TREES BRING

NEW OPPORTUNITIES

WITH

NEW TECHNOLOGY

INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS: MAPPING

INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS: MAKING A MAP

Sunshine State Standards: SS.B.1.4.1

Objectives

Students will learn to draw an accurate map.

Materials

Graph paper, straight edge, pencils, cameras, computer program GIS, Guest Speaker

Background

Cartography (map making) is an old and honored profession. Maps are used by almost everyone who wants to get from one location to another. Maps can be designed to show many different types of information.

Activity

Part A: Students will discuss the history of map-making and parts of a map with a professional cartographer. At end of discussion, students will take the attached quiz.

Part B: Students will be taken to computer lab and exposed to GIS system software to see how maps are made today.

Part C: If CITYgreen software is available, students can calculate optimal tree canopy, carbon, air pollution, storm water runoff, energy ratings and wildlife benefits for their own neighborhoods.

Part D: Students will draw their own maps of their neighborhood. Mount the map on poster board and add photographs taken in neighborhood of locations shown on map.

Assessment

Grade finished poster/map. Grade Quiz.

Introduction to Geographic Information Systems:

Part A: The making of a map

1. Define map:

2. Lying with maps is extremely simple, please explain how a map shows little “white lies” (hint: Mark Monmonier explains it in his book, “How to Lie with Maps”)

3. What is the branch of geography called that makes maps?

4. What does the acronym GIS mean?

5. There are 5 elements on a map, they are as follows:

GEOGRAPHIC INFORMATION SYSTEMS (GIS) AND SOFTWARE
Classroom Application of CITYgreen

Geographic Information Systems (GIS) is a tool used in urban and regional planning to facilitate the decision making process. GIS in the school will allow students both to gain spatial reference to the neighborhood in which they live as well as to analyze the current ecological situation that exists, helping them better understand the intricate links between nature, man and development.

What does GIS do? In short, GIS takes the geographical world (for example, rivers or city boundaries) and integrates it with attribute information specifically pertaining to a certain study area. For example, GIS can take a line that represents a river on a map and give that line attributes--depth, flow, sedimentation, pollution, etc. Or, it can take polygons that represent neighborhoods in a city and add demographic data to show population or income distribution.

Why use GIS? GIS allows students to work with the geography that is most familiar to them--their backyard, block or neighborhood--and integrate the data they collect about the physical surroundings, such as trees, soils, building types etc. Something abstract, such as numbers, is placed into a known tangible, the block or neighborhood that they call home.

What is CITYgreen? CITYgreen software was created in a collaborative effort between Environmental Systems Research Institute (ESRI) and American Forest. The original purpose of the software was to allow cities and conservation groups to conduct their own ecological benefits studies by measuring the economic benefits of trees, soils and other natural resources.

CITYgreen converts the ecological benefits--including storm water runoff reduction, air pollution mitigation, carbon sequestration, avoided carbon emissions, energy conservation and wildlife habitat--into a financial equivalent and further models the impacts of various development and planning scenarios.

The CITYgreen analysis software is an application that runs on ArcView 3.X GIS created by ESRI. The CITYgreen software includes:

- Tree Statistics -- summarizes species composition, average tree height, average trunk diameter, average tree health, canopy area, and tree ownership within the study area
- Carbon -- estimates the carbon storage capacity and carbon sequestration rates of trees within a defined study area
- Air Pollutant Removal -- estimates the annual air pollution removal rate of trees within a defined study area for NO_2, SO_2, O_3, CO and PM_{10}.
- Storm Water Runoff Reduction -- assesses how land cover, coil type, slope and precipitation affect storm water runoff volume, time of runoff concentration and peak flows.

- Energy Conservation and Avoided Emissions -- assigns energy ratings to trees based on their location, species type and height. Based on local climate and cooling costs, the software will estimate the dollar value of direct shading benefits trees provide.
- Wildlife Benefits -- identifies and rates tree species within a study area for providing food, shelter and nesting habitats for urban wildlife.

