GIS educator

ESRI • Summer 2008

GIS Use across the Campus

Learning GIS with Real-World Applications

Students apply newly learned skills to local problems

Students at an Australian university work on tutorial projects that reinforce GIS concepts and skills through solving real-world problems related to their field of study.

The University of the Sunshine Coast in Queensland, one of the fastest growing universities in Australia, has GIS labs used for teaching introductory and advanced courses associated with various undergraduate programs such as environmental sciences and urban planning. Students learn basic GIS principles in the lectures, then apply this knowledge and these techniques in a real-world context. Students demonstrate the knowledge they have acquired through assignments. The themes for these assignments are selected based on each student's undergraduate program. Students are encouraged to enroll in ESRI Virtual Campus courses and use other resources to perfect their GIS skills.

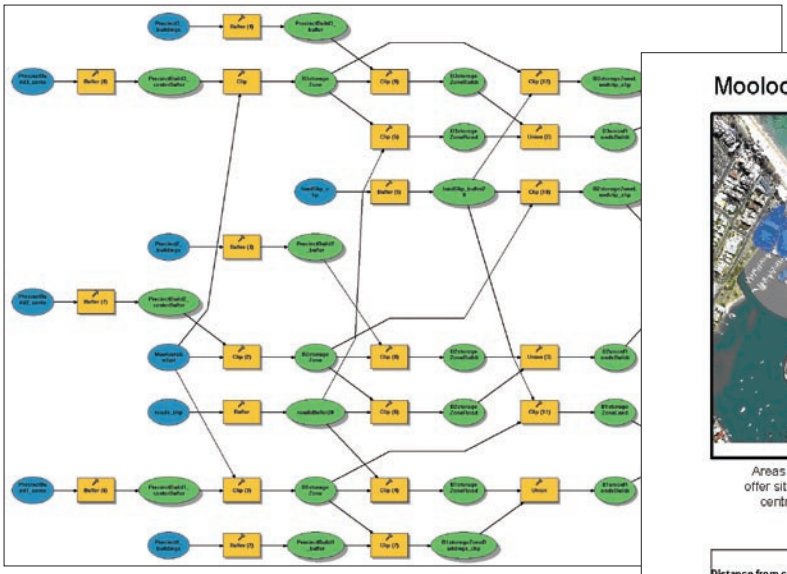
After acquiring basic GIS skills, some students enroll in advanced GIS courses. In these courses, they are given real-world problems to solve with the advanced GIS skills they are learning. To properly document their geoprocessing steps and have reproducibility of their work, students use ModelBuilder in ArcGIS.

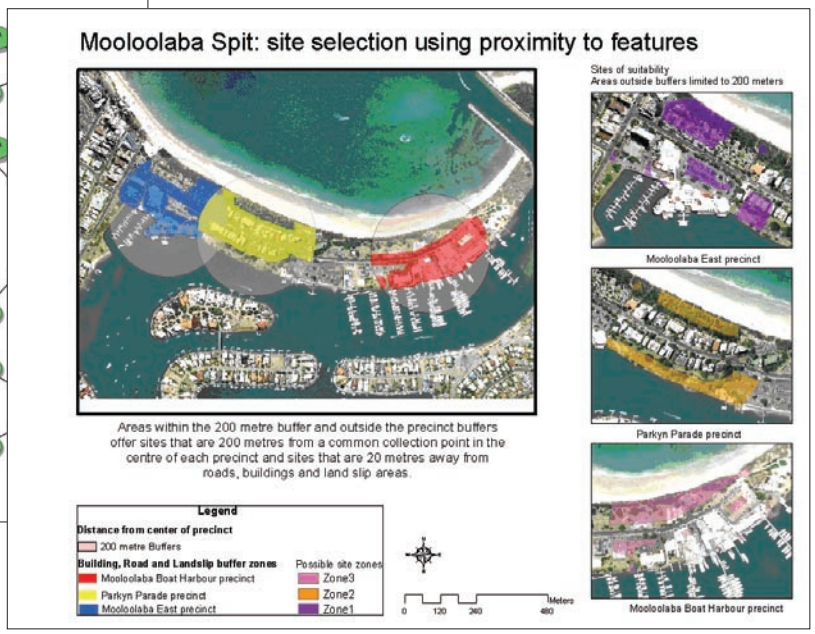
During a recent semester, the Mooloolaba Spit was selected as the study area for an advanced GIS course. The Mooloolaba Spit, located in the Sunshine Coast region of Queensland, Australia, is a small peninsula formed at the confluence of a coastal river, Mooloolah River, with the Pacific Ocean. The Mooloolaba Spit provides a secure harbor for commercial and recreational fishing, a popular beach frontage, several recreational facilities, residential areas, and caravan parks. The Maroochyshire Council maintains a spatial data repository for the local area. Students used these datasets for their study in addition to planning documents and a briefing on the Mooloolaba Spit master plan from the Department of Natural Resources and Water, Queensland.

Students demonstrated their new geospatial skills with great enthusiasm. The students identified data gaps that needed to be addressed for given problems. Missing data was digitized from aerial photographs or Google Earth imagery. The students developed possible solutions for problems such as managing parking places, identifying crime spots, managing storm water, and

Continued on page 2

In This Issue





This ModelBuilder flow diagram shows different geoprocessing steps used by a student analyzing datasets used in this study. The map shows grouping for buildings in the Mooloolaba Spit for estimating annual runoff of the rainwater. *(Model and map courtesy of Rory Hall)*

Combining Geographic and Computer Sciences

Undergraduate achievement awards in geographic science

The Association of American Geographers (AAG) Marble Fund for Geographic Science announced a new awards program that recognizes excellent academic performance by undergraduate students from the United States and Canada. The new Marble-Boyle Undergraduate Achievement Awards reward students who are bridging geographic science and computer science and encourage other students to work in this area.

These awards, together with the William L. Garrison Award for Best Dissertation in Computational Geography, are sponsored by the Marble Fund and supported by donations to the fund. The Marble-Boyle awards are supported by ESRI president Jack Dangermond. The awards are named for Dr. Duane Marble, creator of the Marble Fund, and the late Dr. A. R. (Ray) Boyle, who was a major Canadian contributor to the early development of both computer cartography and GIS.

Each Marble-Boyle Undergraduate Achievement Award consists of a cash prize of $700, a $200 credit for books published by ESRI Press, and a certificate of recognition. Initially, up to three awards will be made each year. Formal presentation of the awards will be made at the annual AAG awards luncheon. Award recipients are encouraged, but not required, to attend.

Applications will be reviewed by the Marble Fund's Undergraduate Achievement Award Committee. The committee will recommend up to three applications to the Marble Fund trustees as winners. Final awards will be made by the trustees. To apply for this award, applicants must

- Be enrolled in a full-time program of study at an accredited United States or Canadian college or university.
- Be no more than 12 months from graduation at the time of the application.
- Demonstrate reasonable intent to embark on a career or further education that will make use of both geographic and computer science.

There is no limit on the number of students who can apply from a single institution. However, only one student per year from an institution may receive an award. Applicants do not need to be members of AAG but are strongly encouraged to consider membership. The current application period is June 15–October 15, 2008. Complete details on the awards and application process are available at www.aag.org/grantsawards/marble_boyle.htm.

