VISIT: Virtual Immersion in Science Inquiry for Teachers

Geo-spatial Technologies in Science Education

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Presentation at International Conference on Education Information Systems: Technologies and Applications: EISTA’ 03
Orlando, FL
July 31 – August 2, 2003
Online Collaboration for

Inquiry Education
and GIS Instruction
VISIT

What it is (Mission Statement)

The goals of VISIT are to:

• Engage teachers in scientific investigations using digital data while integrating instructional benchmarks, and educational standards.
• Practice scientific thinking in context of real-world problems.
• Expand the professional roles of teachers in inquiry-based instruction.
VISIT: Levels of Collaboration

1. GIS for Teachers: Getting Started
   Prepare teachers with online communication skills and with basic skills needed to operate a GIS software package while exploring prepared GIS activities.

2. Classroom Tryout Tools
   Conduct a GIS-based short science inquiry lesson using prepared materials and report results to the collaboratory.

3. Developing GIS Lessons
   Carry out the process for developing and implementing a GIS-based investigation for classroom use.
VISIT
Vision of a Collaboratory

Enable teachers and other educators to:

- draw upon their own and others’ expertise to share tools and build knowledge.
- learn about, create and evaluate educational projects and experiences for use with their own students.
- develop scientific and geographic investigations that take advantage of tools for spatial visualization and analysis of geo-referenced data.
10155. The earthquake lesson caught their attention

10176. The earthquake lesson caught their attention

10205. The earthquake lesson caught their attention

10233. The earthquake lesson caught their attention

10156. GIS takes a lot of time
Subject: The earthquake lesson caught their attention

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Message no. 10155 Posted by Lisa McCray (v_mccray) on Fri Feb 28, 2003 13:44

Dear all, I was playing with the earthquake and volcano lesson while a group of teachers was attending a WebQuest workshop. I couldn't stand not sharing with them so at the end of their workshop I took five minutes just to give them a taste of what this GIS lesson includes. They were so enthusiastic about this. Some of them started leading the discussion about hypotheses to try queries to make... Anyway; I just wanted to share.

I have attached my ideas on the earthquake and volcano lesson and a map I generated. On the map I was trying to investigate the relationship between earthquakes and fault lines. Left room to talk about rivers and lakes too. I had to change some of the symbols to make the map easier to read.

Hope I'm on the right track with this.

Lisa

See Attached

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A Series of VISIT Science Curriculum Materials

1. VISIT Investigations (Water Quality, HazMat, Radon, Watershed Management, River Eco-Studies, Benthic)
2. GIS-based Science Inquiry Lessons (ready-to-use, short, subject-specific science lesson plans for classrooms)
3. Adaptation of other educational or curriculum materials from,
   • the Work/Site Alliance Training Manuals and Cases Studies
   • ESRI K-12 Educational Materials
   • LATE (Look At Environment) GIS Lessons
   • MFteach Lessons
   • IDRISI Lessons
Procedures Conducting VISIT Investigations

Every VISIT investigation takes a different form based on the nature of the problem under study, the curriculum purposes of the teacher, availability of relevant and adequate data, the amount of time and other resources available to invest, and many other factors. However, most investigations follow a common framework or series of steps.

First, the teacher constructs a draft Scenario. The scenario reflects that teacher’s curriculum, his students’ interests, issues of interest and importance in the local community, and the teacher’s interests. The investigation ends with a published product, which might take the form of lesson plans, student presentation to a local community organization, or a teacher presentation at a professional meeting.

The Investigation Wheel below illustrates that the steps we take in conducting an investigation are not always done in a linear sequence. As the wheel turns, some steps may be repeated. In our real-world investigations we are continually learning. As we learn more about a problem or situation, we may revise our scenario, seek new data, adjust curriculum objectives, recruit a new team member, try a different analysis method, or change our means of assessing what we are learning.
The Wheel-Diagram for Conducting VISIT Investigations
GIS-based VISIT Science Inquiry Lessons

1. The GIS-based VISIT science inquiry lessons are short science lesson plans,
   • with an interesting science topic,
   • with clearly defined curriculum objectives,
   • with pre-compiled science data sets,
   • with hands-on exercises written with step-by-step instructions based on a GIS software
   • with student worksheets promoting science inquiries,
   • using GIS scientific visualization capacities (thematic mapping or graphics),
   • using spatial reasoning/analysis or database analysis functions, and
   • with an intention for teachers to learn, and to bring them back to teach in classrooms.

