Al Lewandowski
• Geography Instructor
• Teacher Consultant
• GIS Education Trainer
• Online Facilitation Coordinator
Online Collaboration for Inquiry Education and GIS Instruction
Your teaching methods, which were more interesting than probably any other teacher in the school, probably had a positive influence on the quality of thinking. When you taught, you tried to make us think in terms of a geographer and not a learner. However, I was bored to death.
Presentation Goals

• Explore Inquiry
• Explain GIS
• Describe VISIT
• Demonstrate Project Results
• Take Questions
A Model for Inquiry

1. Ask
2. Investigate
3. Create
4. Discuss
5. Reflect
The Inquiry Model: A Process Strategy

**Springboard:** Developing the problem or question by making it manageable and meaningful

**Hypotheses:** Generating some tentative answers or educated guesses

**Initial examination of information**

**Search for relationships among data**

**Data Collection and Analysis:** Arranging and interpreting data sets

**Noting similarities and differences**

**Trends and patterns identification**

**Conclusion:** Evaluating evidence against the hypotheses

**Generalizations:** Testing against new evidence
The Inquiry and Research Process

Stage 1: Preparing for Research
Stage 2: Accessing Resources
Stage 3: Processing Information
Stage 4: Transferring Learning
Geographic Model for inquiry

- Ask (geographic) Questions
- Acquire (geographic) Information
- Arrange/Explore (geographic) Information
- Analyze (geographic) Information
- Answer (geographic) Questions
Asking
Asking

Acquiring

Exploring

Analyzing
Multidisciplinary
Integrated
Holistic

- Asking
- Answering
- Acquiring
- Exploring
- Analyzing
A (brief!) introduction to Geographic Information Systems
GIS components

Spatial data

Computer hardware / software tools

Specific applications / decision making objectives
GIS: a formal definition

“A system for capturing, storing, checking, integrating, manipulating, analysing and displaying data which are spatially referenced to the Earth. This is normally considered to involve a spatially referenced computer database and appropriate applications software”

Chorley Report, 1987
Say What??

A quick demonstration will make things easier to understand.
We'll start with some simple data: The 1990 United States Census! 45 different measurements for 83 Michigan counties.

- Stored in an Microsoft® Excel™ file to aid in data manipulation and analysis.
- Requires complex analytical skills to draw conclusions from this data.
A simpler way to analyze the data might be to display it visually.
By hand
(colored pencil on a base map)

✓ A hands-on activity for students.
✓ Complex mathematical, mapping and coloring skills required.
✓ Requires significant instruction time by teacher.
✓ Difficult to make revisions.
✓ Material intensive.
High quality, consistent maps.

Initial map requires significant work, however, editing future maps much easier.

Still requires students to manipulate and analyze data by hand.

Changing the data requires producing a new map.
With A GIS

Students can:

✓ Quickly produce quality maps and legends.
✓ Engage in inquiry based learning.
✓ Experiment with color, texture and style to produce an analysis meaningful to their own unique style of learning.
GIS: Describing Our World

We can describe any element of our world in two ways:

**Location Information:** Where is it?

- 51°N, 112°W

**Attribute Information:** What is it?

- Species: Oak
- Height: 15m
- Age: 75 Yrs
GIS - Links Data Sets

GIS software links the location data and the attribute data:
1997 African American Population per County

Number of African Americans per County

- 0 5000
- 5001 20000
- 20001 40000
- 40001 80000
- 80001 100000
These are just a few of the kinds of layers a GIS can contain:

- Base Map Data
- Elevation
- Surface Geology

GIS contains many layers of information:
GIS Is an Instrument for Implementing Geographic Thinking.

Managing Parts

Seeing the Whole
Student Investigations

Using GIS

Great Lakes Bioregion
Forest Cover
People with money vs. people who can read and write

By looking at these two maps you can analyze that the areas with a higher % of people who can read and write are the same areas with a high amount of money. For example Australia has a very large % of people who can read and write and also a large % of people with money.

Cortogrepher: Chellsie Donaghy
Date: April 23, 2001
Source: Newsweek
Projection: Robinson
The life expectancy of females is higher in richer countries while the life expectancy of the general population is also high in the richer countries.
Bioregion Investigations
Making this atlas was by far one of the most challenging projects that I have ever worked on. As a class we had to learn how to use new software, ArcView to be exact, and we also had to think of new things to map that have never been mapped before.
St. Clair County Prairie Restoration Sites

Northren High School Prairie Restoration Project

Prairie Restoration Sites

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</tbody>
</table>

Cartographer: Christina Wettman
Date: 6-12-02
Source: Wildlife Habitat Council
appel@dtenergy.com
The map above shows the area surrounding the Mercy Wetland site. Our school is, as you can see, just down the road from the wetland site.
C.S.O. stands for Combined Sewage Overflow. What we are in the process of doing is separating all of the combined sewers into separated systems. This will prevent the overflow of wastewater from happening. The twenty-four points on the map are located on the Black River and all along the St. Clair River. The city has already separated ten of the twenty-four points. After the process is finished, the twenty-four active C.S.O. points will no longer dump sewage into the river during periods of rain.
Warning!

Women of childbearing age, particularly those who are pregnant or nursing, and children under 15 should not eat these fish due to high mercury levels.
Teachers helping Teachers

Dr. Yichun Xie  
Professor and Director  
Eastern Michigan University  
Institute for Geo-spatial Research and Education  
125 King Hall  
Ypsilanti, MI 48197  
Tel: (734) 487-8655  
Fax: (734) 487-5396  
March, 2003

(Materials are taken from the VISIT project)
The goals of VISIT are to:

- Engage teachers in scientific investigations using digital data and integrating science benchmarks, or educational standards.
- Learn science in context of real-world problems.
- Expand the professional roles of teachers in inquiry-based teaching.

How the VISIT works?

- VISIT works with teachers through online collaboratory as well as through face-to-face workshops.
The VISIT Vision of a Collaboratory

- enables teachers and others from different regions to draw upon their own and others’ expertise, share tools, build knowledge.
- learn about and create and evaluate educational projects and experiences and use with their own students.
- develop scientific and geographic investigations that take advantage of tools for spatial visualization and analysis & geo-referenced data.
- Provides a series of options for obtaining graduate credits in science education free from Eastern Michigan University, or modest fee from Colorado School of Mines.
VISIT: Levels of Collaboration

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

2. Classroom Tryout Tools
   GIS-based short science inquiry lessons enable teachers to conduct science inquiry and hands-on exercises.