Continued from page 1

Learning GIS with Real-World Applications

locating water tanks for effectively harvesting rainwater from the rooftops of buildings.

The analysis of the potential for rainwater harvest indicated that up to 56 megaliters can be collected annually from the rooftops of the buildings in the study area. This harvested water can be utilized for irrigating the recreational areas within the spit. Further, some site suitability analysis was performed for the ideal locations of the water storage tanks with factors such as buildings, roads, and landslip areas taken into consideration.

Similarly, for storm-water management, areas were identified where vegetated swales can be grown. These areas were identified by considering factors such as slope, existing vegetation, impervious surfaces, accessibility, and flow direction.

Some students used geoprocessing tools for managing parking spaces. The main aim of the study was to minimize the trips of vehicles to the spit and increase available parking spaces. Thousands of vehicles enter the spit every day, but this can be minimized by relocating most of the parking spaces to the entrance of the spit. Based on these criteria, a multilevel car park was proposed and its location was determined with site suitability analysis.

A few students preferred to work in geodatabase mode. They converted all the spatial data into a geodatabase format to allow for spatial modeling. The geodatabase offered more stability and portability for the project. A single geodatabase maintained data integrity and ensured all datasets were produced within the same environment with the same coordinate system. In addition, students learned different ways to manage the intermediate datasets produced during the analysis. The students realized how a GIS project can become large and unwieldy if datasets are not properly managed.

While solving real-world problems, students learned to transform their spatial thinking into a geoprocessing. The students chose geoprocessing tools from ArcToolbox to address these problems. This led them to study the concepts behind individual tools in more detail. The tutorial exercises gave students an occasion for applying their skills and prepared students for handling future GIS-based projects. After finishing the course, some students were hired to do GIS-related work in the local councils.

Enlightened Urban Planning Essays on Sustainable Development

The philosophical insights, professional observations, and reviews of urban planning research by a leading French authority on transportation are contained in this collection of essays. Written by Jean Poulit, an urban planner and former president of the European Umbrella Organization for Geographic Information (EUROGI), *Connecting People While Preserving the Planet—Essays on Sustainable Development* contests commonly held beliefs about transportation, environment, and the quality of life. According to Poulit, access to destinations is tantamount to a creation of value. Fighting for a preserved planet and preserving the economic efficiency of humankind go hand in hand. By dedicating a small portion of a nation's wealth, he maintains, it is possible to reach a balance between prosperity and respect for the environment. ISBN: 1589481925

GIS Tutorial for Marketing

The value of GIS technology for business and marketing has never been greater than it is today. Small and large businesses are finding GIS an indispensable analysis tool in site selection, market area analysis, sales territory management, customer profiling, sales and service-call routing, and merchandising strategy development, to name just a few specific applications.

However, software training geared toward this burgeoning discipline is scarce. *GIS Tutorial for Marketing* fills this void. Filled with relevant, scenario-based, hands-on exercises, it is an important and timely resource for those who want to take business and marketing research to the next level.

This text contains ArcGIS tutorials that complement the standard curriculum of any undergraduate marketing program. Each chapter focuses on a marketing scenario that relates to a specific course in the marketing curriculum. The nonsequential nature of the chapters allows marketing students to develop GIS skills as they progress through the marketing curriculum. This volume is also an excellent resource for professionals who want to use GIS in marketing applications. No previous GIS experience is required. This book gives beginning students or professionals the knowledge and skills that will give them an edge when developing and planning marketing strategies and solving marketing problems.

The book includes a DVD that contains a 180-day trial version of ArcGIS 9.2 and a data CD with tutorial datasets and samples of ArcGIS Business Analyst and Community Tapestry data. ISBN: 1589480791

Project Management

University adds an important element to GIS curriculum

By Temashio Anderson, Kalonie Hulbutta, Josh Meisel, Lee Meisel, Carol Bowen, Lou Hara, John Kostelnick, Dave McDermott, and Rex Rowley

As applications of GIS become more complex, students need to learn more than just how to manipulate GIS software. To build successful careers in business or government, those entering the GIS workforce also need to know how to work collaboratively on large projects.

In response to these needs, Haskell Indian Nations University in Lawrence, Kansas, recently modified its GIS curriculum to add instruction in project management. Loosely defined, *project management* is the application of a body of techniques for organizing, executing, and evaluating complex endeavors that grew out of the scientific management movement of the 19th century. Project management won wide acceptance in military and industrial projects in the 1950s and 1960s.

To provide GIS students with these skills, Haskell added project management modules to its GIS courses. In a three-month test, students undertook a large, collaborative coastal flooding analysis project and used project management methods. The test was designed to provide an opportunity to apply project management methods and evaluate whether these methods made completion of a large GIS project easier.

Project management is particularly relevant to Haskell's GIS students. Many of these students are environmental science majors who plan careers in tribal government. In this setting, they will have to work collaboratively not only with other GIS staff but also with environmental scientists, administrators, and elected officials from state, federal, and tribal governments.

A grant from the National Aeronautics and Space Administration (NASA) Curriculum Improvement Partnership Award II (CIPA II) provided funding for a team of three undergraduates and their faculty advisors to design a large GIS project, work on it using project management techniques, and present the results at a CIPA symposium sponsored by NASA and the United Negro College Fund Special Programs (UNCFSP).

The team began by working through a set of project management training modules originally developed for Haskell's advanced GIS class. This training introduced students to techniques for defining the scope of projects, conducting risk assessments, and using program evaluation and review technique (PERT) and Gantt charts for monitoring progress. (The project management exercises used in the advanced GIS course are available from the authors.)

Team members then developed a list of possible projects and conducted a feasibility study for each proposal that considered the likelihood of success, the analytical power of each project, and its applicability to tribal lands. Based on the feasibility study, the team elected to investigate the potential impacts of rising sea level on both the Puyallup Reservation on Puget Sound and a section of coastal Maine in close proximity to the Passamaquoddy Reservation. The project deadline was not negotiable—it was a conference at which the students would present their results. Team members performed a risk analysis to identify factors most likely to put the project in jeopardy. When the risk analysis suggested that most potential problems could be overcome, the team made a promise to the project stakeholders, including the university and NASA, to deliver the project on time.

The GIS analysis was complex. Although both studies used light detection and ranging (lidar) data for elevation modeling, data providers supplied products in different formats. In addition, tides on the Atlantic and Pacific coasts differ, and the lidar data used for each coast required specific adjustments to accurately reflect both mean sea level and local high tide. Each study area required a different model to capture the unique flooding behavior of basins separated from the ocean and account for variables such as local rock and soil conditions.

The students analyzing this data were committed to providing the finished flood models as high-quality animated visualizations. This required acquiring, merging, and clipping dozens of orthophotos that covered the study areas before the creative work of building animations could begin.

Analytical work was performed using ArcGIS 9.2. Raster calculator functions were used extensively to build inundation models, some at intervals as small as one foot. Visualizations were built by displaying flooded regions over orthoimagery in ArcGIS, then importing the completed images into Macromedia Flash. This allowed the finished animations to have playback controls and functionality to let users select different areas for display.

