Providing Geospatial Education and Facilitating Geospatial Implementation through the Virginia Geospatial Extension Program

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Abstract
The Virginia Geospatial Extension Program (a partnership between Virginia Space Grant Consortium and Virginia Cooperative Extension) has developed a program to facilitate workforce development opportunities in Virginia. The primary goal of this program is to increase the awareness and understanding of geospatial tools and technologies at all levels from k-12 education to local and state governments, and to facilitate the adoption of appropriate geospatial tools to end users. The Virginia Geospatial Extension Program identified three objectives to attain the primary goal: Geospatial technology workshops (Location, Location, Information!) designed to increase awareness and understanding of geospatial technologies using customized Virginia-based curriculum, Extension Agent GPS workshops designed to increase knowledge and use of GPS technologies by Extension Agents in Virginia, and the Virginia Geospatial Academy whose purpose is to provide a portal for users in the community to access geospatial instructors and training opportunities across the state. A variety of geospatial software and hardware is used throughout the program, including ESRI software.

Background
The Virginia Geospatial Extension Program (VaGEP, http://www.cnr.vt.edu/gep) began in 2003 as a partnership between the Virginia Space Grant Consortium and Virginia Cooperative Extension. VaGEP seeks to promote the integration of geospatial tools and techniques through a coordinated approach at the local, regional, and state levels. It aims to extend opportunities and empower organizations and individuals across the Commonwealth of Virginia through training, assessing application needs, and providing increased access to data resources.

VaGEP is part of a larger nation-wide network, the National Geospatial Technology Extension Network (NGTEN, http://geospatialextension.org/), which consists of 14 similar geospatial extension programs across the continental United States (Figure 1). Its mission is to facilitate the practical use of earth systems science and technology, and help meet the growing demand for a spatially literate workforce. NGTEN is made possible through seeds sown by NASA, USDA and NOAA, and the science and education networks provided by Land Grant (Cooperative Extension), Space Grant, Sea Grant and other local partners. Each program supports and promotes objectives specific to their region along with some common initiatives such as:

- Technology and application training
- Information sharing
- Course development and dissemination
- Educational outreach

Figure 1: Map illustrating states supporting geospatial extension programs as of spring 2005.

VaGEP's Primary Goal

The primary goal of each program is unique to its constituents. For Virginia's geospatial extension program (VaGEP), its goal is to meet crucial workforce needs by providing K-12 educational outreach, specialized workforce courses, and training through Virginia's Community College System (VCCS) and other Virginia Space Grant Consortium (VSGC) member universities, faculty development, and linkages to NASA and other geospatial resources for data and programs. A key component of this program is its participation with Virginia extension agents, through Agriculture and Natural Resource programs and 4-H Youth Educational initiatives, to support the dissemination of information, training, and application development at the grassroots level.

Objectives

The program seeks to act as a knowledge broker and disseminate geospatial knowledge crucial to the needs of the Commonwealth's geospatial workforce in a top-down manner while simultaneously integrating critical feedback from the bottom level of the hierarchy, the users of the technology (Figure 2). It accomplishes its primary goal through three different objectives:

Figure 2: Illustration of top-down knowledge transfer and corresponding user feedback.

1. *Geospatial Technology Workshops* designed to increase awareness and understanding of geospatial technologies using customized Virginia-based curriculum. These instructor-led workshops provide several layers of technology and knowledge transfer to users. First, users have access to an instructor who is knowledgeable both about geospatial technologies and geospatial problems inherent to people across the commonwealth (through the integrated feedback loop mentioned earlier). Beyond that, the instructor is available after the workshop is complete to help the users integrate the knowledge learned into their workplace. The primary goal of this additional support is to enhance the retention and effectiveness of materials and knowledge learned during the workshop, not provide consulting services. Finally, the workshops are flexible in their design, content, and duration. Not only does the VaGEP offer "ready-to-teach" workshops, but it can customize workshops to the applications and problems of a specific organization or need, providing another avenue for maximizing the geospatial literacy of Virginia's workforce.