3. Developing GIS Lessons
   Teachers practice the basic steps of developing and implementing a GIS-based investigation for classroom use.
Overview of GIS Tools and Learning Materials

for

VISIT Participants

VISIT offers a variety of geospatial software tools and learning alternatives for teachers, scientists and students who conduct VISIT investigations and explorations. Most of the software packages are available free to educators and scientists. You can choose to follow one or more of the GIS Tools and Learning paths in VISIT in order to acquire and install the software, learn basic GIS concepts, and operate the software, and use the software tools to conduct investigations and explorations.

VISIT GIS learning resources are organized into three paths:

- **Resources in Learning Sequences** - GIS learning materials and tools are organized by levels of complexity from introduction to intermediate and to application;

- **Resources by Software** - GIS learning materials and tools are organized by software packages and

- **Resources on Web** - Links and jumps to other GIS learning materials and tools available on Web sites by other research and educational institutions.

Resources in Learning Sequences

(Table 1)
Weekly Schedule of Activities

The following lists the activities week-by-week. There is flexibility in this schedule to accommodate individual needs, school schedules, and individual goals. However, research has demonstrated clearly that success in an online course is directly related to a high degree of structure and scheduling. If you cannot do all the assignments for a week, you should at minimum participate three times in your topical forum.

PLEASE NOTE: You can access all of the readings, lessons, and forums for this course from the Course Menu of the VISIT Workshops and Forums webct “course”.  
http://webct.emich.edu:8900/SCRIPT/VISITWorkshopsandForums/scripts/serve_home

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<th>Segment / Week(s)</th>
<th>Activities</th>
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<tr>
<td>1 Getting Started /1</td>
<td>Read Syllabus - Choose Forum - Install ArcVoyager - Do Race &amp; Ethnicity Lesson - Post Learning</td>
</tr>
<tr>
<td>1 Getting Started /2</td>
<td>Explore Lesson - Describe patterns - Respond to colleagues - Introduce self</td>
</tr>
<tr>
<td>1 Getting Started /3</td>
<td>Choose and review an example of GIS in schools &amp; communities - Post analysis - Use forums</td>
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<tr>
<td>2 GIS for Teachers /4-6</td>
<td>Complete exercises - Post results &amp; comments - Use forums</td>
</tr>
<tr>
<td>3 Classroom Tryout /6-8</td>
<td>Plan tryout - Help others plan - Conduct tryout - Report results - Use forums</td>
</tr>
<tr>
<td>4 Develop a Lesson /6-8</td>
<td>Design Lesson - Post Specs - Help others - Use forums</td>
</tr>
<tr>
<td>4 Develop a Lesson /8-12</td>
<td>Build Base Map - Locate Data - Prepare Data - Write Lesson - Finish developing / modifying lesson - Test lesson - Post progress, feedback - Post final product - Use forums</td>
</tr>
</tbody>
</table>
## VISIT Workshops and Forums

### Overall Goal

Participants will learn to identify, locate, and analyze spatial data and apply these processes into their curriculum and classroom practice. Participants use software tools for visualizing and analyzing geospatial data, and apply it in an instructional setting. Teacher investigators will develop and implement investigations or lessons whose process and outcomes are connected to existing educational standards and benchmarks.

By the end of this course, a VISIT participant will complete one of the following projects, either working as a member of a team or as an individual:

1. Develop a lesson or student project in which students in your classroom and curriculum use georeferenced [geospatial] data and tools for visualization and analysis.
2. Adapt an existing lesson for use in your own classroom, field test, and report results to the VISIT Collaboratory.

### Supporting Goals

Throughout the course and in support of that overall goal, you will learn and practice the following:

1. Collaborate with teachers, scientists and technologists on issues related to the topics of this course (including getting technical or scientific assistance with one's own project, and assisting others in their project development). This is accomplished mainly by participating in online discussion forums and real-time chats on WebCT.
2. Locate, navigate and become familiar with VISIT's information, tools, lessons, data sources, other resources and people in WEBCT and on the WWW.
3. Download and install lesson materials, software tools and databases used in VISIT – from WEBCT and WWW.
4. Learn and practice basic operations of one or more GIS software tools (ArcView, ArcVoyager, web-based interactive mapping, others).
5. Work through example curriculum-related inquiries using GIS-based short lessons. Begin to recognize and analyze spatial data.
6. Using the VISIT rubric, evaluate a sample lesson for use/adaptation in your classroom, students, community and curriculum.
7. Adapt a lesson for use in your own classroom.
8. Develop a lesson or student project for use in your own classroom.
9. Locate and use online sources of georeferenced data for your own project.
VISIT Workshops and Forums - 4 Develop a Lesson

Table of Contents

1. Overview: Develop a Lesson
2. Designing the Lesson
   2.1 Designing the Lesson (Instruction)
   2.2 Worksheet 1a
   2.3 Worksheet 1b
   2.4 Completed Example Worksheets
   2.5 Sample Advice from a VISIT Leader
3. Building the Base Map
   3.1 Making a Base Map for a GIS Project or Lesson
   3.2 Base Map: Important Data Types and Sources
4. Locating Data
   4.1 Locating Data for Your Project or Lesson: General Advice
   4.2 Interpreting and Using Metadata
   4.3 VISIT Guide to Data Sources
   4.4 Tips on using Search Engines and Keywords
5. Preparing Data
   5.1 Preparing Data for Your Project or Lesson
   5.2 Lessons on Adding Data into an ArcView Project
   5.3 Lessons on Adding Images into an ArcView Project
6. Writing the Lesson
   6.1 Writing the Lesson
   6.2 Worksheet 4a
   6.3 Worksheet 4b
7. Packaging & Submitting the Lesson
   7.1 What to Include in Your Final Product’s ZIP File
   7.2 How to Create the ZIP file and Post It
(partial) List of Data Sources

- Environmental Hazards and Chemistry
  - U.S. EPA EnviroJustice Mapper
  - U.S. EPA EnviroMapper and Envirofacts
  - U.S. EPA CAMEO, MARPLOT and ALOHA
  - LandView III

- Water Data
  - National Hydrography Dataset (NHD)
  - National Park Service Nationwide Rivers Inventory (NRI)
  - Precipitation (NOAA)
  - Rouge River National Demonstration Project (RPO)
  - U.S. Geological Survey Real Time Water Data
  - Water on the Web

- Watersheds and Natural Features
  - U.S. EPA Surf Your Watershed
  - U.S. EPA Watershed Information Network Atlas
  - U.S. EPA EnviroMapper for Watersheds
  - U.S. EPA BASINS
  - Natural Resource Conservation Service (USDA)
  - New National Land Cover Dataset

- Weather and Climate; Global Change
  - Carbon Dioxide Information & Analysis Center
  - Climate Monitoring and Diagnostics Laboratory
The value of the culture of collaboration cannot be overemphasized and the importance of this atmosphere becomes obvious when one observes that other institutions of great tradition and research strength are trying to develop a culture of collaboration where none exists.
### December 2002

To compile a list of entries, click **Compile**.