Throughout the project, team members met twice a week to discuss progress. PERT charts formed the basis for these discussions and allowed all team members to see how delays in one individual's work could be catastrophic for other workers.

As the project deadline approached, PERT charting allowed the team to coordinate completion of the analyses and production of the conference presentation. PERT charting also revealed one critical bottleneck in the process—using new animation software—that could not be accomplished without putting the deadline in jeopardy. The team was able to make an informed decision to abandon those animations and shift resources to preparing the conference presentation. The project was completed on time and the team was able to present a polished product at the NASA/UNCFSP symposium.

Haskell Indian Nations University enrolls an average of more than 1,000 students from federally recognized tribes across the United States. The Haskell Sequoyah Computer and GIS Laboratory (www.haskell.edu/gis) conducted this project. The lab provides geography and GIS instruction and conducts research in collaboration with the Center for Remote Sensing of Ice Sheets. The center is funded by the National Science Foundation and headquartered at the University of Kansas. This work was supported by grants ANT-0424589, OPP-0122520, and HRD-0407827.

Kalonie Hulbutta, Dave McDermott, Lou Hara, and Temashio Anderson (shown left to right) study project management reports for a sea level rise visualization study and come up with a plan for finishing the essential parts of the project before the deadline.

GIS Day Celebrations

Event enhances curriculum

GIS Day is a valuable tool for educators that provides an opportunity for introducing geospatial technologies to students and helping them appreciate and understand the world around them. In 2007, the ninth annual GIS Day was celebrated on November 14.

GIS Day is a global celebration of GIS technology and geographic awareness that highlights why geography matters to all of us. The event gives educators opportunities for engaging students in critical thinking and helping them understand real-world problems. GIS Day can also promote a university's GIS program, communicate the many career opportunities available to graduates, and encourage community service through GIS-related projects.

Hundreds of GIS Day celebrations were held in 2007 at schools, colleges, universities, businesses, and government facilities in 90 countries. Here are just a few examples of these GIS Day celebrations:

Students and teachers gathered at Jahangirnagar University, Savar, Bangladesh, to celebrate their first GIS Day. The event included a GIS Day rally and march complete with GIS Day T-shirts. Participants shared a GIS Day cake and attended a GIS seminar. Jamail Basir, a fourth-year student, spearheaded the GIS Day planning efforts. He said, "Bangladesh is looking for a better future through GIS."

The Smithsonian Institute held its eighth annual GIS Day event at the National Zoo's Amazonia Science Gallery. There, GIS research scientists presented posters, maps, videos, computer and interactive displays, and career information. GIS datasets for the Ocean GeoPortal, Amazon GIS, Global Volcanism Program, biodiversity studies, and other programs were mapped in two and three dimensions. Approximately 45 adults and 85 students took home materials that included information about the use of GIS for mapping tropical and ocean environments, careers in surveying, and giveaways from ESRI and the National Geographic Society.

Join the community of educators celebrating GIS Day this year on November 19, 2008. For more information, visit the GIS Day Web site at www.gisday.com.

Libraries Support GIS Use

Site licenses expand benefits across the campus

By Eva Dodsworth, University of Waterloo, Canada

University libraries in Canada do more than supply maps. These libraries offer access to GIS training, data, and software for students and faculty across the campus.

Every year, new GIS certificates and programs are created and existing programs are modified or expanded. Many Canadian universities have ESRI site licenses that permit numerous seats of GIS. Because the library system is the information hub for the campus, many GIS services are accessed through it.

A GIS usage survey sent to universities across Canada found that all institutions using GIS are employing ESRI products, the majority being ArcGIS 9.x; some institutions use ArcView; and many have both available. Not all users are working with GIS for course-related studies. How the software is used differs from institution to institution and ranges from simple map creation to advanced spatial analysis.

Librarians and library staff also use ArcGIS for both large- and small-scale library projects. Regardless of the services offered or the scope and complexity of the projects, ESRI GIS software meets the needs of all these users. It provides departments, such as the library, with tools that allow creative and innovative mapping projects.

At the University of Waterloo in Waterloo, Ontario, the map library offers a variety of geospatial services that includes the distribution of geospatial data, access to ArcGIS ArcInfo 9.2, online GIS training provided by the ESRI Virtual Campus, hands-on ArcGIS workshops, and training of staff to assist patrons.

The library serves the entire campus and often finds GIS users in disciplines that have not traditionally taken advantage of this technology. The map library's top users come from the geography, planning, and architecture departments, but the staff also works with students and faculty members from earth sciences, engineering, and biology.

With the exception of students taking GIS courses, most library patrons are not familiar with GIS technology. About 70 percent of these students want to create a simple map, a task they can usually accomplish in minutes with ArcGIS. Unlike the many open source programs available to the students, ArcGIS offers cartographic elements such as legends, north arrows, scale bars, and text inserts. ArcGIS prints maps exactly as shown on the screen and provides several image format options including PDFs, which are widely used for presenting slides and providing maps on the Web.

Using the Define Projection tool, staff members can quickly assist novice users working with unprojected data. Architecture students, who are not interested in spatial products, require files converted to an AutoCAD format—a simple and quick conversion in ArcGIS. The map library has an extensive orthoimagery collection in MrSID format, which is supported by ArcGIS. Many students use imagery as a background for vector data and create a World file from the control points generated in ArcMap to retain the image's georeferencing.

With its ease of use, ArcGIS can benefit non-traditional users. The library's GIS staff have received ESRI's Virtual Campus training and use ArcGIS for a variety of library projects—displays, brochures, presentations, and database work.

Occasionally, users are not interested in spatial data but simply want information in tabular format that pertains to a geographic boundary. Clipping an attribute table to a boundary of interest provides the non-GIS user with information related only to a specific area. Sometimes users need to know the area of polygons that might delineate wetlands or forests, and ArcMap can easily supply this information. Although ArcMap is a powerful mapping program, many people benefit from it without using it cartographically.

Currently, the map library is scanning, digitizing, and georeferencing historical aerial photos. The final product will be made available as georeferenced images and KMZ (zipped Keyhole Markup Language, i.e., KML) files. These KMZ files can be used by GIS and non-GIS users alike with free, downloadable programs such as Google Earth. With ArcMap, the historical aerial photo collection will combine old and new information and, in the future, support interoperability with new products.

For more information, contact
Eva Dodsworth
Geospatial Data Services Librarian
University Map Library
University of Waterloo
Waterloo, Ontario, Canada
Web: www.lib.uwaterloo.ca/locations/umd/index.html
E-mail: edodswor@library.uwaterloo.ca

Where do **STUDENTS** find reliable data and graphic reports for writing a business plan?

Where do **RESEARCH FELLOWS** find analytical tools to prepare PEST and SWOT studies?

Where does **FACULTY** find a state-of-the-art but easy to use market segmentation system?

