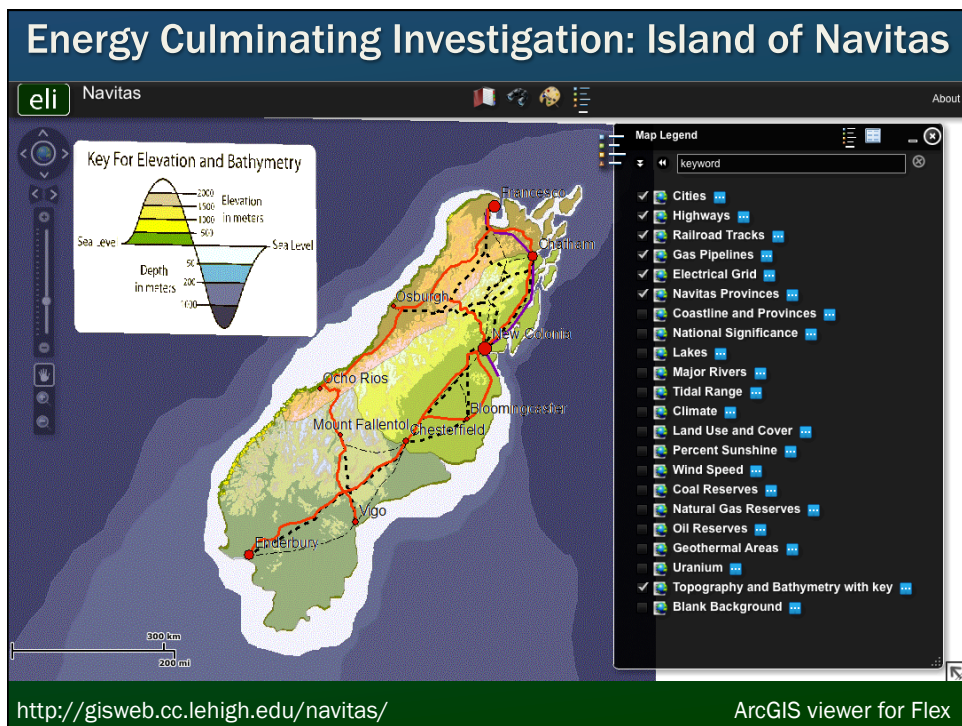
- a. Open your Web browser. Go to www.el.lehigh.edu/assessments/energy/
- b. Click on **Where is the Best Place to Locate a New Wind Farm with Web GIS?**

Step 2: Basic Features of Web GIS

- a. Your screen should open to a global view as shown in the picture to the right.
- b. To navigate in Web GIS you can use the navigational tools (# 1) or the toolbar (# 2). You can move around the map by selecting different areas or scrolling to them.
- c. You can zoom in or out using the zoom in/out options (# 3).
- d. You can find your exact location on the map by viewing the latitude and longitude location of your cursor in the location bar.
- e. You can get back to the location bar using the **Bookmark** icon in the toolbar at the top of the screen (# 4).
- f. You can also get back to the location bar by clicking on the **Home** icon in the toolbar.
- g. The data for each activity can be activated using the **Map Legend** panel (# 5). Click on the **Map Legend** icon in the **Map Legend** window. You will see a data layer that you can expand or shrink a legend item by clicking on the globe icon next to each data layer label.
- h. To observe the legend for a specific data layer, select the globe icon next to that item in the list (# 6).

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Findings

Geospatial technology integrated curriculum increases student's knowledge of Energy concepts and spatial reasoning skills.

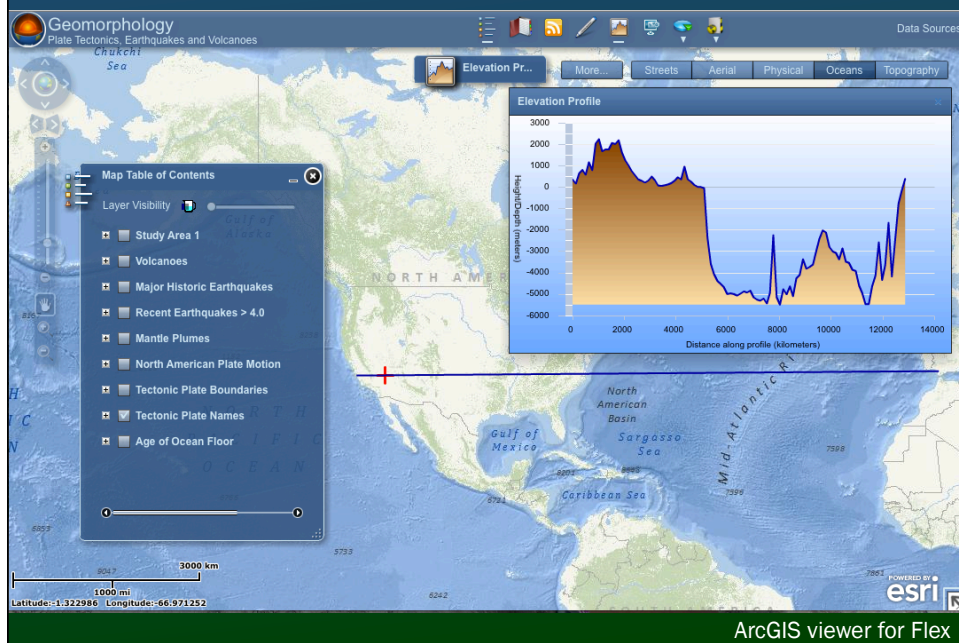
Energy achievement and achievement by subscale for pre/post test.