To view, add, or edit the daily schedule, click a hyperlinked date below.

**Note:** All private entries are italicized.

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</table>
Week 5 News & Announcements

- **Returning teachers**: please continue in your working group Forums (Earth Science 2002; Environmental Science 2002; Land Use Impact on Watersheds 2002; Social Studies 2002).
- **New this semester to VISIT**: Please read this Week 5 Announcement to the end.

Week 5 starts today (Sunday March 9). Please share your learning!

**During the past four weeks of VISIT**, 71 teachers and leaders have shared insights about data layers, data sources, visualization, learning styles, generating hypotheses, using GIS maps in PowerPoint presentations, supporting state standards. Important discussion topics have included watersheds, frog populations, historical patterns of U.S. population, invasive species, sustainable communities, landforms, and much more.

**During Week 4**, more participants looked closely at GIS applications in schools and communities.

**In week 5**, we continue 2 GIS For Teachers in the Course Menu. 2 GIS for Teachers provides a collection of hands-on instructional materials and data sets that participants may use to become familiar with GIS software, or develop skills and concepts (if already familiar with the software), or tailor materials for classroom use.

Here’s what to do this week:

1. Make sure you’ve responded to a peer’s Week 4 post in your topical forum.
2. Then go to 2 GIS for Teachers in the Course Menu, and choose "1.1 GIS for Teachers: Activities"
3. Note that we’ve scheduled Weeks 4, 5, and 6 of the Collaboratory for review and posting of the activities in 2 GIS For Teachers.
4. Something to think about as you plan your posts: Notice how helpful and efficient it is when people give their posts relevant, unique subject headings?
5. Watch the Calendar for any scheduled online chats. These can be a quick way to solve problems and generate ideas.
6. Also, take advantage of other Forums such as Main, Leaders, Technical HELP, and Water Cooler Conversations.
### VISIT Workshops and Forums

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The earthquake lesson caught their attention

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

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 it with them so at the end of their workshop I took five minutes just to give them a taste of what this GIS lesson included. They were so enthusiastic about it. 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
Subject Re: The earthquake lesson caught their attention

Message no. 10233 Branch from no. 10155 Posted by Cynthia Vernon (v_cvernon) on Sun Mar 22, 2003 23:57

Lisa,

I will be passing on your information to one of the teachers who are skeptical in regards to GIS. He's already done plate tectonics this year, but I've been emailing him any/all the info I find on here. (After he told me he didn't cover it, I passed his room, saw the kids with maps on their desks---there was a misunderstanding---after mentioning this to him he said he'd be happy to see the software. It's been three months!) You're info will refresh the topic!

Cindy
Subject: Re: The earthquake lesson caught their attention

Message no. 10244 Branch from no. 10233 Posted by Lisa McCray (v_hmccray) on Mon Mar 03, 2003 13:39

Cindy, If I could, I would come show him myself. In a room full of teachers, I had everyone's attention (and that's not always easy) most of them were suggesting ways to use the little bit that I showed them.

One thing I think I have learned- just because you don't know a whole lot about the software doesn't mean it isn't useful to you. the ole KISS principle.

I think it's great you are trying to encourage others.

Lisa
Subject GIS in Education: An Examination of Pedagogy

Message no. 10177 Posted by Cathleen Nichols (v_nichols) on Sat Mar 01, 2003 10:24

Hello all: A: Week 3, boy does time fly. This week I chose to read the article titles “GIS in Education: An examination of pedagogy”. The study was designed to provide a successful model for implementation of GIS training into the pre-service teacher education programs. Hopefully, this training would result in the use of GIS software in the classroom as an additional tool to be used by students as they investigate Geographic Themes. The use of this technology could allow students to meet all 18 National Geography standards (1994) that all K-12 students should meet to be considered geographically literate. This topic really interests me since I graduated from Eastern Michigan University in 1995 with a major in Group Science and a minor in Social Science and never used GIS during my study. I am surprised that I never had any experience with GIS because I had several geography and earth science courses. Since I am new to GIS, I was interested in looking at the approaches that Universities may introduce GIS to perspective teachers.
In fifth grade our students learn about plate tectonics. You could just turn on the plates layer and then superimpose the country borders to have a good visual aid to the discussion. Now you could ask the students, "based on what you see and what you know about the shifting of the plates, where do you predict to see earthquakes?" Now turn on the earthquake layer. Pretty impressive.

Now what countries (continents) are most affected by earthquakes? Remember the country layer is off. This gives the students a chance to check their memory of where the countries are. Turn on the country outline and use the identify tool to check on country names. "Ever hear of earthquakes in these countries?" Discussion possibilities are endless. With just the plates and earthquakes on, query to find out the location of earthquakes > 6. Any hypotheses of why they are mostly around the pacific plate? Now let the students explore: is there a relationship with the magnitude and the depth, look at the faults………

Another direction is to have the country layer, rivers and lakes on and turn on the volcano
GIS in Education: An Examination of Pedagogy

Abstract

Geographic information systems (GIS) have been identified as one of the most critical and important software programs for implementing computer-based technology in social studies and science education. Much of the research about effective GIS integration is "pinned from intuition." This study will present the results of three different teaching methods based on the Jasper Yooehung Problem Solving Series and provide a model for successful GIS implementation into any pre-service teacher education program.

"No exemplary models for integrating GIS into preservice teacher preparation programs exist."

Since the inclusion of geography as a core subject in the Goals 2000: Educate America Act, there has been widespread acceptance among citizens of the United States of the goal of developing students who are internationally competitive as well as productive and responsible citizens in a global economy. In response to this desire for a geographically literate society, the National Geography Standards 1994 were developed. The function of the standards is to help students and teachers develop a clear understanding of what geography is and how to effectively apply that understanding to life (National Geography Standards Project, 1994).