***"BusinessDecision** is one of the most useful tools for teaching business I've ever used. Students can investigate demographic, geographic, lifestyle and behavioral dimensions of a target market on one site with minimal instruction on the software. From a teaching perspective, this is phenomenal."*

- Lisa Bogaty, Associate Professor, Business Computer Technology and Director of Technology Programs, Pellissippi State University, Tennessee

BUSINESS DECISION Academic

ESRI Technology
AUTHORIZED BUSINESS PARTNER

CIVICTechnologies

2007 ESRI Business Partner of the Year (CA)

ESRI data and tools for the non-GIS expert

- Featuring Community Tapestry market segmentation data
- Provides consumer market data for market analysis
- No previous experience with mapping tools is needed
- Entirely web-based, with reports delivered on the fly
- Choose national or census region coverage

For more information contact Julie Peterson at 888.606.7600 or julie@civictechnologies.com

Using GIS to Study Sports

By Joseph Kerski, Ph.D., ESRI Curriculum Development Manager

Sports are geographic activities. Because sports have geographic characteristics, patterns, and movement, GIS can be used effectively in education about sports. Certainly, GIS is used in the business of sports—from choosing stadium location to managing security at sporting events. GIS can enhance the study of sports at any scale from global to local—choosing a city to host the next Olympic Games to tracking a soccer player's location throughout a game.

Here are just a few of the sports questions that can be posed in a GIS environment.

- In which cities are specific teams located and why?
- What is the total distance that a certain team has to travel throughout the season?
- How do the distances traveled by teams competing in the World Cup Soccer tournament compare to the distance traveled by a team in the Norwegian Hockey League?
- How do radio and television stations decide which teams to broadcast?
- How can bicycle, sailboat, and running routes be organized and tracked?
- What is the best orientation of the playing field from a player's perspective and from a fan's perspective?
- How can team owners and business managers establish marketing campaigns for ticket sales based on customer characteristics?
- How can parking and security be managed at sporting events?
- How can weather and air pollution be predicted for upcoming events?

Mapping and analyzing the locations of radio station affiliates in the Kansas City Royals and St. Louis Cardinals baseball networks in ArcGIS open up areas of spatial analysis and encourages spatial thinking. While Missouri has radio stations that broadcast the Royals games as well as those that broadcast the Cardinals' games, Kansas is exclusively the domain of the Royals radio network. Students can measure the areal extent of each team's radio coverage, or "catchment area," and compare these measurements with those for other teams.

For example, the catchment area for the Milwaukee Brewers is smaller, sandwiched between the Minnesota Twins and the two Chicago teams, the White Sox and the Cubs. Students can draw what they consider the boundary between the two teams, noting those cities where one station broadcasts the Royals' games and another station broadcasts the Cardinals' games. Some boundaries, such as the one dividing these catchment areas, are fuzzy, even in Missouri. The students can plot the location of surrounding teams, noting where those teams carve into the Royals' and Cardinals' territory. Cardinals stations abruptly end in northeastern Illinois where the domain of the White Sox and Cubs begins. The Royals' western sphere of influence extended far into western Colorado until 1993, when Denver was granted the Colorado Rockies franchise. Colorado radio stations then switched affiliation from the Royals to the Rockies, but the absence of a team in the western north-central part of the country means that some South Dakota and Wyoming radio stations are part of the Royals network. Students can also investigate the relationship between the size of a city and the presence of a baseball affiliate radio station and compare the diffusion of baseball fans to the diffusion of radio stations in the network.

A GIS-based lesson about the World Series of baseball uses maps of Fenway Park in Boston, Massachusetts, and Coors Field in Denver, Colorado. The 2007 World Series was played in these two stadiums. In this lesson, students explore the different zones in a baseball stadium from the infield to the outfield to the stands; study the direction the players face in both stadiums; and consider the effect of the setting sun on batters and players in the infield and outfield. The students measure distances on each field and speculate at which stadium as well as from which side of the field (left, center, right) it would be easiest to hit a home run.

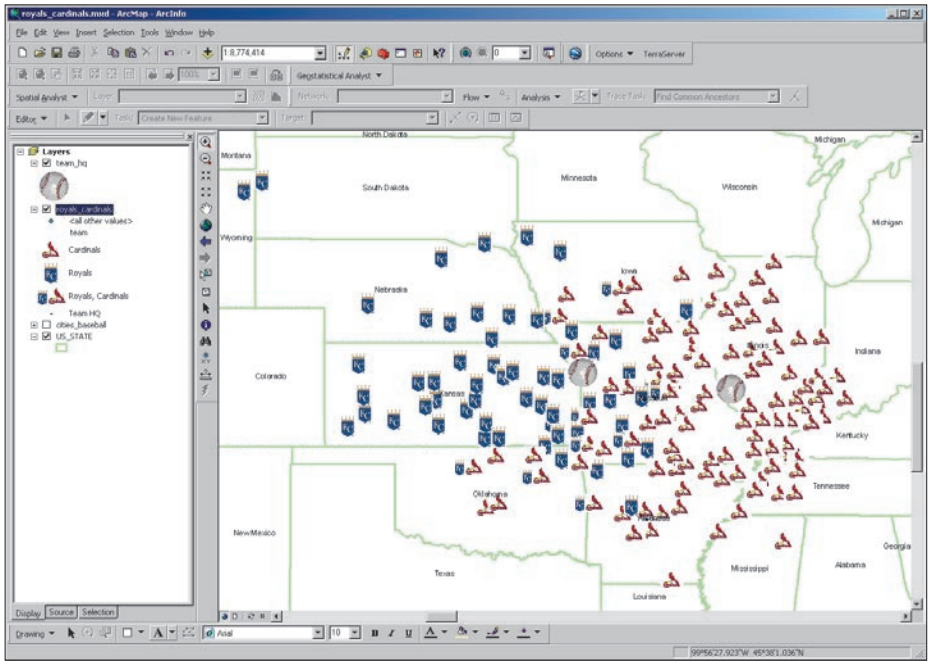
This lesson uses ArcExplorer—Java Edition for Education, but it can be modified to use ArcGIS

