

GIS *educator* Special Edition

ESRI • Summer 2004

GIS Use Across the Campus

ArcGIS 9 Delivers Robust New Functionality

ArcGIS 9 introduces a new, comprehensive geoprocessing framework for creating and executing complex GIS procedures that uses ModelBuilder. This release also features improved annotation and labeling, more robust support for raster data, and geodatabase interoperability. Many productivity enhancements to both ArcMap and ArcCatalog eliminate repeated menu choices and allow keyboard shortcuts. ArcToolbox, previously a stand-alone application, now becomes a dockable window that is available in both ArcMap and ArcCatalog.

New Geoprocessing Framework

ArcGIS 9 Desktop supplies the new geoprocessing framework at all license levels—ArcView, ArcEditor, and ArcInfo. The number of tools available depends on the license used. These geoprocessing tools let users easily accomplish a variety of tasks from common GIS operations

such as overlay and buffer to more advanced ones for raster processing, topology, and schema definition. ArcGIS 9 gives users more options when performing the geoprocessing tasks that were previously handled by ArcInfo Workstation and ARC Macro Language (AML). The same operations, commands, or tools can run within dialogs, interactively in visual models, or quickly via command line input. They can also be integrated into multipart scripts written in common scripting languages or built into applications for advanced analysis. These tools work with all supported data formats including geodatabase feature classes.

The ModelBuilder interface, new to ArcGIS at version 9, provides a graphical framework for designing and using geoprocessing models that can include tools, scripts, and data. Models are process flow diagrams that link together tools and data to create advanced procedures and work

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Internet Site Brings GIS Careers to Light

ESRI has joined forces with Career Corner TV Corp. to promote opportunities available to students in the high-tech geospatial industry in the United States and around the globe. Virtual Job Shadow (VJS) is Career Corner TV's award-winning Web site that helps thousands of students at schools nationwide explore career options. VJS features a growing library of fast-paced "day in the life" profiles captured on video that show different people on the job. Each career story is augmented by a wealth of career information, links, and other interactive features.

Career Corner TV Corp. promotes the opportunities available to students in the high-tech geospatial industry.

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Curriculum Development and the Workforce

- What should be included in a GIS curriculum?
- What are the skills and competencies needed by the workforce?
- Is there an industry need for this type of program?
- What kinds of positions and salary does the GIS profession provide to graduates of different disciplines geared to different GIS workforce domains?

These are some of the most frequently asked questions that come to ESRI's Higher Education team as educators try to develop GIS programs. These may seem like questions with straightforward answers. However, geospatial technologies have grown so rapidly and become part of so many workforce domains that answers must typically begin with "It depends."

A panel session at the 2004 American Society of Photogrammetry and Remote Sensing (ASPRS) Conference in Denver, Colorado, entitled "Current Employment Trends and Activity in Geospatial Technology," brought together industry professionals to discuss the skills, experience, and education requirements for geospatial workers. This article addresses some of the topics discussed during that session.

One issue raised during the panel discussion was that there are still no widely accepted job titles and job classifications for geospatial technology workers. Unlike dentists or firefighters, whose professions have clearly understood skill requirements, the skills required of GIS professionals—whether technicians, analysts, or specialists—are

not generally agreed upon and neither is the compensation for these positions. To complicate matters, few positions are exclusively geospatial ones. Most require extensive knowledge in a specific workforce domain in addition to GIS, remote sensing, and/or GPS. Geospatial skills are used for only a portion of the job duties.

Many job classification schemes are loosely based on the six categories defined by the Urban and Regional Information Systems Association's (URISA) Model Job descriptions. These six categories are based on studies of state and local governments and relate to job responsibilities. For example, GIS technicians working in large organizations with many GIS users may be limited to entry level duties such as digitizing and updating databases. In organizations that have only a few GIS users, GIS technicians may be required to design databases, carry out data analysis, and present concise visualizations.

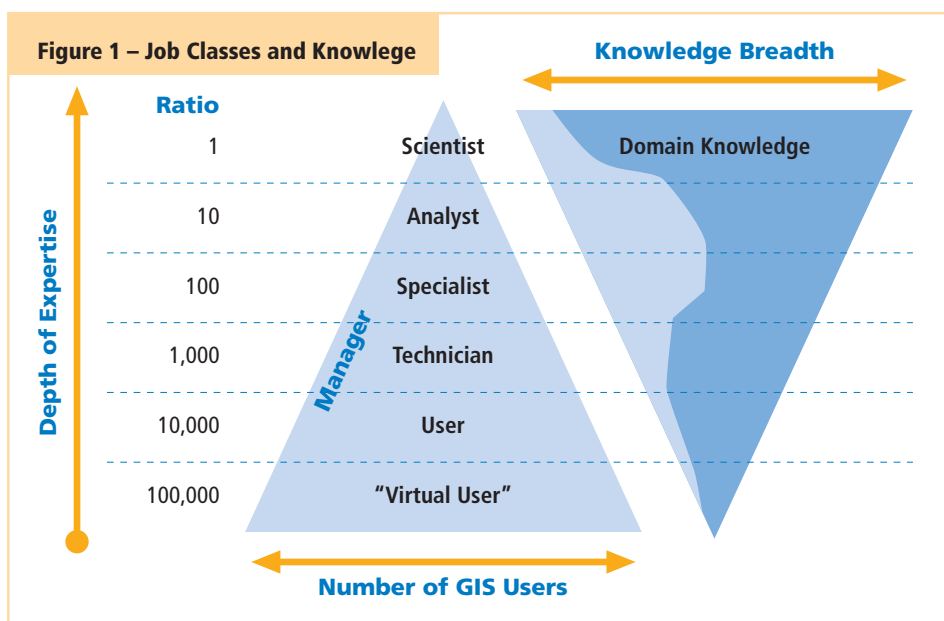
Human resource departments that write descriptions for positions that require geospatial skills often have a hard time specifying the competencies and degrees required or setting appropriate pay scales. Consequently, workers looking for positions that use GIS, remote sensing, or GPS skills may not find those terms listed separately but find them included under the umbrella term *geospatial technologies*. Given the confusion on the industry side, it is not surprising that educators have a difficult time developing geospatial curricula and justifying programs that include GIS, remote sensing, and GPS.