The effective teaching of the National Geography Standards has been the focus of K-12 social studies curricula throughout the nation. It has been identified in order to effectively teach the standards, teachers require a clear understanding of a geographic information system (Bednarcz, 1995; Sel, 1995). A geographic information system (GIS) is a software that allows a user to store, retrieve, manipulate and display geographic data about any place in the world (Environmental Systems Research Institute, 1993). Even though such an understanding of GIS is necessary, it has not been adopted in the K-12 American classrooms at a rate that the National Science Foundation, the Environmental Systems Research Institute (ESRI), and geography educators had once hoped (Environmental Systems Research Institute, 1993; Fitzpatrick, 2002). (Fitzpatrick, 2002) noted that GIS's goal in 1992 was for K-12 educators to be the largest single group of users by 1996, a goal still not achieved. The key reason for this slow pace of GIS integration, according to Bednarcz and Audet (1999), is that no "exemplary models for integrating GIS into preservice teacher preparation programs exist." (p. 65).

In response to this lack of exemplary models for teaching GIS, the purpose of this study is to develop and research the effectiveness of three GIS instructional models for university-level instructors to use within preservice teacher education courses.

Rationale for the Study

The geography education reform movement of the 1990s had three principal goals. The first was to forge a consensus among geographers, educators, and the general public regarding the goals of geography education. The second was to examine technology use by geography educators. The third was a revision of geography curricula that would combine current issues in geography technology to enhance student achievement (Phillis, 1994).

In response to the first goal, Geography for Life: National Geography Standards (1994) was written outlining eighteen standards that K-12 students should meet to become geographically literate. The National Geography Standards have been described as a "vital contribution" toward helping students "use their minds well so they can be prepared for responsible citizenship, further learning, and productive employment in our nation's modern economy" (National Geography Standards Project, 1994). Unfortunately, the second and third goals
Subject: GIS in Education: An Examination of Pedagogy

Hi everyone!

I was really interested in Cathleen's comments regarding the article on GIS in Education. Her comments about having "graduated from Eastern Michigan University in 1995 with a major in Group Science and a minor in Social Science and never used GIS during my study" really struck me, as I had a similar experience. I feel somewhat cheated for not having been introduced to this tool before graduating in 96, or at least during my master's courses which I finished last spring. Getting this tool out to classroom teachers is a critical step, that seems to have been overlooked until recently. I greatly appreciate the VISIT program!

Laurie

I am surprised that I never had any experience with GIS because I had several geography and earth science courses. Since I am new to GIS, I was interested in looking at the approaches that Universities may introduce GIS to perspective teachers.
Subject Re: GIS in Education: An Examination of Pedagogy

Previous Thread Next Thread Close

Message no. 10229 Branch from no. 10177 Posted by Theodore Younglas (v_tyounglas) on Sun Mar 02, 2003 22:03

In her last posting, Cathy states...

I still believe GIS is valuable in allowing students to develop life skills and not just basic knowledge.

It is quotes like this that keep me going. I have always believed that our job is to help teach students life skills that they can use every day of their adult life. I am glad to hear that there are others out there that feel the same way. Keep up teh good work!

Ted

Previous Message Next Message

Previous Thread Next Thread Close
You make a good point about learning styles. GIS is another tool for us in education to try to reach all students.

To comment on another of your remarks, "I still believe GIS is valuable in allowing students to develop life skills and not just basic knowledge." I understand that GIS/GPS technology is now being used in many different careers and jobs. The knowledge of the technology is not necessarily outlined in the job description but is assumed.

I'm not sure I have this "quote" thing right but it worked.
Al Doyle>> I was wondering, I'm in a very urban environment, what kind of projects could we get involved with?
Alew>> Good question, Al. What content area?
Al Doyle>> I like to do something with neighborhoods, which would complement a map unit I do. I teach Technology which I integrate other curricula, my choice.
Steve >> There are a lot of things you can do with census blocks and tracts that center on specific areas.
Al Doyle>> That sounds like it could work.
Alew>> How large is your actual school site?
Al Doyle>> We are in Manhattan, near Central Park.
Steve Wanner>> Most cities and counties now use GIS. I have had a great response from these people when I have wanted local data.
Al >> I have a contact in planning for the NYC Mass Transit Authority. I wonder what software they use to create their maps.

Alew>> it would be interesting to hear what they're using.

Al >> I will look into it.

Steve>> That would be perfect. They could probably have access to information on other topics as well.

Alew>> And when you do Al, post a short message, successful or not, telling the rest of us what you tried to do.

Al>> Where is that (TIGER data), I know I've seen it somewhere.

Alew>> You can also go to the ESRI K-12 site and get a complete set of directions for accessing the 1995 TIGER data, I'll post a message tomorrow with URL's to all of this stuff.

Al>> You da man.

Alew>> Not really, you're pushing my envelope, but I'll do what I
Alew>> Next, choose <how to use the atlas>
Alew>> then click on the little esri magnifying glass at the top.
Pam>> OK I did that
Alew>> Great. Are you looking at the map, or a page of text?
Pam>> map
Alew>> welll, then you're home free.
Alew>> you can display or turn off themes by clicking
   in the check box in front of the name
Pam>> Thanks for your help. I don't know if I'll be
   home free, but it will give me something to play around with
Alew>> You add new layers by clicking on the green
   "+" sign in the upper left hand corner
BEV>> I wish teachers would say something about what they think they are learning when the post up their lesson results in the GIS class

RON>> Maybe we can give them the goal and always come back to it in our responses; How to use it in their classroom

AL>> I’ve begun asking how individuals intend to apply the ideas in their practice

BEV>> Yes. every time. what is point of the exercise results if they do no thinking about what to do with it?

RON>> Right from day one ... How can kids look up gis data to the last day, “here is my unit…”

BEV>> I think after they post their lesson they don’t come back till they have another one to post so there is no interaction, reflection, inquiry going on. have to change that!

RON>> We could scale back and say part of the grade is to post then we hook them with great conversation on the craft
Alew>> Hello Pam.
Pam>> Hi Al, I've got the disc in, but I can't find show me. Where do I look for it?
Alew>> OK....go start, programs
Alew>> and you should find either voyager, or arcvoyager.
Pam>> OK let me try that.
Alew>> that should keep opening until you come to the actual program icon (a little boat!)
Pam>> I have arc voyager
Alew>> Sound like an astronaut!
Alew>> ok, now, choose show me, its the third choice, I believe.
Pam>> Thanks! I found it.
Below is the proposed agenda for our webconference scheduled for Wednesday, Dec 18. As you can see, we have a full plate. I’d like to start on time and end on time, and so will follow the procedure. I will set a time limit on each item. Each participant will be asked to contribute a single statement on each item. We’ll move on until the time for the item expires. We would greatly appreciate any additional comments in the moderator’s forum as a response to the notes of the meeting which will be posted the following day.