Self-Study Course Teaches Geoprocessing

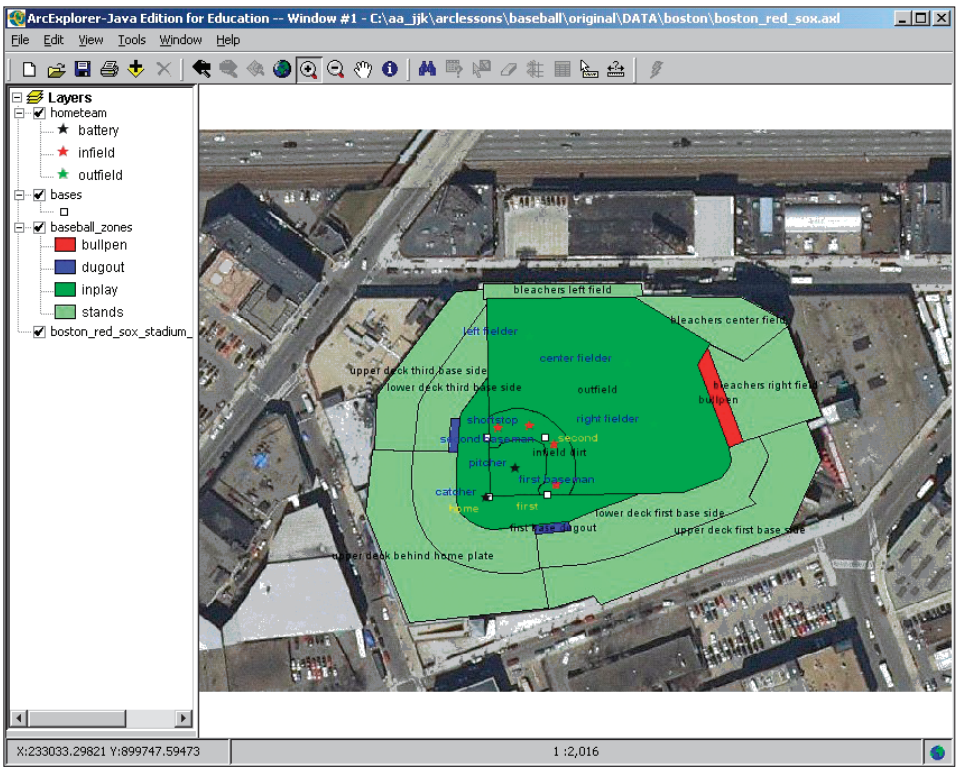
Hands-on approach emphasizes workflows

ArcGIS Desktop software provides hundreds of tools for accomplishing geoprocessing tasks that work with ModelBuilder, the graphic environment for visualizing and executing workflows in ArcMap. Learn how to use these tools by taking *Geoprocessing with ArcGIS Desktop.*

This five-module course teaches practical strategies for using the ArcGIS geoprocessing framework to accomplish GIS workflows and is available as an online, self-paced course. Students work with geoprocessing tools to create and organize workspaces, prepare data for analysis, and perform GIS analysis tasks, then streamline processes using models and scripts. In addition, students also learn how to create custom geoprocessing tools and document custom tools, scripts, and models. This course provides a solid foundation in the ArcGIS Desktop geoprocessing framework and emphasizes hands-on practice through software exercises.



The locations of radio station affiliates for the Kansas City Royals and the St. Louis Cardinals are symbolized using the KC symbol and a cardinal.



Students explore the different zones in a baseball stadium from the infield to the outfield to the stands.

with football, soccer, rugby, lacrosse, track, swimming, or other sports scenarios.

Neighborhoods change, and so do the stadiums in them. Consider the location and orientation of Comiskey Park, home of the Chicago White Sox, in 1938 compared to the stadium in 2002. By then, the stadium was located on the other side of the street, faced south, and was named U.S. Cellular Field. Looking at the accompanying photos of the White Sox's home field, note the size of the parking lots in both images and the rail line running north–south along the eastern edge of the images. How do you think most people commuted to the stadium in 1938? In 2002? How did the expansion of the sports arena affect the neighborhood land use, housing, and sense of place?

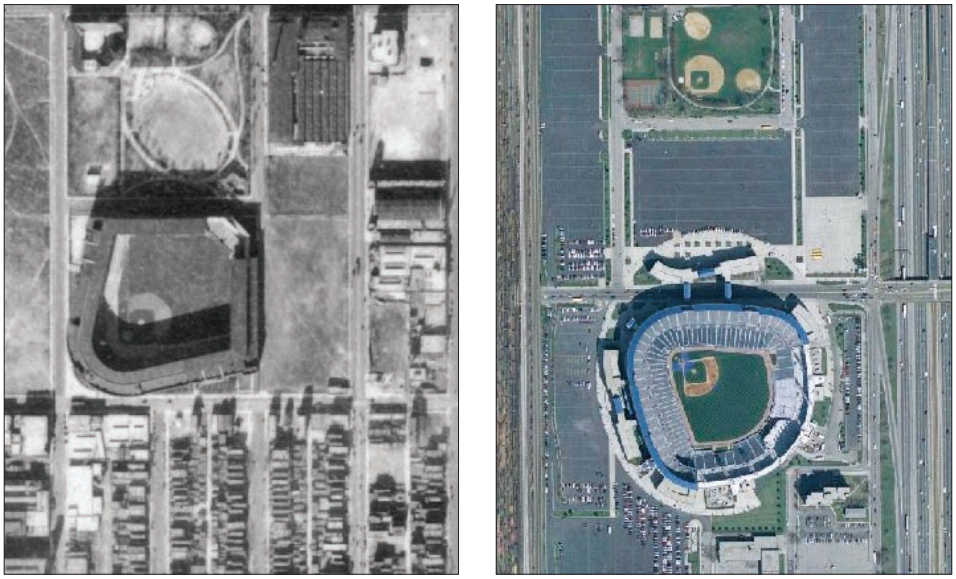
Background information for creating sports-based GIS lessons is everywhere. Data on the teams, players, fans, and recruitment exists and sometimes only takes a bit of manipulation to bring it into a GIS.

- The Royals/Cardinals baseball example required only the addition of a field to a cities layer for holding the name of the team broadcast by the radio station in that city. The information for populating this field was found online. The baseball and team logo graphics were created as marker symbols in the ArcMap style manager.
- The baseball zones in Fenway Park and Coors Field were digitized as points and polygons on top of aerial photographs by Charlie Fitzpatrick, ESRI K–12 education program manager, who obtained the aerial photographs from TerraServer (terraserver-usa.com).
- The 1938 image of Comiskey Park was obtained from the Illinois Department of Natural Resources and georeferenced in ArcMap.

For ideas on what to model with sports and how to think spatially about sports, see *Sports Geography* by John Bale. In this book, Bale explores the geographic diffusion of modern sports; its economic impact; cultural geographies of sports; and landscape, place, and location. The book is available from the publisher Routledge and online through Google Book Search. *Sports Illustrated Sports Atlas,* published in December 2004, gave an excellent overview of the power of mapping and GIS in sports that was summarized in the February 8, 2005, issue of *Directions* magazine.

Students at all grade levels are interested in sports. Help students see the advantage of the geographic approach and dig into GIS-based analysis beginning with a topic that is already interesting to them. Be creative and use GIS to uncover new geographic relationships on a myriad of scales.

The lessons described in this article are available in the ESRI ArcLessons library on www.esri.com/arclessons.



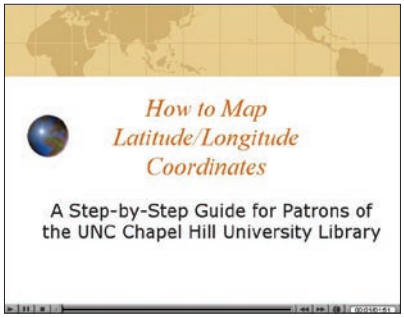
Compare the White Sox's home field in 1938 (left) and 2002 (right).

Delivering GIS Instruction on Demand

Video tutorials gaining in popularity

Academic libraries support GIS users on campus with a variety of services that include answering reference questions, developing and maintaining a spatial data collection, helping patrons find appropriate data for class or research projects, and offering instruction on the use of GIS. Although many library services require one-on-one interaction, training one patron at a time is not a very efficient use of a librarian's time. It is becoming less feasible as GIS continues to gain popularity among a variety of disciplines. Often, disciplines new to GIS, such as history or business, do not offer a GIS methods course, so the library becomes the primary source of GIS instruction and support.