Several projects have been undertaken to help with the process of geospatial curriculum development. One of the earliest attempts was the core curriculum done by the National Center for Geographic Information and Analysis (NCGIA). Although it has not been recently updated, the core curriculum, posted at www.ncgia.ucsb.edu/giscc/, consists of topics that can be incorporated into a GIS curriculum but does not specify what materials should be presented. Several organizations, including Partnership in Environmental Technology (PETE); the Northwest Center for Sustainable Resources; colleges such as Fox Valley Technical College in Appleton, Wisconsin, and the Houston Community Colleges in Houston, Texas, have started Developing a Curriculum (DACUM) projects related to GIS. These DACUM projects brought together working GIS professionals who identified the required tasks for their positions. From those tasks, a list of skills and competencies was created for each workforce domain surveyed that can be used to determine what workers must know to carry out these tasks.

The National Workforce Development Education and Training Initiative (NWDETI) sponsored by the National Aeronautics and Space Administration (NASA) carried out a study for geospatial technology at The University of Southern Mississippi (USM). The GeoSpatial Workforce Development Center at USM developed a geospatial technology competency model, which is a matrix of roles and competencies for the geospatial technology workforce. This competency model was developed through an extensive process of meetings, sessions, and interviews with current geospatial professionals. These competencies can be used to create course and curriculum content based on different workforce domains. This process has been undertaken as part of a Department of Labor initiative.

Another ongoing project, the Model Curricula in Geographic Information Science and Technology (GI S&T), is being carried out by a task force of the University Consortium for Geographic Information Science (UCGIS). The strawman document, available at www.ucgis.org, is a very good document outlining the need to define a multipath approach to a four-year undergraduate degree based on concepts and methods used in GIS. The model identifies knowledge areas important to GIS, introduces crosscutting topics, and recognizes that GIS is multidisciplinary in nature. The three general paths of GIS programs include emphasis on GIScience, computer science/information technology, and the application of GIS with different master levels.

As geospatial technology matures and becomes more pervasive, there will be a need to define the profession and provide the best training and education for it. The GIS Certification Institute and



This diagram compares various GIS job titles in terms of geospatial expertise versus the need for domain knowledge and reflects the generalizations discussed in this article rather than empirical data.

the Certified GIS Professional process is one way to recognize individuals who are already engaged in the geospatial technology workforce. According to the Career Voyages Web site (www.careervoyages.gov), a joint effort of the departments of labor and education, geospatial technologies are one of the three hot career areas.

Hopefully, additional work on the GI S&T Model Curriculum and the development of curricula based on the Geospatial Technology Competency Model will help educators develop the needed curricula to meet the needs for a workforce trained and educated in geospatial technology-related careers.

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ArcGIS 9 Delivers Robust New Functionality

flows. ModelBuilder also provides a mechanism for sharing methods and procedures with other GIS users. The complete model (excluding input data) is saved as a single XML file. The entire model—model diagram, properties, and model metadata—can be shared with other users.

Improved Labeling and Annotation

The new Label Manager lets users centrally manage labels. For high-level cartographic output, the Maplex for ArcGIS optional extension integrates with the Label Manager to provide additional automation and placement control. New tools for managing geodatabase annotation allow users to more easily update and create annotation, and the geodatabase now supports more advanced text formatting and annotation.

Enhanced Raster Support

With ArcGIS 9, raster data can now be managed within a geodatabase so the same storage, metadata, indexing, and spatial search functions can be used with both raster and vector data. This yields faster analysis and raster display. Large rasters can be mosaicked into a single raster or managed as a series of tiles. Raster data can also be associated and stored with vector features.

Geodatabase Interoperability With XML

Geodatabase XML provides information interchange between geodatabases and other data formats. In ArcGIS 9, the complete geodatabase schema and content has been published as an XML specification. Sample implementations illustrate how to share data updates between heterogeneous systems.

With this specification, other applications can import and export data in a geodatabase-compatible format, and users can share all or part of a geodatabase and publish data models in an open and interoperable environment.

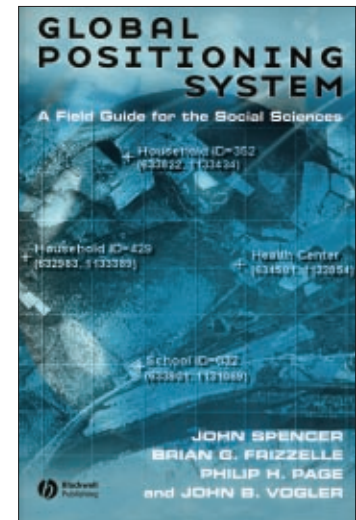
A Foundation for Using GPS Intelligently

A series of nine one-credit hour courses focusing on the use of GPS for scientific and engineering applications will be offered by the University of Maine (UMaine) asynchronously via the Internet. The *GPS, Geodesy and Application Program (GAP)* series focuses on the geodetic, mathematical, and physical foundation of geospatial positioning.

The program is coordinated by Alfred Leick, professor of spatial information science and engineering at UMaine. The course work deals with this topic in sufficient depth and with sufficient rigor for the spectrum of geospatial positioning accuracy levels, from 100 meters to a centimeter, achieved in both real-time and post process. These courses supply the foundation in geodesy and mathematical modeling needed to understand GPS and its applications. With its emphasis on mathematics and physics, this series contains courses for both undergraduate and graduate students to fulfill course requirements. Students will explore satellite positioning using a variety of systems: the GPS, Global Orbiting Navigation Satellite System (GLONASS), and forthcoming GALILEO system.

These courses are available to everyone and may be taken for credit or on a pass/fail basis. However, successful completion with the achievement of the grade C or better and proof of an undergraduate degree is necessary for the Post-Baccalaureate Certificate of Completion. All nine courses will be offered simultaneously and continuously in the spring and fall beginning in September 2004. An individual course must be completed with the regular UMaine semester schedule, but students may take any number of courses within the same semester. Visit www.umaine.edu/bursar/charges.htm to view the fee schedule and register. The series consists of GPS 401, 402, 403, 441, 442, and 443, which are undergraduate courses, and GPS 570, 571, and 571, which are graduate courses.

Practical Information for GPS Data Use



As GPS units have become more accurate, easy to use, and less expensive, they have become a tremendous research tool and an inexpensive but accurate data source for GIS. A new book, *Global Positioning System—A Field Guide for the Social Sciences*, by John Spencer, Brian G. Frizzelle, Philip H. Page, and John B. Vogler, helps GIS users take advantage of GPS. This text is based on the cumulative experience of the authors, both in the classroom and in the field.

Although the book is targeted to researchers in the social sciences, it is a very good introductory text for all types of users. The book is divided into two parts. The first section provides a foundation for understanding GPS technology. In addition to a brief history of GPS and an explanation of how it works, the section includes chapters on coordinate systems and datums that help users avoid the “black box” syndrome, intelligently apply GPS, and evaluate the data produced.