<table>
<thead>
<tr>
<th>Discussion Item</th>
<th>Goal/Key Question</th>
<th>Action Steps</th>
<th>Person(s) responsible / due date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Collecting additional elements for Third Module – After Hunter Message #6637</td>
<td>Q: What additional tools should be available for participants as part of developing GIS lessons module?</td>
<td>Contributions of various pieces from moderators to the moderator forum posting</td>
<td>Moderators submit elements to moderator forum by 12/8, VISIT leaders prepare useful tools for distribution to participants on an “as needed” basis.</td>
</tr>
<tr>
<td>2. Topical Group Issue Moving additional participants into the topical forums</td>
<td>Q: Who (or how many) are not yet participating in topical forums? Q: What can each of us do to move these folks into a topical forum</td>
<td>Personal email contact? Further Chat session scheduling</td>
<td>Leaders identify individuals for contact, primary moderators send emails to topical forum participants</td>
</tr>
<tr>
<td>3a. Content Item 1: Earth Science Forum. David Does Geology of northern NY.</td>
<td>Q: What sort of positive advice/action steps can we recommend for this project?</td>
<td>Post individual responses to project development discussion in the Earth Science forum</td>
<td>Individual moderators each post a response to this (and/or) other “featured” projects</td>
</tr>
<tr>
<td>3b. Content Item 2: Land Use Impact on Watershed. Stacey Vance. Houston Area Watershed Project</td>
<td>Q: What sort of positive advice/action steps can we recommend for this project?</td>
<td>Post individual responses to project development discussion in the Earth Science forum</td>
<td>Individual moderators each post a response to this (and/or) other “featured” projects</td>
</tr>
<tr>
<td>4. Suggested Changes for February (Announcement)</td>
<td>A renewed call for recommendations for changes to be posted to the “Changes for February” thread...</td>
<td>At close of submission period, moderators will be surveyed to prioritize items posted. An attempt to implement top priority items will be undertaken before beginning of February session</td>
<td>Post suggestions/recommendations by 12/21, survey available by 12/31, implementation team operational 1/6/03</td>
</tr>
<tr>
<td>5. Posting/Grading for items 1a, 1b, 4a, 4c (Announcement)</td>
<td>Q: Is there general agreement with this decision?</td>
<td>Status report from Leadership team</td>
<td>None</td>
</tr>
<tr>
<td>6. Virtual Workshop for Leaders</td>
<td>Q: Would it be possible to schedule an extended Virtual Workshop prior to the start of the February session</td>
<td>Organize and schedule a virtual leader workshop</td>
<td></td>
</tr>
</tbody>
</table>
Gis Lessons for Classroom Integration
Race and Ethnicity Lesson
I really enjoyed reading the thoughts I’ve compiled below and I’m looking forward to reading more!

Message no. 9856  Theodore Younglas (v_tyounglas) on Fri Feb 14, 2003 15:00.

Before I began the lesson, I had some vague ideas as to where the populations of Native Americans would be found. Through westward expansion of the “whites” in the 1800’s, I figured that states in the southwest and the Black Mountain regions would be the most populated.

Like Cathy mentioned in her response, I was shocked to discover the native populations in New York, North Carolina, and Michigan. I am curious as to the reasons behind this.

Message no. 9879  Steven Owens (v_sowens) on Sat Feb 15, 2003 17:10.

I could see some questions surfacing as I worked through the visual parts of the lesson. For example, why would Illinois be a focus of settlement by Asian/Pacific Islanders and Hispanic groups.

Message no. 9833 posted by Jean Hammonds (v_jhammonds) on Wed Feb 12, 2003 10:05 Subject Assignment #1 Race Lesson.

As far as the actual lesson goes, it was very interesting to see where the ethnic differences were in the US. The Southwest was about what I guessed based on reviewing the state reading standards for another class. It was interesting to see how observations we assumed about the area were verified with the data.

Message no. 9833  Cathleen Nichols (v_cnichols) on Thu Feb 13, 2003 09:22.

When I changed the parameters to look at the actual Native American population I was surprised by my findings. Michigan, New York and North Carolina were now part of the top 10. Living in Michigan I knew that there was a large population of Native Americans however I never imagined that we would be in the top 10. As
Message no. 9833  Cathleen Nichols (v_cnichols) on Thu Feb 13, 2003 09:22

Well, this lesson really demonstrated to me how statistics can be manipulated. As a person who evaluates data I realized that I need to look at various pieces of data in order to draw conclusions. For instance, when I was looking at the map of US with the percentage of Native American tribes shown, I was not surprised to see the states at the high end.

Message no. 9855  Theodore Younglas (v_tyounglas) on Fri Feb 14, 2003 15:09

What a great tool to use/incorporate into the classroom. I was amazed at how much information I had at just the touch of a mousepad!

Message no. 9879  Steven Owens (v_sowens) on Sat Feb 15, 2003 17:10

What impressed and inspired me the most was the sheer volume of data associated with the theme tables. While I am not a social studies teacher, I can see where having this much data available could lead to the design of a multitude of questions for students to explore.
U.S. Landforms Lesson
Subject GIS and MEAP Objectives - after Younglas

Message no. 10204 Posted by Al Lewandowski (v_alewandowski) on Sun Mar 02, 2003 11:47

In message 10039 on Sun Feb 23, 2003 20:38, Theodore Younglas (v_tyounglas) writes:

> I enjoyed the section with the continental divide. It immediately brought me back to a question that was asked on the state mandated MEAP test a few years ago. The students were given a map of the Amazon River and South America. The question asked them to decide in which direction the river flowed. I was amazed to see how many students got the question wrong!