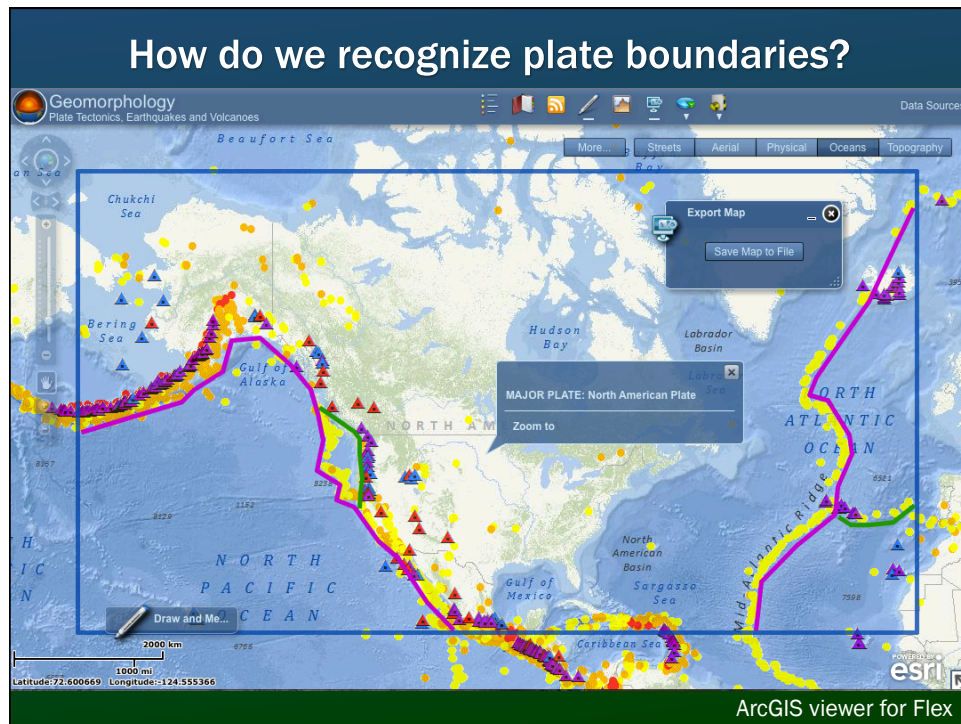
	Pre-test Mean (SD)	Post-test Mean (SD)	Gain (SD)	Standard Effect
Entire Assessment (n=38)	15.16 (5.10)	22.10 (7.18)	6.94 (6.04)	1.36***
Content Subscale (n=27)	10.80 (3.83)	16.09 (5.48)	5.29 (4.81)	1.38***
Spatial Reasoning Subscale (n=11)	4.36 (1.97)	6.01 (2.28)	1.65 (2.38)	.84***

*** $p < 0.001$
N=928

<http://www.ei.lehigh.edu/eli/research/pubs>

Current Project: Tectonics





Tectonics Investigations

- 1: How do we recognize plate boundaries?
- 2: How does thermal energy move around heating and cooling objects and places?
- 3: What drives plate tectonics?
- 4: What happens when tectonic plates pull apart?
- 5: What happens when plates collide?
- 6: What happens when plates move sideways past each other?
- 7: Tectonics and Me – Where is the nearest plate boundary? What are the geologic hazards near my area?

Conclusions

- Geospatial technologies are more effective than “business as usual” methods at promoting spatial thinking and mastery of content.
- Web GIS is accessible in today’s classrooms.
 - User-friendly interfaces
- Effective Instructional design model for learning with geospatial technologies (Kulo, 2011).
- Embedded content and pedagogical supports for teachers are essential for classroom enactment.

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Curriculum, support materials, and papers available at the Web address above

To access assessments, use:

Login: eliteacher

Password: 87dja92