

## Geographic Information Systems in the classroom

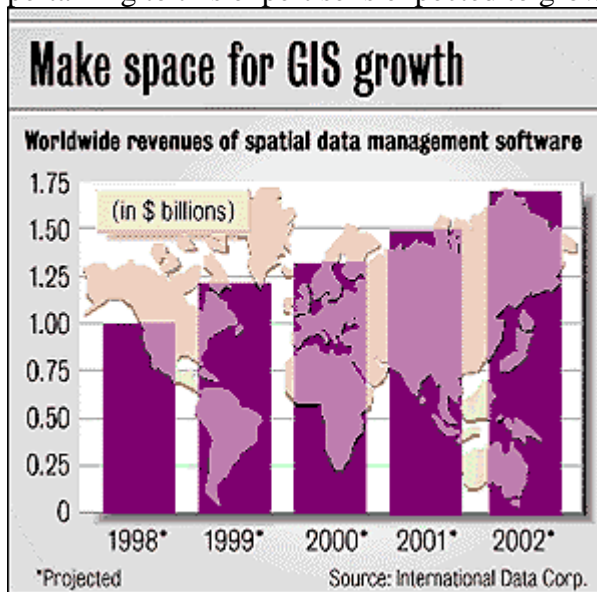
by Matt Gebhardt

One of the fastest-growing group of businesses that you never hear about are the businesses that specialize in Geographic Information Systems (GIS). GIS are mapping applications that take spatial data for a variety of topics and layer them one on top of the other in order to see a correlation that's otherwise difficult to notice. John Brown, director of the GIS project at Essential Information (an advocacy group dedicated to researching the civil rights of low-income families and founded by Ralph Nader), explains that trends and patterns are often missed when the data is presented in a spreadsheet. "People who have a hard time relating to statistics can instantly grasp the impact of a map," he says.

One of the reasons for the phenomenal growth is the wide range of companies that employ GIS solutions in their efforts to discover reasons for any difficulties they're experiencing. GIS is currently being used in environmental research, financial tracking, marketing, law enforcement and a multitude of other public, private and government agencies and organizations.

And although GIS has been around for quite some time, it really has only begun to gain prominence in the mainstream of the business world during the latter half of the past decade. Future projections for the continued growth of this industry are very promising, as illustrated in Figure A.

**Figure A:** Today's students will need to develop skills working with GIS, since the number of job openings pertaining to this expertise is expected to grow rapidly.



Any time there's an insurgence of a relatively unknown technology being spread across many different industries, the cry goes out for educated and skilled workers. And who's there to answer this call? It's the responsibility of educators and educational administrators to respond so that the next generation of workers will be prepared to meet the demands of society and excel within its ever-changing structure. And this education isn't restricted to geography or social studies classrooms; GIS can also be used to enhance your instruction in most subject areas.

## Leading the way

Intergraph and Environmental Systems Research Institute (ESRI) are two major GIS companies that are greatly outdistancing their competition. Autodesk and MapInfo are the nearest contenders, and Microsoft is trying to get into the market with their recently released, MapPoint 2001. While MapPoint 2001 is a greatly scaled-down GIS application, its lower costs and ability to integrate with other Microsoft Office applications, such as Excel and Access, may give MapPoint 2001 the distinction it will need in order to compete with the industry's heavyweights.