2. Every VISIT science inquiry lesson may take a different form based on the nature of the topic under inquiry, the form of data sets analyzed, and the curriculum objectives. However, they are constructed for one lesson hour and at most for two lesson hours.

3. A VISIT science inquiry lesson may be one of the products developed from a VISIT investigation, for instance the pH lesson from the Water Quality Investigation. A science inquiry lesson may also be an independent lesson plan motivated by interesting science topics or curriculum objectives.
El Niño’s Chain of Cause and Effect

This lesson was created by David Armstrong, a teacher at Stoneham High School in Stoneham, Massachusetts, as a VISIT teacher project. The lesson includes four parts:

a) Teacher’s Notes for Teachers, which states the purpose and objectives, and provides background materials, teacher’s notes, and additional links related to the research;

b) Worksheet For Students, which graphically illustrates four sets of questions on El Niño;

c) Hands-on Exercise Procedure, which provides technical instructions (step by step based on ArcVoyager Software) to explore El Niño’s impacts on ocean temperatures and weather anomaly; and

d) GIS data sets and images that support this lesson plan development.

The lesson provides a complete set of curriculum documents and GIS datasets for both teachers and students to recap a GIS-based lesson plan development. The connections with the curriculum are very strong. The technical instruction is lucid and graphically illustrated, even including all small size “software button icons”. It is easy for others to follow the instructions to complete the exercise. Moreover, this lesson applies GIS functions to explore the associations between El Niño phenomena and ocean temperatures and weather anomaly.
For instance, when comparing the two world map views (the top one is ‘Precipitation Anomaly’ and the bottom one is ‘Sea Surface Temperature Anomaly’ in December 1997), learners can easily identify similarity in the patterns of rainfall and sea surface temperature in the Pacific Ocean (Armstrong, 2003). This comparison can lead to questions, such as, “Do you think that one might cause the other? Which (warmer sea surface or higher rainfall) do you think is the cause of the other? Explain your reasoning (Armstrong, 2003)!”
Another example is visual comparison between precipitation anomaly, sea surface temperature anomaly, and surface-500 meters depth ocean temperature profile in February 2002. The arrows are drawn indicating current strength and upwelling. We can clearly see how the westward current pushes warm water to the West and how cold water “upwells” in the East. This picture helps explain the question, “Shall we expect more humid, rainier weather in the Western Pacific or closer to South America during this month (Armstrong, 2003)?”
State Trends in Teacher Salaries

This lesson was developed by Rebecca Bates, a Math teacher at Opportunity Center, Royal Oak Schools, Michigan, as a VISIT teacher project. The development of this lesson followed a well-organized sequence of five steps for developing a geo-technology based lesson.

**Defining the Learning Unit**
Brief description of the project, driving questions, planned student activities, description of student learning, and needed resources are stated in the learning unit.

**Establishing Curriculum Connections**
School district’s curricular objectives, state’s (mathematics) standards and benchmarks, national (mathematics) standards, key concepts and key words, and enduring understanding initial draft are clarified in this step.

**Metadata Analysis**
This step will determine the list of attributes being analyzed, study (geographical) area, data sources, date of data collection, data collection methods, data format (file type), and the size of data sets.
Data Processing

This step will preprocess the data sets to make them ready for analysis, including organizing data sets on a computer for easy management, setting up right projections and scales, and linking geographical feature data with attribute data.

Organizing and Developing Lessons

Up to now, it is a good time to revisit previously identified understanding, key concepts and key words, and move from ‘enduring understanding’ to ‘evidence of understanding’, and then to ‘assessment of understanding’. Next it is time to determine lesson details, such as, lecture coverage, field activities, computer-based activities, subject (mathematics) centered activities, and assessment activities. Finally a timetable will be set to conduct and implement these activities.
The lesson, State Trends in Teacher Salaries, is designed to have students create shaded maps (thematic mapping and legend editing) and scatter plots (GIS data graphics) to investigate the differences in average teacher salary from state to state (Bates, 2003). Students are asked to analyze their maps and plots and to speculate on some of the factors related to teacher salary (Fig. 10). This lesson is designed to teach Mathematics for students at Grades 7 to 12.