The second part contains a tremendous amount of practical information on planning and executing a GPS field project. This information will help users collect data at an appropriate level of accuracy in the most efficient manner. This nuts-and-bolts approach addresses such topics as training field-workers, the creation of equipment checklists, logistics, and safety in the field. Post field-work processing is covered, and one chapter in this section is devoted to using GPS data within GIS. Blackwell Publishing, Ltd., 2003, 218 pp., ISBN 1-4051-0185-7

Did You Know?

Members of the Higher Education team often think the word has gotten out about a beneficial program or resource only to learn that only a few of the people needing the information have received it. This list contains information that you may not know. Links to these items can be found on the Did You Know page, accessed from the GIS: Getting Started Essential Information for Educators page that is linked to the main page of the ESRI Web site (www.esri.com).

Resources

- The ESRI Support Center (support.esri.com) provides software, scripts, terms, and data models.
- College and university faculty can request a desk copy of an ESRI Press book.
- The ESRI Higher Education searchable database of GIS programs can help students and others find the GIS program that is right for them. Program information must be entered by someone at the institution.
- A GIS dictionary online can help you and your students with GIS terms and usage.
- The Virtual Campus library has almost 30,000 bibliographical entries.
- Events of interest to educators are listed online at kangis.org.
- Learn about grant opportunities offered by agencies and foundations and find out how GIS can be used to meet the goals of grants by visiting www.esri.com/grants.
- The series of software manuals that incorporate “using” in the title include useful tutorials and exercises. PDFs of these books are on the installation CD-ROMs and hard-copy versions can be purchased at www.esri.com/shop.
- A learning paths guide can help faculty or students determine what ESRI course sequence will work best is available online.
- Sample curricula are available online.

Publications

- Sign up to receive the *GIS Educator* newsletter at no charge.
- Receive free e-newsletters that contain the latest information about GIS in higher education or site licenses by signing up online.
- A white paper, *Guidelines for Developing a Successful and Sustainable Higher Education GIS Program*, provides insights for those starting GIS programs.
- Subscribe to *ArcUser* magazine, download tutorials and exercises, or read articles by visiting www.esri.com/arcuser.

Site Licenses

- A site license allows unlimited use of most of ESRI’s software. A LAB KIT license is a per seat license. A LAB KIT PAK provides up to 25 licenses that can be used in one lab room location.
- Site license holders can get unlimited, free access to technology courses offered by the Virtual Campus.
- An online FAQ for site licenses may help answer questions about how site licenses work.
- A list of all colleges and universities covered by site licenses, organized by state or country, is available online.

Special Offers

- Instructors receive a 40 percent discount on ESRI instructor-led courses.
- Students, faculty, and staff can sign up to participate in the live seminars offered by the Virtual Campus.
- Students can purchase a one-year timeout license for ArcGIS 9 with Spatial Analyst, 3D Analyst, and Geostatistical Analyst extensions. Call 1-800-447-9778 for details.
- Free, one-day passes for the ESRI User Conference are available to students and faculty, but registration is only offered at the event.

A Growing Educational Resource



A few years ago, ESRI created a place on the Web where educators could share classroom exercises. The ArcLessons site at www.esri.com/arclessons began with lesson packages created by ESRI Education team members. It has grown to more than 100 exercise sets that have been shared by individuals across the education community from K–12 to the university level.

This “leave and retrieve” site works in the same fashion as ESRI’s ArcScripts site (www.esri.com/arcscripts). Submitted materials are reviewed by ESRI staff and, once accepted, posted to the ArcLessons site so they can be downloaded by others. Typically, an ArcLesson package consists of a document in PDF, rich text format, or Microsoft Word; sample data; and archived project files. When a package is submitted, the author provides basic contact information.

ArcLessons is not static; it is a constantly growing resource for GIS educators. Instructors are invited to share their favorite lessons with other teachers who can benefit from new ideas and approaches to teaching GIS. Currently, most lessons use ArcView 3.x. Lessons using ArcView 8 or 9 are urgently needed.

One strategy for expanding the available ArcGIS materials might be revisiting ArcLessons written for ArcView 3.x. With permission from the author, currently posted lessons can also be updated, localized, or translated. Most authors are gratified when the usefulness of their original work is recognized and expanded upon and find an author citation is ample reward.

Educators who author ArcLessons packages are encouraged to promote these and the other materials available at the site. Please help others learn about this teaching resource. ArcLessons can also highlight GIS lesson resources available from other Web sites or through other means. To discuss lesson cross-posting or ideas for promoting ArcLessons, contact Angela Lee at alee@esri.com.

Technical Support Group

ESRI's Technical Support Group is dedicated to providing timely, expert assistance to ESRI software users within the United States. This group helps users install and maintain ESRI software, solve problems, integrate peripheral devices, and log enhancement requests and bug reports.

Developer Support Group

The Developer Support Group (DSG) is composed of highly skilled programmers and database administrators who specialize in solving development issues related to ESRI software. The group provides technical support, training, and consulting services specifically for ESRI developer tools and back-office software. Independent developers, developers in the ESRI Business Partner Program, or in-house developers can subscribe to a DSG plan that provides support via phone, fax, and e-mail. Training and consulting services are available on-site or at ESRI.

Premium Support Group

The Premium Support Group (PSG) services are designed for, but not limited to, GIS customers with highly specialized needs. A senior PSG analyst oversees each account and responds rapidly with comprehensive solutions to specific issues. PSG analysts are GIS professionals with expertise in database administration and diverse application issues including cross-product and cross-platform implementation. The PSG analyst also serves as a dedicated personal account manager who acts as the liaison between the ESRI Software Development team and the Quick-Fix Engineering team. Assistance is tailored to meet each client's specific needs and business goals and ensures all support needs are handled satisfactorily.

ESRI's Maintenance Program for ArcGIS 9

With the release of ArcGIS 9, ESRI moves to a maintenance-only model for software updates and discontinues its software upgrade program. This primarily affects ArcView single use licenses, because ArcView concurrent use licenses have been available on a maintenance-only basis for several years. An explanation of ESRI's software maintenance program is offered here for ArcView single use license holders who might not be familiar with this program along with a description of the Maintenance Activation Program.

What Is Maintenance?

