The Effectiveness of a Geospatial Technologies-Integrated Curriculum to Promote Climate Literacy

Overview and Instructional Sequence
The Climate Change curriculum was designed to engage a middle school science classroom with lessons that explored climate and weather patterns from a global perspective. The curriculum included a series of activities designed for a middle school learners. Assessments, teacher educative materials for 21 days.

Example Activities
Day 1: Investigating the effects of climate change on Earth's surface. Students will use Google Earth to explore significant changes in temperature and climate patterns.

Day 2: Investigating weather and climate patterns with Google Earth. Students will use Google Earth to explore global temperature changes. They will also analyze and interpret climate patterns of 13 different cities, and analyze differences between weather and climate patterns.

Educational Philosophy
Align instructional materials and assessments with the Science Literacy Learning Units (SLLU) Geospatial Technologies for tapping into the spatial reasoning of students and investigating problems. Contextualize the learning of key ideas within real-world problems. Support teachers in adapting and implementing GIS and Inquiry-Based Activities.

Support Materials and Examples

Support Materials and Examples
Instructor PowerPoint Files
Google Earth kml Files
Online reference content for teachers
Investigation Sheet
Student Handout
Teacher Guide
–Publically available web site
–Preservice Teachers
–Teacher Professional Development
–Professional Conferences
–Journal Articles
–Book Chapters
–Book Chapters
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–Book Chapters
–Book Chapters
–Book Chapters
–Book Chapters
–Book Chapters
–Publicly available web site

Assessment Items Aligned to Misconceptions
The graph displays the changes in sea surface temperatures (SST) over time. Two main features of interest are the large oceanic temperature and the changes in temperature between different regions:

1. The graph shows that SST has increased over the past century. The data are based on measurements from satellites and ocean buoys. SST is measured by warming and cooling of the ocean surface, which is affected by changes in solar radiation, wind, and ocean currents.

2. The current climate warming is due to natural variations, such as volcanic eruptions, ocean currents, and variations in solar radiation. These natural variations can cause changes in SST over different time scales.

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School Population
Three eighth grade earth and space science classes participated in this study. The majority of the students are from diverse ethnic backgrounds, including 67% Hispanic, 19% White, 13% Black, and 1% Asian. The school includes students from low-income households.

Results
The pre- and post-test Climate Change Knowledge Assessment data were analyzed using a paired t-test to compare the pre- and post-test results. The results indicated a significant improvement in climate literacy for middle school students. The effect size was moderate (ES = 0.4), which is considered a reliably established effect.

Overall Climate Change achievements by ability and track for Pre/Post Test, N=179:

- Low Track (N=63)
  - Pre: 7.41 (2.46)
  - Post: 8.02 (2.73)
  - Effect size: 0.34

- Middle Track (N=44)
  - Pre: 7.73 (2.72)
  - Post: 8.23 (2.90)
  - Effect size: 0.37

- Upper Track (N=29)
  - Pre: 8.39 (2.96)
  - Post: 9.00 (3.22)
  - Effect size: 0.40

- Upper Track (N=29)
  - Pre: 8.91 (3.00)
  - Post: 9.59 (3.23)
  - Effect size: 0.45

- Upper Track (N=29)
  - Pre: 9.29 (3.12)
  - Post: 9.99 (3.27)
  - Effect size: 0.48

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