Ted raises an interesting and important point about MEAP and GIS. I wonder what some of the rest of you are thinking right now about how using inquiry-based learning experiences with GIS will effect efforts to address state standards and/or improve scores on high stakes tests such as Michigan's MEAP test?
Subject Re: GIS and MEAP Objectives - after Younglas

Message no. 10208 Branch from no. 10204 Posted by Laurie Wahlstrom
(v_wahlstrom) on Sun Mar 02, 2003 12:20

As a Geography teacher who agonized myself over many student's responses to that same MEAP question, I have since spent a deal of time looking for ways to help them understand that concept. I would definitely agree that using GIS is a step in the right direction.
Message no. 10161 Branch from no. 10017 Posted by Alan Sills (v_asills) on Fri Feb 28, 2003 16:48

Charlie:

Regarding noting your wife in ny or ca... consider this: with the right data sets in arcview, you can see whether those high aids rates are universal to all ethnic groups or whether they're concentrated within specific minorities or groups with specific sexual prefs --- from what I understand, and I live in the ny area, they are -- that is: while aids rates are high in the area, it's generally isolated to blacks, hispanics (of low economic status) and homosexuals.

My point? Seeing a "hotspot" in an area of the nation (for anything -- aids, earthquakes, etc.) can prompt a more "indeth" look to gain insight as to what is *really* going on.

Another example: have kids plot earthquake activity in the northeastern states -- there's lots of events! Should we worry? Not once you realize that most are around a magnitude of 2 or 3!!

Alan Sills

In message 10017 on Sat Feb 22, 2003 16:14, Donald Walrath (v_dwahrath) writes:

> I also enjoyed this activity. A part that you didn't
> mention and that I found interesting was the ability to
> see the states with the largest AIDS percentages. This
> makes me glad that I didn't meet my wife found NY or Ca.
> I am not sure about incorporating this lesson into my
> curriculum but looking over the lesson on earthquakes
> and related processes, this lesson will make it. Have
> fun with the rest of your lessons. Charlie Valrath

Donna ladipalo (v_dladipalo) Mon Feb 24, 2003 19:41
Donald Walrath (v_dwahrath) Fri Feb 28, 2003 10:54
Ron Robinson (v_rrobinson) Fri Feb 28, 2003 22:25
1. The GIS-based VISIT science inquiry lessons are short science lesson plans with:
   • an interesting science topic,
   • clearly defined curriculum objectives,
   • pre-compiled science data sets,
   • hands-on exercises written with step-by-step instructions based on a GIS software
   • student worksheets promoting science inquiries,
   • using GIS scientific visualization capacities (thematic mapping or graphics),
   • using spatial reasoning/analysis and
   • with an intention for teachers to learn, and to bring them back to teach in classrooms.
Science Inquiry Lessons: (selected from the ESRI K-12 Education GIS Sources, see the Lesson Synopsis for detail)

- Climate Graphs
- Earthquakes Around the World
- Blown Away
- BCancer
- Mapping pH in the Rouge River
- Evolution
- Mapping GLOBE Temperature Observations
- Hurricane Floyd
- Mapping the St. Lawrence Seaway
- Hawaii Island
- Michigan Bedrocks
- Michigan Glaciers
- Cancer Rates and Cement Plants
- Where to Stock Trout? Ecological Classification of Streams and Rivers
## Climate Graphs Lesson

**Curriculum Subject:** Physical/Earth Sciences

**Topics Covered:** Temperature and precipitation data

**Comments:** Shows how to create climate graphs from monthly temperature and precipitation data. Climate graphs are linked to map, making it easy to compare climate.

**GIS Technique:** Beginning level, graphics, spatial joins, summarizing tables

**Geographic Scale:** National

**Software Used/Needed:** ArcView or ArcVoyager

**Developed by:** ESRI Schools and Libraries from ESRI

**Source:** [ESRI Schools and Libraries](https://www.esri.com) from ESRI

**Adapted by:** Mark Schaap and Yichun Xie

**Edited by:** Eastern Michigan University - CEITA
Developing Inquiry Lessons
VISIT Teachers’ Investigations

Water
- Ecological classification of streams in Michigan
- Phosphate levels in Maine lakes
- Visualizing parameters of water quality
- Mapping Passaic County streets and streams
VISIT Teachers’ Investigations

Environmental Topics
- Cancer rates & cement plants
- Environmental justice
- Forest management
- Economic development & ecological footprints
- Ozone monitoring in New Jersey

http://maps.acad.emich.edu/smplInv/sampleIndex.htm
Calculating Your Ecological Footprint
YOUR RESULTS:

<table>
<thead>
<tr>
<th></th>
<th>Hectares</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Footprint</td>
<td>2.5</td>
<td>6.2</td>
</tr>
<tr>
<td>Transportation Footprint</td>
<td>4.5</td>
<td>11.2</td>
</tr>
<tr>
<td>Housing Footprint</td>
<td>1.5</td>
<td>3.6</td>
</tr>
<tr>
<td>Other Footprints</td>
<td>3.1</td>
<td>7.8</td>
</tr>
</tbody>
</table>

Total Footprint per person      | 11.6     | 28.8  |

IN COMPARISON:

Your Eco-Footprint measures **114.1** % of an average American Footprint.

Worldwide, the biologically productive space available per person is 2.2 hectares or 5.4 acres.

Now, choose:
How much of the biosphere should be set aside for other species?

25%  

[Calculate]
<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>ACRES</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOOD</td>
<td>6.9</td>
</tr>
<tr>
<td>MOBILITY</td>
<td>2.7</td>
</tr>
<tr>
<td>SHELTER</td>
<td>5.4</td>
</tr>
<tr>
<td>GOODS/SERVICES</td>
<td>7.4</td>
</tr>
<tr>
<td><strong>TOTAL FOOTPRINT</strong></td>
<td><strong>22</strong></td>
</tr>
</tbody>
</table>

In comparison, the average ecological footprint in your country is 24 acres per person.

Worldwide, there exist 4.5 biologically productive acres per person.

If everyone lived like you, we would need 5.1 planets.