ESRI's maintenance program provides software updates and access to technical support through a yearly subscription fee. Subscribers automatically receive new versions of all software for which maintenance is current and have telephone technical support throughout the term of the subscription. In the long run, subscriptions lower cost to own by providing the latest version of the software. Many educators find it easier to budget for an annual maintenance fee than to obtain funds and permission to purchase new software as it is released. Maintenance helps keep the cost of a GIS program stable. Please note that maintenance subscriptions are not mandatory license fees. If maintenance is not paid, the user can still use the purchased version of the software indefinitely but will not receive software updates or have access to technical support.

What Is the Maintenance Activation Program?

In the past, two options existed for updating software licenses—subscribing to maintenance or paying an upgrade fee when a new version was released. With the release of ArcView 9, the

ability to purchase software upgrades has been eliminated. To help customers make the transition from upgrading to purchasing maintenance, ESRI is offering a special program through September 2004. All ArcView 8.x licenses include 12 months of maintenance with purchase. With the Maintenance Activation Program, users can activate maintenance subscriptions for ArcView and become eligible to receive ArcView 9.

Two options are available with this program. The ArcView core software maintenance option covers only the basic ArcView license. The ArcView core plus extensions maintenance option includes updates and support for any extensions already purchased as well as the ArcView core software. Consequently, the cost of maintenance activation will depend on how many, if any, extensions are currently used. A maintenance subscription on an ArcView LAB KIT, LAB KIT PAK, and Schools and Libraries Bundle covers all the licenses within that particular package.

Contact an ESRI account manager or customer service representative to receive a quote for activating maintenance on ArcView licenses for a 12-month term. Once maintenance subscription is active, users will receive ArcView 9 and continue to receive updates and support on ArcView 9. At the end of the 12-month term, the user will receive a quote to renew the maintenance subscription for another 12-month term.

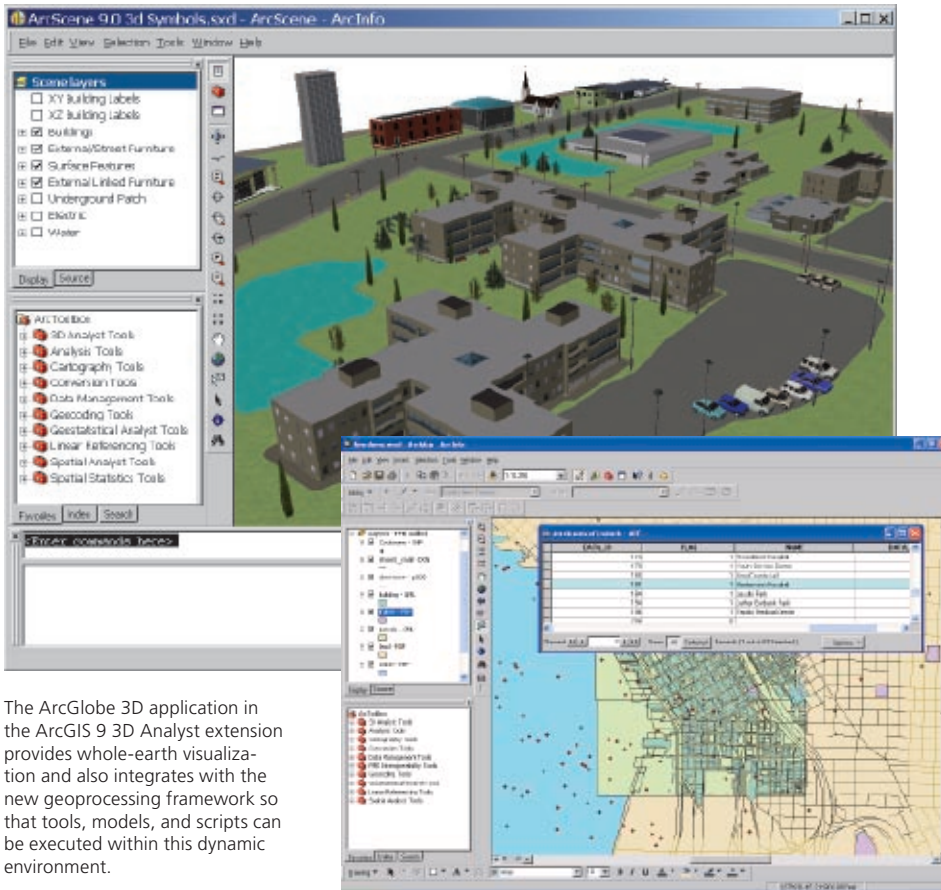
Contact Ann Marie Masangcay, higher education coordinator, at highered@esri.com, or Judy Laudenbach, schools and libraries marketing assistant, at k12-lib@esri.com with any questions or comments about the maintenance program options or ESRI's education programs.

Introducing the ArcView Student License

A special one-year license of ArcView is available to full-time and part-time students and instructors. Available for either ArcView 9 or ArcView 3.3, this new license is designed for students who need access to GIS software to complete course assignments or research projects. ArcView 9 also includes the ArcGIS Spatial Analyst, ArcGIS 3D Analyst, and ArcGIS Geostatistical Analyst extensions. The ArcView 3.3 version does not include any extensions. Students in the United States can order the ArcView student license by calling 1-800-447-9778. Students outside the United States can contact their local ESRI distributor.



Enhanced and New Extensions



The ArcGlobe 3D application in the ArcGIS 9 3D Analyst extension provides whole-earth visualization and also integrates with the new geoprocessing framework so that tools, models, and scripts can be executed within this dynamic environment.

The ArcGIS Data Interoperability extension enables users to directly read, display, and analyze data in more than 65 formats and export data to more than 50 formats.

The release of ArcGIS 9 introduces significant enhancements to an existing extension, ArcGIS 3D Analyst, and two new extensions, Maplex for ArcGIS and the ArcGIS Data Interoperability extension.

The ArcGlobe 3D application in the ArcGIS 9 3D Analyst extension provides whole-earth visualization and three-dimensional symbology. With ArcGlobe, users can manage and visualize data at both the global and local scale. Gigabytes of data can be seamlessly merged on-the-fly to create dramatic fly-throughs that zoom from miles above the earth down to a city block with ease. ArcGlobe also integrates with the new geoprocessing framework, allowing tools, models, and scripts to be executed within this dynamic environment.

The Maplex for ArcGIS extension uses a sophisticated set of rules that automatically modify labels so they are placed correctly the first time. Advanced settings for text placement include placement priority, text formatting, and conflict resolution. Labels can be truncated, stacked, or curved to fit within features.