In response to this increased demand for training, libraries across the country are finding innovative ways of providing GIS services and instruction more efficiently. Virtual reference services, including e-mail, instant messaging, Web-based research tools, and other self-help resources, can be used at any time from many locations to extend the reach of library services. One self-help resource that is becoming increasingly popular is the video tutorial.



Video tutorials are appealing because they provide an accurate representation of what the user will see and are especially effective for illustrating complex processes. Videos can be supplemented with text or narration to provide additional information and paused or replayed if necessary. Also, video tutorials can demonstrate a task in less time than would be required to read the text instructions describing that task. Creating video tutorials that answer frequently asked questions saves time for librarians as well as lets patrons learn at their own pace.

In presentations at the 2007 ESRI Education User Conference, librarians from two institutions described their techniques for creating video tutorials. Amanda Henley from the University of North Carolina and Michael Howser, Ken Grabach, and Robbyn Abbitt from the Miami University of Ohio have combined video with Microsoft PowerPoint slides. The slides provide background information to set the stage for the tutorial. Video footage illustrates the actual process. Miami University's video-making process can also include a voice-over that supplies additional explanations.

Microsoft PowerPoint and Tech-Smith's Camtasia screen recorder are the primary tools used to create these video tutorials. The procedure is outlined in the following steps:

1. Create a storyboard outlining the procedure and organizing the workflow.
2. Create the PowerPoint presentation.
3. Record the GIS procedures using Camtasia.
4. Edit video footage and integrate it with the PowerPoint slides.
5. Record voice-overs or create captions.
6. Export the completed tutorial to an appropriate file format.

While video tutorials enhance GIS librarians' efficiency, it also creates adequate and timely assistance for students and other library visitors. A couple of examples illustrate this point. A student needs help using GIS to complete a project due the next morning, but the GIS-trained staff members are gone for the day. In this situation, a video tutorial becomes a vital resource. Or perhaps a user has a quick question but none of the GIS instructors is available. Some patrons find this interactive and move-at-your-own-pace approach is more effective because it allows for "just in time" learning, teaching new skills when they are most relevant.

However, a video tutorial isn't always the answer to every challenge in GIS instruction. Librarians note that virtual teaching will not replace one-on-one instruction. Individual instruction provides more interaction and explanation than video tutorials. In addition, creating videos requires a considerable time investment, and videos may require revising after significant GIS software updates.

Nonetheless, at the University of North Carolina, Henley found a strong demand for these videos. From 2002 to 2006, requests for GIS in-person consultations, e-mail references, and GIS instruction all rose steadily. The volume of e-mail reference requests rose nearly 300 percent. Video tutorials were introduced in 2006. Within six months, video tutorials had become one of the most popular resources on the library's reference Web site. Video tutorials are an effective tool for helping librarians provide GIS instruction and support services more efficiently.

To see examples of the video tutorials created at the University of North Carolina Library, visit http://www.lib.unc.edu/reference/gis/faq/.

NSF Grant Funds Geospatial Education

A new, multimillion-dollar initiative will increase opportunities for geospatial education in the United States.

The National Geospatial Technology Center of Excellence (GeoTech Center) is a four-year, $5 million grant-funded initiative that will provide leadership to community and technical colleges in all aspects of emerging geospatial technology to better prepare America's twenty-first century workforce. GeoTech Center's mission is to increase the number, diversity, and quality of geospatial technology professionals. This initiative encompasses GIS, remote sensing, GPS, and mobile and location-based services.

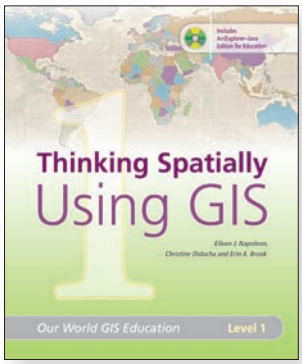
The geospatial industry is one of just three sectors identified by President George W. Bush's High Growth Job Training Initiative as having the greatest potential for impacting the economy and adding a substantial number of new jobs. With the rapid growth of the geospatial industry, a gap is developing between the number of students able to use these technologies and industry's need for skilled workers.

GeoTech Center is a National Center of Excellence under the Advanced Technological Education (ATE) program of the National Science Foundation. Led by Del Mar College in Corpus Christi, Texas, the center is a partnership of seven community colleges and one university. The other participating institutions are Central Piedmont Community College in Charlotte, North Carolina; Century Community College in White Bear Lake, Minnesota; Gainesville College in Gainesville, Georgia; Kentucky Community and Technical College System, headquartered in Versailles, Kentucky; Lake Land College in Mattoon, Illinois; Niagara Community College in Sanborn, New York; Southwestern Community College in Chula Vista, California; and San Diego State University in California. ESRI and Texas Engineering Experiment Station (TEES) Research Services in College Station, Texas, are also involved in GeoTech Center.

GeoTech Center has five major goals:

- Create a national clearinghouse of exemplary geospatial curriculum resources.
- Foster partnerships and collaborations that promote the education of geospatial technicians.
- Meet U.S. workforce needs by increasing the quantity and quality of geospatial technicians.
- Provide a unifying voice for geospatial technology education interests in organizations, industry, and government.
- Increase the number of community and technical college-level faculty and secondary school teachers participating in geospatial professional development.

Our World GIS Education

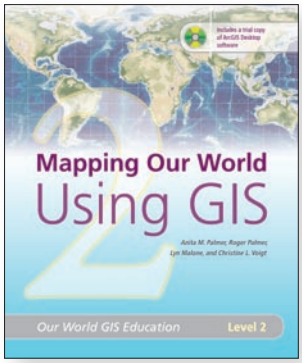


Thinking Spatially Using GIS

Eileen J. Napoleon, Christine Didocha, Erin A. Brook

Thinking Spatially Using GIS presents young students with engaging lessons that use fundamental spatial concepts and introduce GIS software. The computer-based lessons in this volume guide students to find relative and absolute locations of map features, create maps, locate human and physical features on maps, discover and analyze geographic distribution patterns, and investigate changes over time.

- Developed for grades 3–6
- Includes ArcExplorer™—Java Edition for Education for Windows and Mac

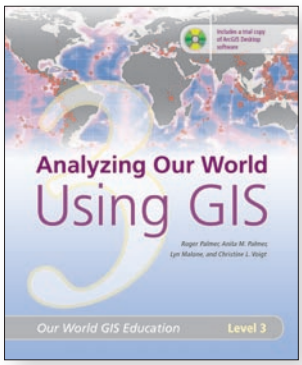


Mapping Our World Using GIS

Anita M. Palmer, Roger Palmer, Lyn Malone, Christine L. Voigt

Mapping Our World Using GIS invites middle school and high school students to investigate GIS through step-by-step lessons that require critical thinking and problem-solving skills. Using ArcView®, these lessons align with national teaching standards for geography, science, and technology in introducing and building skills in geographic inquiry, spatial thinking, and GIS technology.

