Bringing GIS into the introductory Earth Science classroom at Middle Tennessee State University

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I seek to help undergraduate non-science majors use geographic information systems (GIS) to learn Earth Science at Middle Tennessee State University (MTSU). The following paragraphs outline my goals, past efforts, future plans, and the wider significance of the planned work.

Three goals motivate my use of GIS in introductory Earth Science:

1. familiarizing large numbers of undergraduate non-majors with GIS;
2. recruiting students for GIS courses;
3. recruiting Geoscience majors.

The first goal is important because many disciplines need GIS. For example, at MTSU, GIS is used or discussed in geology, geography, biology, economics, sociology, anthropology, political science, history, recreation, and business. Many students majoring in these disciplines complete an introductory Earth Science course to fulfill part of a general studies science requirement. Consequently, this course can acquaint large numbers of non-majors with a problem-solving tool (GIS) encountered again during advanced study.

The second and third goals are important because the Geosciences Department has primary responsibility for instruction in GIS, geology, and geography at MTSU. For example, I teach GIS, Advanced GIS, introductory Earth Science, structural geology, and field geology. I have an ongoing need to bring non-Geoscience students into the GIS course because roughly two-thirds of current enrollees hail from outside the department and approximately half are completing degrees in the social sciences, humanities, or business. In addition, non-majors enrolled in the GIS and introductory Earth Science courses are recruited for the Geosciences major. If enrollment in the major grows, so will the department.

My interest in using GIS to teach introductory Earth Science blossomed during the last few years. Initially, I used GIS to create hardcopy shaded relief maps, radar images, and perspective views of volcanic landforms, and used these materials to teach introductory geology to majors at the California Institute of Technology (Abolins, 1997). Later, at MTSU, I used GIS and ancillary software to create animated block diagrams for a state-funded educational video on human-environment interactions in karst country (Jackson etal., 2001). Most recently, I used GIS to create hardcopy environmental maps for group-use in a large-lecture introductory Earth Science course (Abolins, in review; also, see the poster and demo at this meeting). Success in past efforts encourages continued use of GIS in teaching.

The efforts described in the previous paragraph benefited from access to a diverse suite of software. At MTSU, this suite includes:

- the full spectrum of Environmental Systems Research Institute (ESRI) GIS software;
- ERDAS Imagine, ER Mapper, and ENVI remote sensing software;
- the IDL programming language;
- Adobe Photoshop and Corel Photopaint graphics software;

- Macromedia Flash animation software.

To complete each step in a project, I used the most appropriate software. For example, I used remote sensing software to process images, GIS software to combine images with road maps, and Adobe Photoshop to polish the final product. Use of multiple software packages was more time-efficient than use of a single package.

In the near future, undergraduate non-majors in the introductory Earth Science course will use ESRI's Arcview GIS software to investigate water resources. I chose this topic because (A) it is a departmental emphasis and (B) an appropriate curriculum exists (Hall-Wallace etal., 2003). The Hall-Wallace etal. curriculum provides ready-to-use activities, and also provides a model for the development of original activities. An original activity will be developed at MTSU during early summer 2004, and will address two needs:

1. making the curriculum more relevant to students living in Middle Tennessee by including karst-related content;
2. showing students that they can create GIS-based educational products at MTSU.

I will pilot, evaluate, and improve the original activity by following the approach described in Hall-Wallace and McAuliffe (2002). Future students completing the curriculum will see how involvement with the MTSU Geosciences Department helps them understand their world.

The original activity will have significance beyond MTSU for two reasons. First, the karst-related content will be relevant to students living in other karst areas (e.g., much of Florida). Second, the planned work will show how the Hall-Wallace etal. curriculum can be used as a model for the development of an original activity focusing on the local environment. To reach a wider audience, project results will be disseminated on the web and through conference talks.

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