The ArcGIS Data Interoperability extension enables users to directly read, display, and analyze data in more than 65 formats, including Autodesk DWG/DXF, GML, Intergraph GeoMedia Warehouse, MapInfo MID/MIF, MicroStation Design, Oracle and Oracle Spatial, and XML. The extension also exports data to more than 50 formats and includes tools for defining and importing custom data formats. This extension is also integrated with the new geoprocessing framework and ModelBuilder.

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Internet Site Brings GIS Careers to Light

A profile on Ingrid Bruce, GIS manager, city of Rancho Cucamonga, California, was one first completed. Bruce, members of her staff, and the city are featured in a series of streaming videos that demonstrate how a GIS manager functions. Another story follows the career of GIS practitioner and conservationist Dr. Michael Fay. This video sequence describes how geospatial tools and ways of thinking support his efforts. A forthcoming "day-in-the-life" show will investigate how GIS is important to public safety.

To explore these GIS career profiles, go to the Virtual Job Shadow Web site at www.virtualjobshadow.com, log in, and select Information Tech. Additionally, this site and its contents are being featured via AOL@School, the Association for Career and Technical Education, and other organizations involved with youth career development via links to the Virtual Job Shadow portal.

"These new geographic career features presented by Career Corner TV provide an excellent opportunity for students to learn about GIS and its importance in everyday life, our world, and their personal futures. Pick a walk of life or an aspect

of community, and GIS is there or soon will be," said George Dailey, ESRI K-12 education manager. "The stories, combined with the many Web connections to key geography and geospatial career content at the VJS site, really communicate to young people that opportunities are waiting for them when they're ready."

Added Peter Young, president of Career Corner TV, "We are pleased that ESRI recognizes the value of VJS and its impact on young people across the country. Students make decisions as early as middle school that can affect their eventual career path. We know that thousands of young people will now want to learn more about GIS careers after watching these, and hopefully other, geospatial stories."

The Web site Career Voyages, a joint effort of the departments of labor and education, lists geospatial technology as one of three emerging and evolving industries. The site provides information on some of the occupations that use GIS as well as educational requirements, job growth rates, and earnings. For more information, go to www.careervoyages.gov/whatshot.cfm.

Speed ArcPad Implementation

Collecting data in the field and storing it in a spatial database can improve the efficiency of processes in many industries. A collection of templates that highlight specific applications of ArcPad technology that have been developed to solve industry problems is available online. At the Public Domain Templates for ArcPad Web site, templates that include tools, applets, and forms can be downloaded to jump-start application development. A much larger collection of ArcPad tools and scripts contributed to the public domain by ESRI's user community can be found at www.esri.com/publicarcpad.

Who Do You Call?

This short directory will help you find the right person to answer your questions on software, data, training, technical support, consulting services, books, or just about anything that relates to GIS.

Training Options

ESRI offers a number of training options including instructor-led training, online courses, and software workbooks.

Instructor-Led Training	Contact learngis@esri.com with questions regarding our instructor-led training courses.
Training on the Web	Visit the ESRI Virtual Campus at campus.esri.com for information regarding online course work. For questions regarding the Virtual Campus, send e-mail to campus@esri.com .
Authorized ESRI Instructors	Visit www.esri.com/training/atp/take_class.html to locate a nearby authorized instructor. Contact atp@esri.com if you are interested in becoming an authorized instructor.
ESRI Software Workbooks	Visit www.esri.com/esripress for a list of software workbooks and other GIS books published by ESRI.

Technical Support 909-793-3774	Call Technical Support if you are a registered user with a software problem. Be sure to have your customer number ready. Problems can also be solved by visiting the ESRI Support Center at support.esri.com and consulting the Knowledge Base.
Customer Service 1-888-377-4575	Call Customer Service when you have a question regarding the status of an order, the licenses assigned to your customer number, or maintenance. Be sure to have your customer number ready. Customer Service is available 8 a.m. to 5 p.m. (Pacific time), Monday through Friday. Visit the Customer Service Web site at service.esri.com for product registration information on single use software and server developer software, to make requests for ArcGIS 9 updates and new license files, and to order hardware keys.
Sales 1-800-447-9778	Purchase software by calling the Telebusiness Department, calling a regional sales office, or by visiting ESRI's online store at www.esri.com/shop . For a list of sales offices in the United States, visit www.esri.com/company/contactusa.html .

ESRI's Education Teams

These teams of ESRI staff members serve specific segments of the education community.

Higher Education

Michael Phoenix

909-793-2853, extension 1-1970; mphoenix@esri.com

Mike works with universities outside the United States and with ESRI international distributors in matters regarding education programs in their countries.

Ann Johnson

909-793-2853, extension 1-1793; ajohnson@esri.com

Ann is in charge of university and college programs within the United States. She is the main liaison between these universities and ESRI and has been involved in supporting grant proposals to the National Science Foundation and other funding agencies.

Ann Marie Masangcay

909-793-2853, extension 1-1901; amasangcay@esri.com

Contact Ann Marie with questions on software licensing and pricing for colleges and universities or to request information about software or books.

K-12 Education

Charlie Fitzpatrick

651-994-0823, extension 8349; cfitzpatrick@esri.com

Contact Charlie with questions about using GIS in the classroom or for information about training for K-12 teachers.

George Dailey

214-599-0895; gdailey@esri.com

Contact George for information about using GIS for school administration. George also works with international distributors regarding K-12 education programs outside the United States.

Judy Laudenbach

651-994-0823, extension 8321; jlaudenbach@esri.com

Judy supports the K-12 and the Libraries and Museum teams. Call Judy to request information about software or books or with questions regarding the purchase of software for schools, school districts, museums, or libraries.

Libraries, Museums, and Research Institutes

Angela Lee

651-994-0823, extension 8329; alee@esri.com

Angela manages ESRI's Libraries and Museum Program. Contact Angela with questions regarding ESRI's work with libraries, museums, research institutes, and informal educational institutions.

Finding the Most Beneficial Education Solution

Every successful GIS implementation depends on getting skilled workers and keeping them knowledgeable about current developments in the field. In addition, learning styles and educational needs vary between organizations and between individuals in organizations. To address these needs, ESRI educational products cover topics related to geographic information science, GIS applications, and GIS technology and employ a variety of delivery methods. These solutions include instructor-led training, Web-based training, and self-study workbooks.