- Contains updated and advanced lessons from *Mapping Our World: GIS Lessons for Educators*
- Includes one-year trial of ArcView software for Windows

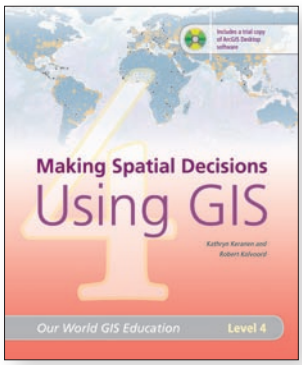


Analyzing Our World Using GIS

Roger Palmer, Anita M. Palmer, Lyn Malone, Christine L. Voigt

Analyzing Our World Using GIS utilizes GIS lessons to help high school students examine the local impact of global issues. Students gain independence in working with GIS and proficiency in exploring geographic data to complete sophisticated workflows such as retrieving data and applying ArcGIS Desktop extensions.

- Contains updated and advanced lessons from *Mapping Our World: GIS Lessons for Educators*
- Includes one-year trial of ArcView software with ArcGIS Spatial Analyst and ArcGIS 3D Analyst™ extensions for Windows



Making Spatial Decisions Using GIS

Kathryn Keranen, Robert Kolvoord

Making Spatial Decisions Using GIS is intended for college, university, and trade school students as well as high school students ready for extra challenges. This book presents a wide variety of real-world settings—from hurricanes to crime waves—for GIS analysis and decision making. With this volume, students learn methods for planning and executing GIS projects for more involved group investigations and independent study.

- Includes one-year trial of ArcView software with ArcGIS Spatial Analyst and ArcGIS 3D Analyst extensions for Windows

Register to receive notifications about the Our World GIS Education series and other ESRI Press books, news, and training at **www.esri.com/subscribe**.

Techie Teens Use GIS to Increase City Revenues

Students inventory city assets

By Barbara Shields, ESRI Marketing Writer

The City of Safford, Arizona, is putting teenagers to work using geospatial technologies that support programs and earn the city revenue. Youth, who love all things techie, happily use GPS to capture a variety of location data—from utility pole placement to library patrons—and input it into the city's GIS. The information is used to create maps and reports for city managers and analysts, helping them with planning and even resolving asset disputes. Their civic efforts are increasing the city's coffers.

Safford's Summer Youth Program was designed to encourage high school students to explore various occupations such as government jobs and engineering. This past summer, the program included 60 participants who performed a variety of tasks throughout the city. From this pool, an elite group of six was chosen to work with the city's GIS department and perform selected geocoding tasks. Safford uses ESRI's ArcGIS software for a variety of applications from utilities to public works. As a key component of the youth project, GIS was used to process digital data collected by the young people and generate valuable maps for analysis and planning by city employees.

The outcome has been a win-win situation. The youths had an opportunity to work with professionals, learn new skills, and get paid. The city had a low-cost workforce and accurate data with metadata attached and was able to increase revenue dollars from joint use rents.

For example, there had been controversy between a telecommunication firm and the city about poles that the firm was using for its service connections and boxes. The city charges rent for use of these poles, but without accurate data, billing was based on estimated rather than actual information. Revenue returns were much lower than they should have been. Joint use pole attachment rates had not been reviewed since the program's inception, and the city was charging $15 to $18 less than the market rate for attachments. The city's most recent pole inventory was 10 years old and expansion of the system had not been reflected in pole use invoicing. Furthermore, there was controversy about who owned the poles. It was clearly time to make a change, but the telecommunications company insisted on a report that included longitude and latitude points to verify the number of poles.

Raymond Brunner, the city's GIS administrator, initiated the revenue-generating pole inventory program as a means of justifying additional GIS investments for city operations. The U.S. Bureau of Land Management lent the city GPS units and the utility division set up the GIS to author and publish the data. Combined with youthful energy, this was just the recipe for success. "Revenue gained through reconciling pole data with billing offset the costs of Safford growing its GIS capabilities for use in other departments," Brunner said.

Data for this GIS map, which shows city-owned utility poles symbolized by attachment types, was collected by a teenage team in a city youth program. Cable TV connections are shown in red, telephone connections in blue. Poles with both connections are green.

Few projects are without skeptics. Up to this point, the city's engineering department had been undecided about the value of GIS to generate reports. The teens' joint use project proved the value of GIS technology. Some city staff were concerned that because these teens were temporary employees they would be ambivalent about data accuracy, but these critics were mistaken. An assignment area for one team would overlap with the assignment area of another and the results of that intersection were compared so the project's manager could validate quality. The results showed few discrepancies. Students looked forward to the daily outdoor work and thrived in a good-natured competition to collect the most accurate data.

"Youth were eager to learn the technology," said Brunner. "It was practically second nature to them. During the training, they were zooming ahead of the talk, pushing buttons, and exploring the data. For example, I was explaining a satellite map but some students had already checked it out 20 minutes earlier. Another advantage of using youth was that the labor costs were at a rate that we could afford to allow students to make multiple passes to get the information right. We were able to sweep the system, and if we need to go back and do it again next summer, we can afford to do so."

The outcome is an accurate pole inventory that provides the final count needed for renegotiating use charges and increasing revenues to the company. Moreover, the inventory revealed an additional 200 poles that had not been included in previous invoicing. GIS made it easy to generate a report that verified this data and cleared up claims of pole ownership. The return on investment more than paid for the project, and teens had an invaluable opportunity to explore career possibilities.

In addition to working on the pole inventory project, the youth force gathered geographic speed limit data for a traffic control study. The group also went to all buildings within the city limits , inventoried posted house numbers, and noted if these met code requirements. That is, if the numbers were too small or not contrasted enough for visibility from the street, they were noted as substandard. The information is helping the city enforce codes that will help police, emergency response professionals, and others identify addresses easier. Teens also worked to improve street centerlines for addressing and bus routing and collected library patron data to create a library patrons map.

At the end of the summer, the youths gave a presentation to the city council to demonstrate the GIS applications and projects that they had completed.

A Humble Beginning

Texas school district plunges into geospatial technologies

A daylong hands-on course motivated an entire school district in suburban Houston, Texas, to adopt geospatial technologies. Fifty-three teachers in the Lake Houston area took the plunge and signed up to learn about how they could incorporate geospatial technologies into the K–12 curriculum.

Participants included teachers from Humble Independent School District (Humble ISD) and the Lake Houston Science Collaborative (LHSC). By the end of the course, each teacher was confident that bringing geospatial technologies into the classroom was possible. To start the process, each teacher received a GPS receiver, camera, tripod, and support materials.

Donna D. Price, a secondary science and health education coordinator for Humble ISD and codirector of the LHSC, initiated the course. As coordinator, Price's role is to help develop and support curricula on a districtwide basis. As the LHSC codirector, her role is to provide teachers in the Lake Houston area with high-quality professional development.

After Price attended a workshop on viewing the Earth from space, she sent out a grant request to the Humble ISD Education Foundation to equip up to 70 teachers with GPS and digital cameras. The foundation was able to fund half the request, while the LHSC provided the rest of the funding.