**ECOLOGICAL FOOTPRINT CAMPAIGN**
- Join the Campaign!
- Who are we?
- More about the Footprint

**EMAIL**
- Email a Friend
- Email Results to Yourself

**WHAT YOU CAN DO**
- Involve Others

**COMMENTS AND QUESTIONS**
- Comment on the Footprint Quiz
- Frequently Asked Questions (FAQ)
- What about other Species?
- What about Population?
- Features to Come
Ecological Footprint
Human Development Index

Human Development

- 0.5 - 1.6
- 1.0 - 3.2
- 3.2 - 4.5
- 4.5 - 6.2
- 6.2 - 10.2
Investigating A Restless Planet
Emily Bolinger
Establishing Curricular Connections

This is the Lesson's Title

<table>
<thead>
<tr>
<th>School District's Curricular Objectives</th>
<th>State's Science Standards and Benchmarks</th>
<th>National Science Standards</th>
<th>Key Concepts &amp; Key Words</th>
<th>Enduring Understanding Initial Draft</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Standard 4.1 - Students will know and understand the composition of the Earth, its history, and the natural processes that shape it.</td>
<td>Same as district</td>
<td>Interactions among the solid earth, the oceans, the atmosphere, and organisms have resulted in the ongoing evolution of the earth system. We can observe some changes such as earthquakes and volcanic eruptions on a human time scale, but many processes such as mountain building and plate movements take place over hundreds of millions of years.</td>
<td>Plate Tectonics, Igneous rocks, Mafic, Felsic, Andesitic, subduction, continental crust, oceanic crust</td>
<td>Type if Igneous rock is a result of type of melted crust. Felsic - continental, Mafic - oceanic, Andesitic - both oceanic and continental. The type of modern volcanic rock supports the theory of plate tectonics.</td>
</tr>
</tbody>
</table>

NOTE: Connections to National, State and School District's Curricula
Message no. 8571 Posted by Emily Bolinger (v_ebolinger) on Mon Nov 25, 2002 17:00:

I am a 5th year Earth Science Teacher and can't imagine doing anything else. I am really interested in how GIS can help our students reach a higher level in thinking as a result of quickly being able to analyze data. I am particularly interested in relating volcano magma composition to plate tectonics (See message Volcano Data)

I have found a couple of great Earth Science Sources. The first one is a link to request review copies of a College level GIS Earth Science course. The directions are amazing and the learning great. Some of the questions will need to be rewritten for the high school student. The best part is that this book comes with a CD which includes a 120 day time locked version of ArcView. This is a cheap (free) way of getting a look at ArcView. The publisher is Brooks/Cole - Thompson. The link to the page follows:

http://www.newtexts.com/newtexts/discipline.cfm?discipline_id=12#cou

I also found the following activity very useful:

Exploring Earthquakes in Space and Time Through the Internet and a GIS:

In this exercise students analyze the world earthquake frequency and distribution. The data is then compared
Subject Re: Bolinger Volcanoes

The original data and the redone data are not related. The biggest problem is that the new data does not contain magma type in general terms, but specific ones about 25 types. This is where the hard part comes in. We need to look at each data point and decide which type it generally is or eliminate the point so that we get a general picture. Also because the data has been used for a variety of purposes, even though the location and magma type are the same on 50 samples, there is other data on the same point that differs. This makes it necessary to delete numerous duplicate points. Getting the data in a usable format is the current biggest problem. I have attached the original data file from Scott for those who are interested in looking at it.
Below are my answers to Bev's questions. I appreciate their being asked and any other input out there.

Bev's questions:

1. What is your driving question or hypothesis? (it is somewhat implied in the posting above, but it would help me to see a more specific statement).

The driving questions for this lesson are:
1. Is magma composition related to the type of melted crust?
2. How is plate tectonics supported by magma composition?

2. What differences do you see in the two data sets, in relation to the driving question or hypothesis?

The first data set was (I believe) chosen to exemplify the pattern of magma type linked to crust type, and is the

3. I think it would help to show the plate boundaries in this visualization. And how do I know where "continental crust is melting?"

I have attached a new screen shot with the plate boundaries marked. You need to observe a particular location at

4. Why would fewer data points result in a clearer pattern?

Fewer data points from the second set of data would help provide a more general pattern on which to base a hypot
Subject Re: Bolinger Volcanoes

I replied to Bev with the original data set. Here is the other data I have edited and used. The smaller, older data set is attached (VolcanoData). This data is the pattern we are looking for in regard to magma and crust type. I have also attached my draft data set used to plot into ArcView (Data Readone). You will notice this is only about 200 of the original points (summed in) and it has been edited for ArcView. I am still dealing with the overwhelming task of editing this data and would love any suggestions on how to make it easier.
Subject Re: Bolinger Volcanoes

Message no. 10090 Branch from no. 10019 Posted by Emily Bolinger (v_bolinger) on Tue Feb 25, 2003 10:03

I have already done as you suggested, in a similar way. See Message no. 9691 (screen shot is attached to this message). The real problem is the original data set Summ_Ign.xls. I go into details in Message no. 9981. I am interested in the code for changing the latitude and longitude. I edited the data redone file by hand and it was a pain for 200 points, I can't imagine the process for 500 - 1000 points.
Stack Development by
Al Lewandowsk

Be Gentle With the Mother
Alew222@yahoo.com
<table>
<thead>
<tr>
<th>Earthquakes Around the World</th>
<th>Topic: Physical/Earth Sciences</th>
<th>Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(click the clipboard to download)</td>
<td>GIS Level: Beginning</td>
<td>Explores the patterns of earthquakes around the world and the relationship between earthquakes and tectonic plates.</td>
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<tr>
<td></td>
<td>Geographic Scale: Global</td>
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<td>Software Used/Needed: ArcView</td>
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<td>Filename: lsn_quake.zip</td>
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<table>
<thead>
<tr>
<th>Rollin' and Shakin'</th>
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<tr>
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<td>Illustrates how current earthquake data can be downloaded from the Internet and explored in ArcView GIS. Lesson developed through Upper Midwest Aerospace Consortium</td>
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<td>Date Submitted: May 02, 2000</td>
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<td></td>
<td>Submitted by: Jo Dodds from OLeary Jr High School</td>
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<table>
<thead>
<tr>
<th>Making Earthshaking Discoveries</th>
<th>Topic: Physical/Earth Sciences</th>
<th>Comments:</th>
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</thead>
<tbody>
<tr>
<td>(click the clipboard to download)</td>
<td>GIS Level: Beginning</td>
<td>This lesson uses GIS to learn about earthquakes and plate tectonics.</td>
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<tr>
<td></td>
<td>Geographic Scale: Global</td>
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</tbody>
</table>
GIS Applications

- Facilities management
- Marketing and retailing
- Environmental
- Transport/vehicle routing
- Health
- Insurance

and many more . . .
“...An organized collection of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information.”

From: “Understanding GIS”

By: Environmental Systems Research Institute, Inc.
Manipulation and analysis

- What would happen if . . .
  
  *A chemical leaked into a river?*

- Where does . . .
  
  *The Green Belt exist in relation to the City?*

- Has . . .
  
  *Population changed over the last ten years?*

- Is there a spatial pattern related to . . .
  
  *Car ownership in our area?*
How do I apply to participate?