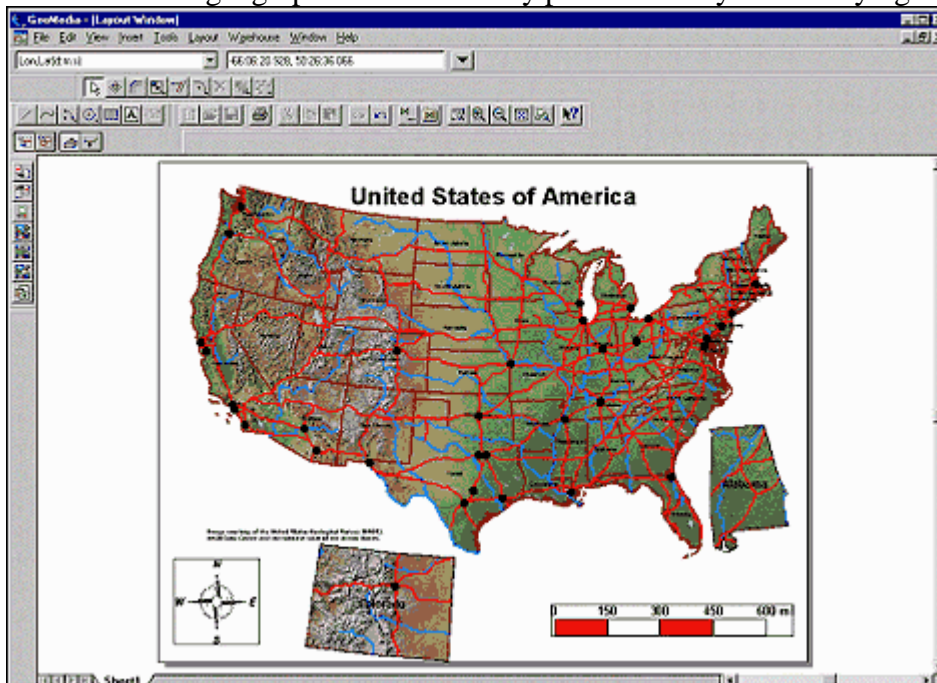
## Intergraph

Intergraph, located online at

[www.intergraph.com](http://www.intergraph.com)

makes GeoMedia, a Windows-based GIS product that doesn't require technical expertise to learn how to apply it in your classroom. Many GIS products are complicated software packages that require a lot of dedicated time to learn all of their ins and outs. GeoMedia was created with ease of use in mind, and students of all ages that can handle tool-based applications should be able to learn the software with little difficulty. GeoMedia, shown in Figure B, is part of Intergraph's academic program, *The Power to Learn*. One of the benefits of this program is a free GIS starter kit that educators can order from the Intergraph Web site. The starter kit includes the GeoMedia software, the Learning GeoMedia Workbook for Schools, a GeoData for Schools CD and the Technical Product Support for Schools. This package contains self-guided tutorials, nine lesson plans, educational statistics broken down into both national and state categories, and online access to the GeoMedia Knowledge Base, which is an ongoing collection of questions and answers submitted by GeoMedia users from around the world.

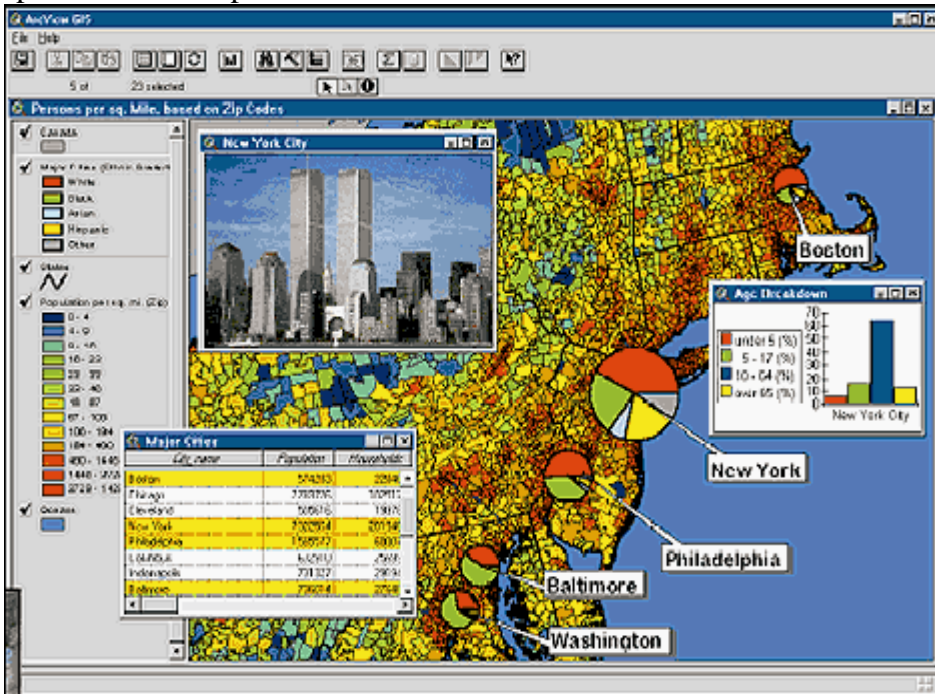
**Figure B:** GeoMedia is an easy-to-use Windows-based program that allows you to layer information on a map to illustrate the geographic context of any problem that you're studying.



## ESRI

Like Intergraph, ESRI offers free educational materials to licensed educators. For starters, there's the GIS for Schools and Libraries CD, full of introductions and tutorials. The CD also includes ArcVoyager Special Edition, shown in Figure C, which is full GIS software that's designed specifically for use in educational settings. Normally you'd need ArcView installed in order to run ArcVoyager, but ArcVoyager Special Edition contains the critical elements of ArcView that are needed to run the ArcVoyager software.

**Figure C:** ArcVoyager Special Edition allows students to analyze a wide assortment of data in terms of their spatial relationships.



There are some limitations to the Special Edition software, yet it's more than enough to get you started printing and analyzing mapped data. The software runs on both Macintosh and Windows platforms and can be installed on any number of computers in the school. Teachers are given permission to hand out the software to their students so that they can load it onto their home computers for assignments that require them to work outside of the school grounds. To order a copy of the free CD, go to

[www.esri.com/industries/k-12/roadmap.html](http://www.esri.com/industries/k-12/roadmap.html)

and follow the appropriate link.