For several reasons, the benefits of using GIS and the CITYgreen software in the school can be extraordinary and are as follows:

1. Students learn how to take observations within their study area. They learn how to identify tree types, species types, soils, etc.
2. Students learn a skill. GIS is an intricate mapping software with the ability to make queries and analyses based on the data inputted by the students.
3. Students learn what makes good data and how to break the data into simple, understandable parts for analysis and maps.
4. Students can bring together a year of learning. GIS integrates elements of biology, geology, geography, chemistry and ecology and can put these into one picture so the students understand that the processes in the environment are not single and unique, but very reliant upon each other.

Using CITYgreen software and GIS as tools in the classroom can be beneficial to the students, as they learn how to bring together classroom hypothetical and real world scenarios.

Introduction to Geographic Information Systems:

Part B: Introduction to ArcView GIS 3.2

Materials

In order to perform this lesson, a computer lab housing approximately 5 computers will be needed. The computer specifications shall be as follows: (this will allow for the software to run properly on the system)

1. Computer: Industry-standard personal computer with at least a Pentium or higher Intel-based microprocessor and a hard disk
2. Memory: 24 MB RAM (32 MB recommended)
3. Operating System: Windows 95/98, Windows NT 4.0, and Windows 2000
4. Reference: Copies of the ArcView manual (Chapters 1-6 and Chapter 9); GIS for Everyone, by ESRI press (1998)
5. Software: ArcView 3.2

Assessment

The students will be evaluated at the end of the session by the project files that they create. Following the completion of all chapters, it is recommended that the teacher give an exam on the basic concepts of GIS and the software they just used. For an example, please see attached or go to www.esri.com and their virtual campus.

Estimated Time Required

The time estimated for completion of all the ArcView software is:
one week of class time, one hour per day, for five days.

Lesson Structure:

Day 1: Chapters 1 & 2, Introduction to ArcView GIS and Working with Views
Day 2: Working with Tables (Chapter 3)
Day 3: Working with Themes (Chapter 4)
Day 4: Querying (Chapter 5)
Day 5: Working with Layouts (Chapter 9)

Quiz: Introduction to ArcView GIS 3.2

(Teacher's Edition)

1. What does GIS stand for? _____

Answer: Geographic Information System

2. In ArcView GIS, everything is represented geographically by three symbols. They are: _____, _____, _____

Answer: points, lines and polygons

3. What is a theme in ArcView GIS?

_____

Answer: A theme is representative of a layer of real information, for example parcels, flood planes or a point coverage representing airports.

4. Each theme is considered a shapefile. What file extension is representative of the theme?

a. .shp
b. .dbf
c. .shx
d. .doc

Answer: a. shp

5. When querying an attribute table, what expression would be used to find a commercial parcel that would be 100 feet from the major interstate?

_____

Answer: [(parcel id = xxx) and (distance = 100)]

6. How do you set a scale in ArcView GIS?

_____

Answer: Go to the View menu and click on Properties; then, to set you must go to the measure units and set to the proper measuring units.

7. What do the following acronyms stand for in GIS:

a. dbf- _____
b. shp- _____
c. shx- _____
d. apr- _____
e. avl- _____

Quiz: Introduction to ArcView GIS 3.2, page 2

Anwer: dbf- database file
shp- shapefile
shx- compressed index file containing codes specific to the shapefile
apr- arcview project file
avl- arcview legend file

8. Please describe and define the GUI in ArcView GIS

_____

Answer: GUI is graphical user interface. In AV GIS, it is the area known as the file menu, the button bar, and the tool bar. The file menu is the same as in any program: for example, add a theme, copy a theme and paste a theme. The tool bar allows you to manipulate the view in which you are working. These change depending on the area of the project file you are working within. For example, top work on a table, the GUI will have only those commands to carry out for the table and will not in the view.

9. ArcView stores its information in files in the project window. What are they?

_____

Answer: view, table, layout, scripts, etc.

10. The table of contents is used to store items in your view. What are they?

_____

Answer: your themes.

11. When a theme is 'active' in your view, what does that mean?

_____

Answer: It means that whatever you do (editing, querying) will be done on that theme and only that theme.

Quiz: Introduction to ArcView GIS 3.2

(Student Copy)

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NOTE: For more information, or to order ArcView and CityGreen software, please contact:

www.ESRI.com (distributors of ArcView products, the platform on which CityGreen software runs)

AND

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