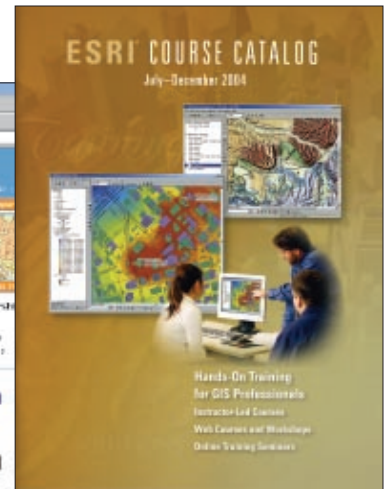
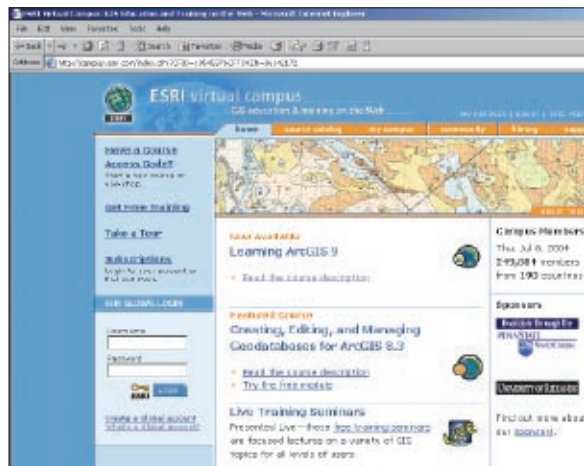
ESRI has a long-standing commitment to quality GIS education and training. The first instructor-led course, *Introduction to ARC/INFO*, was offered in 1982. ESRI developed an instructor certification program for its international distributors in 1988 that ensured the same high-quality instruction and materials were available to users worldwide. *Understanding GIS—The ARC/INFO Method*, published by ESRI in 1991, became the most widely distributed GIS workbook ever published. ESRI's Authorized Teaching Program, started in 1994, certifies qualified individuals in the United States to teach ESRI courses. ESRI Virtual Campus began offering self-paced GIS education and training worldwide via the Web in 1997 and, the next year, ESRI Press became an official imprint for GIS books.

Today, ESRI courses and books support hundreds of thousands of GIS students and professionals. Instructor-led courses are offered at ESRI facilities and client sites around the world, and the ESRI Virtual Campus, a leader in GIS education on the Web, makes GIS courses accessible to a global learning community.

The Advantages of Instructor-Led Training

Instructor-led classes free students from daily distractions so that they can focus completely on learning the material. ESRI instructor-led training is the best solution for individuals who must learn as much as possible as quickly as possible. Courses combine personal delivery, hands-on experience, and class participation to create a rich learning environment. Individual attention, direct peer interaction, professional networking, and the ability to get answers to questions on the spot are key to the effectiveness of this approach. With class time divided equally between lectures and exercises and the "one person per computer" policy at ESRI facilities, students have ample time to practice new skills.

ESRI instructors are subject matter experts who have education in GIS-related fields and experience with ESRI software. They effectively teach



technical content to students at all levels from beginning through advanced and have received consistently high ratings in student evaluations.

ESRI instructor-led courses undergo a rigorous design, development, and testing process that involves subject matter experts and education specialists. Courses are further refined through testing on real classes. High-quality printed and/or digital educational materials, normally consisting of lecture notes, step-by-step exercises, and exercise data, are provided. Those completing course work earn an official ESRI certificate and retain class materials for reference.

This format is especially recommended for application programmers and critical technical staff or for those who are either new to GIS or don't have the full support of skilled staff on the job. It is also useful for those who have specific technical or application questions.

ESRI offers more than 35 instructor-led courses offered at more than 40 training facilities in the United States including ESRI's corporate headquarters in Redlands, California, and nine ESRI regional offices. Discounts on ESRI instructor-led courses are available to faculty and staff at educational institutions, libraries, museums, and employees of United States federal government. For the latest instructor-led course descriptions, class schedules, registration information, and pricing, visit www.esri.com/training. Call the ESRI Learning Center at 909-793-2853, extension 1-1585, for seating availability or additional information.

ESRI Virtual Campus

ESRI Virtual Campus, offering self-paced GIS education and training via the Internet, serves a worldwide learning community whose members share ideas and expertise in a supported environment. The Virtual Campus is open seven days a week, 24 hours a day. Learners can access courses from any location with an Internet connection,

Web browser, and adequate computer (hardware requirements vary by course).

Web-based courses combine hands-on experience, interactivity, and instructional support. Accessibility, convenience, timeliness, and the ability to control one's own learning experience in a dynamic learning environment are the hallmarks of ESRI Virtual Campus courses. These courses undergo a rigorous development process. Course authors are ESRI software, industry, or academic subject matter experts who work with education specialists to design, develop, and test the courses. Online learner feedback continually improves the courses.

Courses typically consist of six learning modules that cover the concepts, examples, challenges, hands-on exercises, and exams needed to master the content. In addition to downloadable exercise data, some courses also supply downloadable, 120-day versions of ESRI software. Each module requires two to four hours of student time for an average of 20 hours per course. These courses are completed at the learner's own pace. Students must pass comprehensive online exams to earn a certificate of completion. After successfully completing a course, students may continue to access the course for reference.

Web-based course work is ideal for motivated learners who want or need a flexible training schedule or cannot afford the time away from work to attend instructor-led classes. Organizations can use these courses to leverage investments in instructor-led training by having staff members who have attended ESRI instructor-led classes mentor others who take Web-based training. Annual subscriptions, which give organizations access to all the campus courses for a flat annual fee, make training even more affordable and support continuing education across an organization.

Courses cover a variety of topics related to GIScience, applications, and technology as well as courses that teach ESRI software. The ESRI

Virtual Campus also provides support and reference materials for learners, including lists of frequently asked questions and monitored discussion forums for each course, a comprehensive library, and access to thousands of learners who provide peer support. Other support features at the campus include online seminars by authors and instructors, live chat, and interest- and industry-based groups that learners can create or join.

An educational discount is available to students and educators worldwide with a qualifying e-mail address. In the United States, quantity discounts are available with the purchase of more than nine courses at a time. ESRI Virtual Campus subscriptions make courses available to the entire organization for a flat annual fee.

Visit ESRI Virtual Campus at campus.esri.com for course descriptions, pricing, and registration information. A tour of the campus is also available. Courses can be purchased online with a credit card at campus.esri.com or, in the United States, by calling 1-800-447-9778. Annual subscriptions cannot be purchased online but are available by calling 1-800-447-9778 or contacting an ESRI sales representative.

ESRI Press Books

The publisher of award-winning books on topics related to GIScience, technology, and applications, ESRI Press also offers popular self-study workbooks on ESRI software and case study books on GIS applications for various industries.