Submit application form at:
http://www.emich.edu/visit/application.html

For More Information Contact:
Dr. Yichun Xie 734-487-7588 gis_xie@online.emich.edu
Beverly Hunter 540-937-4038 bev@piedmontresearch.org
Steve Wanner  (303)442-2430 ext.5312 wanner@bvsd.k12.co.us
Schoolsite Explorations
What makes data spatial?

- Grid co-ordinate
- Placename
- Latitude / Longitude
- Postcode
- Description
- Distance & bearing
The Inquiry and Research Process

- Locate
- Select
- Gather
- Collaborate
- Analyze
- Evaluate
- Test
- Synthesize
- Sort
- Revise
- Present
- Reflect
- Transfer
- Define
- Explore
- Identify
- Relate
A Series of VISIT Science Curriculum Materials

GIS-based Science Inquiry Lessons (ready-to-use, short, subject-specific science lesson plans for classrooms)

VISIT Investigations (Water Quality, HazMat, Radon, Watershed Management, River Eco-Studies, Benthic)

Adaptation of other educational or curriculum materials from,

- the Work/Site Alliance Training Manuals and Cases Studies
- LATE (Look At Environment) GIS Lessons
- MFteach Lessons
- IDRISI Lessons
The value of the culture of collaboration cannot be overemphasized and the importance of this atmosphere becomes obvious when one observes that other institutions of great tradition and research strength are trying to develop a culture of collaboration where none exists.
Who Can Participate in VISIT?

- Educators teaching science in middle and high schools
- Educators teaching geography, social science, math, engineering, and technology
- Other middle and high school personnel

Benefits to the Participants

- Classroom-ready lesson plans
- Professional development as teachers and teacher leaders
- Collaboration with peers and working scientists
- Develop technical skills
VISIT Workshops and Forums

Home > Forums > Technical HELP Forum

- 10062. **Installing ArcVoyager**
  - Ling Zhang (ly_zhang)
  - Mon Feb 24, 2003 12:45 New

- 10264. **Installing ArcVoyager**
  - Ling Zhang (ly_zhang)
  - Tue Mar 04, 2003 16:02 New

- 920. **Mark Palette Problem: Suggestions**
  - Yichun Xie (y_richun)
  - Mon Feb 17, 2003 16:27

- 1032. **Adding themes causes crashes**
  - Harry Bennett (h_bennett)
  - Sun Feb 23, 2003 16:59 New

- 1059. **printing the syllabus**
  - Rob Snyder (r_snyder)
  - Mon Feb 24, 2003 09:10 New

- 10057. **printing the syllabus**
  - Randy Raymond (r_rraymond)
  - Mon Feb 24, 2003 14:40 New

- 1033. **opening a project**
  - Rob Snyder (r_snyder)
  - Mon Feb 24, 2003 14:39 New

- 10033. **opening a project**
  - Ling Zhang (ly_zhang)
  - Tue Feb 25, 2003 11:27 New

- 1039. **Trouble with uploads**
  - Connie GammonPlacentini (c_placentini) Mon Feb 24, 2003 22:37 New

- 10086. **using magnifying glass**
  - Rob Snyder (r_snyder)
  - Tue Feb 25, 2003 09:23 New

- 10094. **using magnifying glass**
  - Ling Zhang (ly_zhang)
  - Tue Feb 25, 2003 11:29 New

- 1004. **screenshot blues**
  - Edward Patterson IV (e_pattersoniv) Tue Feb 25, 2003 20:40 New

- 10197. **screenshot blues**
  - Lance Johnson (l_johnson)
  - Sun Mar 02, 2003 11:11 New

- 10223. **screenshot blues**
  - Edward Patterson IV (e_pattersoniv) Sun Mar 02, 2003 21:10 New

- 1009. **connecting time**
  - Rob Snyder (r_snyder)
  - Wed Feb 26, 2003 13:25 New

- 10138. **connecting time**
  - Yichun Xie (y_richun)
  - Thu Feb 27, 2003 10:24 New

- 10304. **connecting time**
  - Bev Hunter (b_hunter)
  - Fri Mar 07, 2003 18:53 New

- 1021. **"failed" message**
  - Rob Snyder (r_snyder)
  - Thu Feb 27, 2003 10:08 New

- 10139. **"failed" message**
  - Yichun Xie (y_richun)
  - Thu Feb 27, 2003 10:28 New

- 10140. **Active data layer and Identify Tool**
  - Yichun Xie (y_richun)
  - Thu Feb 27, 2003 18:30 New

- 10038. **unauthorized login**
  - Marcia Craft (m_craft)
  - Sat Mar 01, 2003 16:21 New

- 10198. **unauthorized login**
  - Yichun Xie (y_richun)
  - Sun Mar 02, 2003 09:11 New
1. The GIS-based VISIT science inquiry lessons are short science lesson plans with:
   - an interesting science topic,
   - clearly defined curriculum objectives,
   - pre-compiled science data sets,
   - hands-on exercises written with step-by-step instructions based on a GIS software
   - 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.
Making a Base Map for a GIS Project or Lesson

The purpose of this guide is to assist in designing and building a base map for an introductory level GIS project in ArcView.

What is a Base Map?

A base map, in the context of GIS, is a GIS data layer of reference information, such as topography, road network, or streams, to which all other layers are referenced geometrically. It is the base upon which one then adds the additional data needed for the project. A base map provides spatial orientation for other data to be used in the study. The base map establishes the geographic extent, scale, and projection of data for the study.

Examples of Base Maps for Projects

You may look at some example projects and their base maps to get ideas for the type of base map you want to build for your own project. The following table provides links to example lessons and projects that illustrate some different kinds of base maps used for these different purposes. The table also categorizes the examples in terms of the geographic extent and scale. Large scale maps are used for very small areas, such as a school grounds or a neighborhood. Medium scale maps are used for studies of a region, such as a state or several states. Small scale maps are used for larger areas, such as a continent or the entire globe. Row three (for each lesson) indicates the type of information in the base map, such as roads or watershed boundaries. Row four indicates the data type or format, such as shapefiles or images. Row five provides a link to the metadata, where available.

Each of the following links jumps you down to the specific information for a particular lesson:

- Watersheds & Wetlands: Ft. Collins
- Watersheds & Wetlands: Ft. Collins Lesson 1
- Watersheds & Wetlands: Ft. Collins Lesson 2
- Forage Availability Model for Greater Yellowstone Ecosystem