If you find you want to go deeper into the world of GIS with your students, you may want to look into The ArcView for Schools & Libraries Bundle, which contains the ArcView GIS Version 3 software and over a dozen CDs packed with data. A school-wide license for the bundle can be purchased for \$495. (The list price for the individual components is \$2750.) But ESRI also offers schools a chance to earn the bundle by participating in their Community Atlas project.

The Community Atlas project is a great way to introduce GIS to your students. The program requires them to investigate their local community, map the characteristics, and then share the results with other communities that are involved. Students learn how to recognize and analyze the patterns that emerge, while developing the

technical skills needed to master the technology. For more information on the Community Atlas project, point your browser to

[www.esri.com/communityatlas](http://www.esri.com/communityatlas)

If you're already familiar with GIS and you'd prefer to order the GIS for Schools and Libraries Bundle outright or obtain further information about it, call 800-447-9778, or send an email to [k12-lib@esri.com](mailto:k12-lib@esri.com). Be sure to include your name, the name of your school and its location, and the friendly ESRI staff will be happy to assist you.

ESRI also offers an online collection of lesson plans for using GIS in the classroom. This database, located at

[www.esri.com/arclessons](http://www.esri.com/arclessons)

contains lessons submitted by teachers that you can search through by any of the criteria ESRI offers, such as title, topic, GIS level or keyword. ESRI has a virtual campus that offers free training modules and paid certificate programs, as well as a site that's dedicated to K-12 schools and libraries, located at

[www.esri.com/k-12](http://www.esri.com/k-12)

## **How GIS is being used in education**

GIS can help your students discover the ways that geography affects their lives. Since it's always around us, often we don't stop to consider how it influences what we do, why we do it and how it affects the earth. GIS can help students analyze data that's been collected and practice their critical thinking abilities to find creative resolutions to the problem they're faced with.

Often GIS is used for investigating environmental issues. Junior high schools in Arizona recently began using GIS to confront the problem of an increase in highway accidents involving bighorn sheep on Highway 93 between Kingman, Arizona, and the Hoover Dam. The project's materials were developed by the Center for Image Processing in Education (CIPE), and the lesson plan that resulted from these materials is called *Why Did the Sheep Cross the Road?*.

This lesson plan, which can be downloaded at

[www.evisual.org/Instr/EnvSci/sheep/Bighorn.html](http://www.evisual.org/Instr/EnvSci/sheep/Bighorn.html)

calls for students to break into groups of four. Two members of each group take on the role of highway engineers and the other two play the part of wildlife biologists. Once they've conducted their research on the bighorn sheep, their feeding habits, available water in the area (it's a desert environment), as well as reasons for the possible increase in automobile traffic on the highway, the students place the information in the GIS application and begin mapping and layering the results. Finally, they present their findings in front of the class and discuss how their results differ from their classmates.

These kinds of exercises promote individual analysis and team collaboration. There isn't always a clear answer to serve as the best overall resolution. In fact, the state of Arizona has yet to decide upon a final solution, although plans for rerouting the highway are underway. The students that have participated in the project all have shown a great interest in the methods used, the results obtained and how their final verdict will compare with the state's.

Using real-life problems and real data, including photographs of the bighorn sheep and data collected by government and environmental agencies, helps generate the interest in the class project. Another thing the teachers noticed as their students worked on *Why Did the Sheep Cross the Road?* was how much fun they were having with the GIS software. Anytime you give your students educational assignments that they actually enjoy working on, you've discovered a valuable educational tool.

## Web resources

In order to learn more about Geographic Information Systems, check out the Web sites listed in this article. Two additional sites that we've found to be particularly useful are GIS.com ([www.gis.com](http://www.gis.com)), shown in Figure D, and the Geography Network ([www.geographynetwork.com](http://www.geographynetwork.com)). Both of these sites contain education opportunities, news articles, career information, downloadable maps and geographic data, as well as links to the geography departments of universities around the world and links to other interesting geography Web sites.

**Figure D:** GIS.com has a useful section of the site that's maintained specifically for educators, found under the GIS For You Specialty menu on the left side of the home page.



## Finding your way

GIS technology is going to play a very influential role in the direction in which our society grows. As it reads on the ESRI Web site, "Most problems facing the world today--environmental, economic, political, or social--exist in a geographic context and any research and analysis must consider that." Currently, you can get the software and the lesson plans free of charge, so there's no reason not to look into it further. Use it to enhance your earth science, biology or social studies lesson plans, or simply set aside a time to teach your students about a technology that's edging into all the major industries throughout the world.