Workbooks undergo the same rigorous design, development, and testing process as other ESRI educational products. Real-world examples and practical exercises put concepts in context. Step-by-step exercises supply feedback that reassures learners. Workbooks combine print delivery, hands-on experience, and printed and digital support materials. Portability, accessibility, convenience, timeliness, and the ability to control the learning experience have made ESRI workbooks popular.

ESRI workbooks are liberally illustrated and are usually printed in full color. Most ESRI workbooks include a companion CD-ROM with software, exercise data, tutorials, demonstrations, and support and reference materials that complement the text. After reading the text and working exercises, these books remain useful reference works.

ESRI self-study workbooks are ideal for

highly motivated learners. In addition to providing a self-study training solution, ESRI workbooks have been adopted as textbooks in many college and university courses and corporate training programs. Case study books from ESRI Press are not intended for hands-on training but help people understand the benefits of GIS to a specific industry. These books are especially popular with managers.

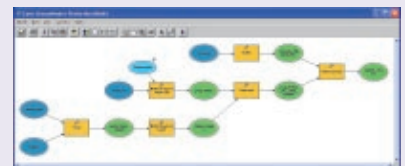
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\$10K Award in Modeling Competition

With the release of ArcGIS 9, models can be created and shared using ModelBuilder. To promote the use of models for sharing methods, ESRI is sponsoring the Best Practices in Science Modeling competition. Students and faculty members, judged as individuals or teams, can win \$10,000 in cash prizes for creating the most innovative or useful models using ModelBuilder. The competition will be independently judged by an academic team led by David Cowen, chairman of the Department of Geography at the University of South Carolina. To be eligible for awards, models must be submitted through the Best Practices in Science Modeling Web page (www.esri.com/models) by April 15, 2005.

All entrants must agree to share their models and post them on the Best Practices in Science Modeling Web page. One first place award of \$5,000, two second place awards of \$2,000 each, and four third place awards of \$500 will be given. Winners will be announced at the 2005 ESRI Education User Conference. All models entered in the contest can be exhibited at the ESRI International User Conference Map Gallery in 2005. Visit the Best Practices in Science Modeling Web page for complete rules and other contest information.

The ModelBuilder interface, new to ArcGIS at version 9, provides a graphical framework for designing and using geoprocessing models that can include tools, scripts, and data.



More Ways to Learn About ArcGIS 9

Both instructor-led and online courses are available for users transitioning to ArcGIS 9 as well as those new to GIS. Visit www.esri.com/training for class listings and related information.

Learn About the Latest Enhancements in ArcGIS 9

Instructor-Led Training

The newest capabilities of ArcGIS Desktop are showcased in *What's New in ArcGIS 9*. Learn about the new geoprocessing, command line, and modeling environments; enhancements to the geodatabase; advanced scripting capabilities; labeling and annotation improvements; three-dimensional visualization and analysis with ArcGlobe; and the new functionality in the ArcGIS Publisher and Maplex for ArcGIS extensions.

New Web Course Teaches the Basics of ArcGIS 9

Virtual Campus Web-Based Training

To teach new GIS users who want to learn the major functionality offered by ArcGIS, *Learning ArcGIS 9* guides users through GIS analytical processes provided with a variety of ArcGIS tools to solve realistic problems. This course emphasizes practical GIS skills including how to symbolize data for different types of maps, create and edit geographic data, perform spatial analysis, and design presentation quality maps.

New Web Seminar Highlights ArcGIS 9 Features

Virtual Campus Web-Based Training

Explore the new features in ArcGIS by taking the free *What's New in ArcGIS 9* training seminar. Learn about some of the most important new functionality including data interoperability options, labeling and annotation improvements, geodatabase enhancements, the geoprocessing framework, three-dimensional visualization tools, and new options for developers.

New Web Course Introduces the ArcGIS 9 Geoprocessing Environment

Virtual Campus Web-Based Training

Geoprocessing with ArcGIS 9 (for ArcInfo) is designed for experienced GIS and ArcGIS users who want to learn about the new geoprocessing environment and the geoprocessing tools and techniques for managing and analyzing GIS data. Course exercises show how to set up the geoprocessing environment, choose appropriate geoprocessing tools for a variety of tasks, prepare data for analysis, create models, execute analyses, and automate and refine geoprocesses using scripts.

Geospatial Mentor—Find One or Be One



their skills with people of all ages. Visit www.aag.org/sustainable to become or find a mentor, learn about current projects, and discover additional resources.

As more educators, students, and community organizations become interested in using GIS and other geospatial technologies, they will probably realize that they need help. While curricula, training opportunities, and online resources are becoming more prevalent, other forms of support are important too.

Mentoring is one of these sources of support. There are tens of thousands of dedicated GIS users around the world and many are happy to offer their expertise, time, and data to help GIS novices with projects.

The My Community, Our Earth (MyCOE) program, which began as part of the 2002 United Nations World Summit on Sustainable Development, provides an online site that registers GIS users who want to be mentors and helps new users find a mentor. The Association of American Geographers and other MyCOE partners would like more GIS users to take advantage of this resource so that experienced users can share

ArcGIS 9—Don't Wait to Upgrade

With the release and shipment of ArcGIS 9, many educators are wondering if they should install the new version now or wait until the spring. Concerns over upgrading to ArcGIS 9 may stem from experiences instructors had migrating from ArcInfo 7 to ArcGIS 8 or from ArcView 3.3 to ArcGIS 8. These major software changes required faculty members to spend time learning how to use the new version and rewriting lab exercises and related materials. This is not the case with ArcGIS 9.

ArcGIS 9 uses essentially the same interface used by ArcGIS 8, so most introductory level labs will need little modification for ArcGIS 9. A revised version of the textbook *Getting to Know ArcGIS* will be available soon and includes only changes to sections affected by new features in ArcGIS 9. The revised edition of *Getting to Know ArcGIS* will include ArcGIS 9 software. Students may also purchase the one year version of the software and receive the ArcGIS Spatial Analyst, 3D Analyst, and Geostatistical Analyst extensions.

Manuals for the software are shipped as PDFs on the installation CD-ROMs. The manuals on using the extensions include excellent tutorials and concept materials that can be incorporated into course work. Students can also purchase hard-copy versions of these manuals.

ModelBuilder and the geoprocessing framework and the integration of ArcToolbox with ArcCatalog and ArcMap will require the creation of new materials, but the effort will be well worth

it. Changes and updates to geoprocessing, database development, topology, scripting, the return of the command line, and enhanced cartography will help students develop more complex projects and visualizations. See www.esri.com/software/arcgis/about/whats-new.html#desktop for more information.