Price contacted Amy Hays, the Texas geospatial extension specialist (GES) who had presented at the workshop, and asked her to partner with Humble ISD in providing training and support for teachers. The Texas Geospatial Extension program (geospatial.tamu.edu) is part of a national U.S. Department of Agriculture Cooperative Extension Service program partnered with National Aeronautics and Space Administration (NASA) and National Oceanic and Atmospheric Administration (NOAA). Specialists in 14 states bring earth science technologies to the public through outreach and education. They work together through the National Geospatial Technology Extension Network (NGTEN) (www.geospatialextension.org).

In the November 2007 daylong course organized by Price, teachers learned how and why GPS works; what GIS can do; about sources of data on the Internet, such as Google Earth and ESRI's Geography Network; and classroom teaching methods. The afternoon was spent using the GPS and digital cameras in a mock class setting. The overriding message of the short course was that geospatial technologies did not need to be seen as an additional subject area for teaching. They can be integrated rather easily into existing classroom curricula.

An outdoor scavenger hunt developed by Price reinforced this concept. Instead of finding traditional objects or caches, she set up GPS locations that related science concepts specific to the Texas Essential Knowledge and Skills (TEKS). For example, teachers had to flag locations and photograph items that showed properties of chemical or mechanical weathering or evidence of the nitrogen cycle. This strategy made teachers more comfortable with the technologies and made it easier to meld this new information with the existing curricula.

To keep the equipment, teachers sign a comprehensive user agreement that sets forth the responsibilities of teachers. Teachers signing this agreement should recognize the significance of the technology they are receiving, the expectation that it be used in the classroom, and the importance of connecting these activities with science learning standards set forth by the state.

The final course requirement for participants was the development of an actual classroom exercise using skills and knowledge from the workshop. These lesson plans for students in grades K through 12 are posted on a Wiki page called gpslessonslhsc.pbwiki.com along with the full text of the teachers' user agreement.

One middle school teacher, energized about the program, e-mailed Price a few months later. "Thanks! I bought my own unit after the in-service and now do geocaching," she wrote. "I had a great idea this weekend while I was trying out some caches." This is just the kind of teacher persistence the project needs to keep the program growing.

Program organizers want to determine if the partnership between a district-level coordinator and a GES, along with providing training, lesson plans, and critical equipment, is enough to successfully integrate the technology. A visit is planned in fall 2008 to assess the extent of the program's success in increasing the adoption of geospatial technology. Perhaps this model can and should be shared with other districts across Texas. Price and Hays are currently seeking additional funds and resources to bring this teaching method to other coordinators.

Kendra Wetuski was one of the 53 Houston-area teachers who learned how GPS and other geospatial technologies work at daylong course.

For more information, contact
Donna D. Price
Secondary Science and Health Coordinator,
Humble ISD Codirector,
Lake Houston Science Collaborative
donna.price@humble.k12.tx.us

Amy E. Hays
Texas Geospatial Extension Specialist,
Texas A&M Institute of Renewable
Natural Resources
ahays@tamu.edu
geospatial.tamu.edu

Where in the World?

GITA expands Location in Education program

Middle- and high-school teachers can use Location in Education program kits for a two-week period and pay only the cost of shipping and handling. The program is sponsored by the Geospatial Information and Technology Association (GITA), a worldwide, not-for-profit organization that promotes the use of geospatial information and location-aware technologies for asset and infrastructure management.

Each kit consists of 12 GPS units, a *World in a Box* video, a geocaching book, and instructions for operating the units and erasing inputted data. The kits are a great way for students to start learning about GPS and GIS at an early age. The kits have been sent to schools all over the country. GITA has recently purchased additional GPS units so kits can be sent to more schools. Teachers who are interested in the program should contact GITA at 303-337-0513 or info@gita.org.

GIS Educator is a publication of the Education Solutions Group of ESRI.

To contact the ESRI Desktop Order Center, call 1-800-447-9778 within the United States or 909-793-2853, ext. 1-1235, outside the United States.

Visit the ESRI Web site at **www.esri.com**.

See *GIS Educator* online at **www.esri.com/highered**.

To submit articles for publication in *GIS Educator,* contact Ann B. Johnson at **ajohnson@esri.com**.

Advertisers contact Teng-Hsiu "TJ" Sovyanhadi at **ads@esri.com**.

To subscribe to ESRI publications, visit **www.esri.com/subscribe**.

To unsubscribe from ESRI publications, visit **www.esri.com/unsubscribe**.

Requests for back issues, missed issues, and other circulation services may be made by sending an e-mail to **requests@esri.com**; calling 909-793-2853, extension 1-2778; or faxing 909-307-3051.

To update your mailing address, visit **www.esri.com/coa** or use any e-mail, phone, or fax option.

If you are from outside the United States, please contact your international distributor to subscribe, unsubscribe, or change your address. For a directory of distributors, visit **www.esri.com/distributors**.

110565
INLD 70.2M 6/08tk

Team	Name—Title
Higher Education	**Ann Johnson—**Higher Education Manager Tel.: 909-793-2853, ext. 1-1793 E-mail: ajohnson@esri.com
	Ann Marie Masangcay—Education Coordinator Tel.: 909-793-2853, ext. 1-1901 E-mail: amasangcay@esri.com
K–12 Solutions	**Charlie Fitzpatrick—**K–12 Education Manager Tel.: 909-793-2853, ext. 1-8349 E-mail: cfitzpatrick@esri.com
	George Dailey—K–12 Education Manager Tel.: 214-599-0895 E-mail: gdailey@esri.com
	Judy Laudenbach—K–12 Education Assistant Tel.: 651-454-0600, ext. 8321 E-mail: jlaudenbach@esri.com
Libraries and Museums	**Angela Lee—**Libraries and Museums Manager Tel.: 651-454-0600, ext. 8329 E-mail: alee@esri.com
Curriculum and Internet Development	**Joseph Kerski, Ph.D.—**Curriculum Development Manager Tel.: 303-449-7779, ext. 8237 E-mail: jkerski@esri.com
	Tom Baker, Ph.D.—Internet Development Manager Tel.: 913-383-8235 E-mail: tbaker@esri.com
Community and Youth Programs	**Esther Worker—**Community and Youth Manager Tel.: 303-449-7779, ext. 8216 E-mail: eworker@esri.com

Copyright © 2008 ESRI. All rights reserved. ArcInfo, ArcMap, ModelBuilder, 3D Analyst, ArcToolbox, Community, Tapestry, GIS Day, GIS Day logo, www.gisday.com, ArcView, ArcExplorer, ArcLessons, The Geographic Approach, Geography Network, Geography Matters, ESRI, the ESRI globe logo, ArcGIS, @esri.com, and www.esri.com are trademarks, registered trademarks, or service marks of ESRI in the United States, the European Community, or certain other jurisdictions. Other companies and products mentioned herein may be trademarks or registered trademarks of their respective trademark owners.

ESRI
380 New York Street
Redlands, CA 92373-8100

My ESRI News keeps you connected with GIS users and events in your area.
Sign up today at www.esri.com/myesrinews.

Presorted
Standard
U.S. Postage
Paid
ESRI