Internet-based GIS (and more) in pre-collegiate science education

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Why GIS in K-12?

- Allows students/teachers a new, powerful way of analyzing and exploring data.
- Technology for Integration
- School-to-Career
- School-to-Community
- Fun and Interesting
- Directly supports standards-based inquiry and Project Based Learning
What is Internet-based GIS?

Any digital mapping system capable of displaying data and/or analysis results from across a network, most typically via a web browser.

Advantages:
- Relatively small learning curve
- No data storage issues (lab available, assigned seating, etc)
- Few tech barriers (security, network, OS, etc)
- Very efficient for collaborative data collection & display

Disadvantages:
- The network may go down
- Tools not as technically powerful
- Base data not always customizable
- Functionality and interface may vary across websites.
Training educators to integrate geotechnologies: A Sequence for Integrating

**Presentation** - the display of a static map or GIS output, usually for an audience

**Exploration** - a simple examination or addition to data presented in the GIS

**Analysis** - selection of features based upon criteria

**Synthesis** - recombination of existing data or creating one's own data into a new map

**Visualization** - a dynamic process of searching for new spatial patterns by altering the way the data is represented or perceived.
Student-created visuals
Biomonitoring

- Middle School Earth Science
- Using lichen as a bioindicator of relative sulphur dioxide levels.
- Mapped with ESRI’s ArcExplorer 2
- Key: Darker green and larger green squares represent greater lichen coverage.
Stream Monitoring

- Cross-disciplinary middle school
- Using Internet-based mapping to track stream quality around town.
- Ongoing.
- Key: Points map sampling locations. No specific attribute.
Bird Monitoring

Citizens and school children of all ages identify and submit to webforms a density and diversity Survey occurs annually in January Internet-based mapping. Key: Darker green polygons represent greater average bird counts per county.
Digital Monarch Watch

- Citizens and students identify and submit first sighting of monarch migration.
- Across the nation. Ongoing. [Live]

Key: Color ramp, darker colors represent reports of initial migratory “wave” by week.
ESIC Animation Research

- Approximately 600 students from grades 6 to 12 in U.S., representing about 20 teachers.
- All students from one teacher were randomly assigned to a treatment group:
  - *static*, in which a list of links is presented, where the student is free to click through each at his/her own pace, and in any particular order
  - *animated with controls*, same as *animation* but with “buttons” that allow for the stopping, pausing, playing, reversing and fast-forward/fast-reverse of the sequential program
  - *animated*, in which each month-by-month display is presented in a sequential fashion.
ESIC Animation Research

An example similar to that used in the *animation* treatment.

United States Tornadoes
Displayed by month, 1950-1990

ESRI Schools and Library CD vs 5.1
KanCRN/Baker (http://kancrn.org/gis)
1 dot = 1 tornado
Online toolkit for contextualized K-12 GIS

- The Student Data Mapper (http://kangis.org/mapping/sdm) allows publication of teacher ideas that require collaborative data collection and representation by students.