One noticeable change is the removal of the Geoprocessing Wizard from the Tools menu. This functionality is now fully accessible through ArcToolbox. This change adds full geoprocessing functionality to ArcCatalog and places these tools in one interface. One workaround for existing exercises is to customize the main toolbar by adding a button for the Geoprocessing Wizard. For details on adding this button, see “Chapter 16: Customizing ArcMap” in the manual *Using ArcMap*.

The ArcGIS 9 3D Analyst extension features the ArcGlobe application that ships with a global 150 meter resolution image as well as sample and tutorial datasets. This new platform allows students to get a better perspective of the world and see how the work they are doing relates to similar problems globally. They will also be able to easily animate projects and share them with others by creating .avi files in ModelBuilder.

The new Maplex for ArcGIS extension will allow students to create better placement of text and labels for cleaner visualizations. It supplies the ability to mask out elevation line symbology where elevation values are placed.

Friend of GIS Education Campaign

A growing number of ESRI business partners and others are recognizing the importance of the education community to GIS. ESRI has encouraged business partners to share geospatial products, services, and programs with teachers, school administrators, college and university instructors, librarians, museum researchers, and educational institutions interested in incorporating geospatial technology into their programs. To further encourage these efforts, the ESRI Education Program team has kicked off the Friend of GIS Education campaign. This is a collaborative effort that promotes and supports the expansion of educational pricing, product development and packaging, and services for GIS education. Campaign efforts will include

- Communicating with companies that want to participate in the campaign at the 2004 ESRI Education and International User Conferences through booth placards and other materials at the conference
- Requesting ESRI business partners to update and expand online listings in the ESRI Partner Directory and on their own Web sites to highlight education interests
- Soliciting case studies and user stories that demonstrate the use of data, software products, and services from campaign participants by the education community
- Recommending campaign participants collaborate with others in the program in outreach and promotion programs to the education community
- Sharing information about the various education communities with campaign participants

Business partners who wish to become involved in this program can contact the ESRI Education Program team at edteam@esri.com. Look for Friend of GIS Education campaign online, in news articles in the *GIS Educator* newsletter, *ArcNews*, and e-newsletters, and at trade shows and other events.

Instructors using ArcInfo who want full functionality and access to all of the tools should do a clean install of ArcGIS Desktop first and then install ArcGIS Workstation. An FAQ that answers many technical questions is linked to the ESRI Support page (support.esri.com) and will help instructors and IT staff install ArcGIS 9. Many Virtual Campus courses, live training seminars, and workshops will help instructors and students upgrade to ArcGIS 9.

Nurturing Community College GIS Programs

In 1996, a survey done by Towson University in Towson, Maryland, revealed that only 10 community colleges had GIS programs. By 1999, 400 colleges had acquired GIS software and more than 100 had some type of GIS program. Currently, 46 colleges have GIS certificate programs and 36 colleges offer associate degrees in GIS, according to the searchable database of GIS programs on the ESRI Web site (www.esri.com/highered).

Increasingly, colleges and universities, such as Mesa Community College in Arizona and West Valley College in California, are actively working on articulation programs. Their programs include courses that are approved for general education requirements or that articulate with programs at four-year institutions. Kentucky, Michigan, Mississippi, Oregon, Washington, and Virginia are among several states with ESRI statewide site license agreements that include community colleges. See the ESRI Higher Education page at www.esri.com/highered for a complete list of site licenses. California community colleges can be covered by a site license through the Community College Foundation.

Site licenses have helped colleges expand GIS use from the geography department to other disciplines including archaeology, biology, history, and business. GIS coursework is offered through academic degree programs and vocational and customized workforce development programs for working professionals. Several colleges have received funding from the National Science Foundation (NSF) and other organizations to develop programs that focus on or include GIS.

In 1996, the GIS for the 21st Century NSF Grant to Indiana State University provided training in GIS to 34 college instructors. Most of these instructors have developed GIS programs and received additional NSF grants. These colleges include Houston Community College in Houston, Texas; Hawkeye Community College in Waterloo, Iowa; and Pierce College in Woodland Hills, California.

While state budgets continue to be very tight, college faculty have found ways to start or broaden GIS programs. Currently, Monterey Peninsula College in Monterey, California; Kirkwood Community College in Cedar Rapids, Iowa; and, most recently, Del Mar Community College in Corpus Christi, Texas; have programs funded by grants. ESRI maintains a grants Web page (www.esri.com/grants/index.html) where educators can sign up to be alerted to grant announcements that include GIS.

An article that appeared February 6, 2004, on CNN.com stated that 80 percent of the country's public safety personnel (fire, police, emergency medical) are educated at community colleges. Consequently, experts see community colleges playing a greater role in national security. Many schools with GIS programs are developing specialized courses relevant to homeland security including training for first responders.

Community colleges are considering developing programs that allow high school students interested in GIS to receive credit for course work and continue their education, first at a two-year school and eventually at a four-year institution. Part of the NSF grant received by Del Mar Community College will focus on developing this type of educational path.

Descriptions of how community colleges have developed curriculum can be found in articles in the *GIS Educator* newsletter, available online at www.esri.com/giseducator, and in presentations made at ESRI Education User Conferences, also available online at campus.esri.com/campus/library. College faculty members who have interesting programs or have found successful ways of dealing with curriculum development are encouraged to share this information with others by submitting an article for publication in the *GIS Educator* newsletter. Visit www.esri.com/giseducator for information on submitting articles.

The Importance of GIS Professional Certification

The GIS Certification Institute (GISCI), the governing body created to oversee the certification process for GIS professionals, has now certified more than 235 individuals through a self-documented, point-based system that recognizes an individual's educational attainment, work experience, and contributions to the GIS profession.

Awareness of GISCI and certification is important to educators for several reasons. Students taking GIS courses should document course content, hours of contact, and credits received for future certification needs. Educators should provide documentation to attendees of their workshops, seminars, or other academic training so attendees can receive points for participating. When marketing training or educational events at conferences, institutes, or workshops, educators should also list the content and contact hours for individuals interested in earning points toward certification or recertification.

Educators should be aware of the code of ethics, available online at www.gisci.org/code_of_ethics.htm, that is part of the certification process. The code of ethics can be included in courses related to GIS or geospatial technologies and should bring up many important issues and topics that students may face once they are working professionals in GIS-related occupations. For additional information on certification, visit www.gisci.org.

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