2. *Extension Agent GPS Workshops* are designed to increase knowledge and use of GPS technologies by Extension Agents in Virginia. Virginia Cooperative Extension (VCE), in partnership with the Virginia Geospatial Extension Program, the Virginia Tech Department of Forestry, and the Virginia Tech College of Natural Resources has conducted a program to provide GPS receivers and GPS supporting software to every local extension office (107 offices throughout Virginia) throughout the Commonwealth of Virginia through the Extension Agent GPS Program. The Extension Agent GPS Program provided valuable tools and training to enhance the capabilities of Virginia's extension agents and specialists.

The Extension Agent GPS Program is enabling extension agents to obtain more accurate information to support the needs of their local constituents. The GPS receivers provide both direct and indirect benefits to Virginia's citizens through the agents and specialists. By providing more accurate area measurements of agricultural fields, for example, farmers and other producers are able to more accurately estimate fertilizer or herbicide application rates, or to more accurately support the delineation of riparian buffer zones as well as support other best management practices. It is anticipated that these measures will potentially result in reduced agricultural runoff, and improvements in water quality. Other potential applications that are currently supported by the Extension Agent GPS Program include:

- Crop insurance declarations
- Phase I of the Premise I.D. Program
- Estimating pesticide/fungicide program application needs
- Estimating fertilizer application needs
- Rotational grazing plans
- Estimating lengths of fence lines
- Evaluating soil compaction issues over time
- Estimating production yields
- Supporting urban tree inventories
- Identifying drainage issues in fields
- Estimating areas of proposed riparian zones
- Identifying point and non-point pollution sources
- Estimating area (acreage) for timber harvests
- Establishing and locating silviculture research plots
- Livestock tracking
- Tracking of other animal diseases, including avian influenza
- Pin-pointing soybean rust infestation areas
- Identifying and monitoring endangered species
- Developing urban tree inventories

The Extension Agent GPS Program is intended to support the day-to-day application demands of the agriculture and natural resource (ANR) extension agents, family and community sciences, food, nutrition and health, and 4-H program areas. It is anticipated that the program will also serve to encourage the adoption and application of additional geospatial tools (i.e. geographic information systems [GIS], remote sensing imagery) by the extension community and their constituents. In addition, the program can potentially serve to better facilitate the vertical integration of the extension agent's day-to-day activities with partnering state agencies and federal programs (e.g., NRCS, Homeland Security).

3. *The Virginia Geospatial Academy* (http://www.cnr.vt.edu/geoacademy) whose purpose is to provide a portal for users in the community to access geospatial instructors and training opportunities across the state. Through this educational portal, you can:

- Identify geospatial workshops being sponsored by the public and private sectors in your region
- Obtain detailed information about scheduled workshops and training opportunities, by directly contacting instructors
- Customize your own training requirements in any region of Virginia by contacting suitable instructors associated with the Virginia Geospatial Academy. Instructors will organize training opportunities in Virginia based on your needs.
- Link to additional miscellaneous geospatial educational resources

The Virginia Geospatial Academy is poised to become a major portal for accessing training information across the Commonwealth and potentially the nation (through NGTEN). The power of the portal comes from its ability to create new bi-direction links and pathways that both increase the knowledge and technology transfer to the users and provide an additional method for the users to provide feedback to the trainers about specific gaps in their knowledge base.

Future Program Directions

As Virginia's geospatial workforce becomes more sophisticated, so will the applications and training demands of VaGEP's workforce development program. The program (and VaGEP itself) will use the feedback from users and higher-level technology development to evolve and successfully meet the growing sophistication. Currently, the program is pursuing additional methods to meet the already fast growing geospatial workforce. These are: additional advanced geospatial workshops, a web-based geospatial extension tool, online self-guided training materials, and increased support for local governments and state agencies. Each method would be developed heaving integrating critical user feedback to maintain the high level of adoption and retention by the users.

Summary

VaGEP has developed a workforce development program whose primary goal is to increase the geospatial literacy of potential users across the Commonwealth. It achieves this goal through three primary objectives: Geospatial technology workshops, Extension Agent GPS workshops, and the Virginia Geospatial Academy. The underlying design of the program is the "train the trainer" model where users will leave the program with enough knowledge to integrate the geospatial technologies at their workplace and train their peers, thus increasing the overall level of geospatial literacy across the Commonwealth. It is anticipated that as additional application demands are placed on users, and therefore on the program for additional training, this demand will be met by providing advanced training opportunities, web-based tools which meet specific needs, applications, and user levels and self-guided online training materials addressing specific common geospatial problems.

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