

STRENGTHENING OUR NATION'S Workforce

with
Demand-Driven
Solutions



Office of Apprenticeship Training
Employer and Labor Services (OATELS)
Anthony Swoope, Administrator

Employment and Training Administration
United States Department of Labor



**Registered
Apprenticeship
Trends in
GEOSPATIAL
TECHNOLOGY**

Registered Apprenticeship in the Geospatial Technology Industry



Registered Apprenticeship training plays an important role in developing skilled workers. With the combination of on-the-job learning, related instruction, mentoring, and incremental wage increases, the apprenticeship model can be an effective system for addressing human resource issues and skill shortages that many industries/businesses face. Registered Apprenticeship can provide the expertise and knowledge individuals need to do their jobs effectively and advance in their careers.

Twenty-first century apprenticeship allows for a flexible competency-based training strategy that enables apprentices to move through a program at her/his own pace, benchmark the achievement of each set of core competencies and build a portfolio of skills and interim credentials that validate the acquired skill levels. Additionally, the related instruction is articulated with many two- and four-year colleges, allowing apprentices to work toward a degree. This is good news for the geospatial technology industry because it meets many of their human resources and skills training needs.

The geospatial technology sector is an emerging industry that is poised to grow exponentially over the next decade. To meet growth requirements—and requirements within the applications and geospatial users arenas in particular—employers need to examine alternatives to the traditional pipeline. These alternatives include a combination of on-the-job learning and training provided by technical

and community colleges. The fastest emerging occupations within the geospatial technology industry require technical skills; however the industry does not have enough training models or curricula to develop the necessary pipeline of skilled workers.

The University of Southern Mississippi's Workplace Learning and Performance Center is developing an innovative, competency-based, apprenticeship training model that addresses training for the skills geospatial technology workers need to do their jobs well. The university is working with NASA and private companies to pilot and implement the model. So far, companies are finding that the program is improving retention, enhancing skills training and developing a curriculum and program to standardize skill competencies nationwide.

The Registered Apprenticeship model has proven its ability to address these and other issues in other industries and should become part of the human resources and training strategy for geospatial technology. The model offers an efficient, flexible training system that is responsive to new technology to keep workers up-to-date on skills they need to do their jobs.

The U.S. Department of Labor (DOL), Employment and Training Administration (ETA), Office of Apprenticeship Training, Employer and Labor Services (OATELS) has made a strategic decision to introduce the model to geospatial technology. "Advancing the Apprenticeship System" is one of the department's key initiatives, with investments of

more than \$12 million to fund apprenticeship programs in new industries through the President's High Growth Jobs Training Initiative. They include:

- Health Care
- Advanced Manufacturing
- Information Technology
- Maritime Trades - Transportation
- Military - Indiana National Guard
- Geospatial Technology

The following case study looks at early results of investments and marketing efforts in geospatial technology. Even though the project is young, there are promising trends that point to the value of apprenticeship:

Benefits to Employers

- Greater competence of employees
- Reduced turnover rates
- Greater employee retention
- Lower investment in recruitment
- Higher productivity
- Improved quality of products and services
- More diverse workforce

Benefits to Apprentices

- Nationally recognized and portable certificates
- Improved skills and competencies
- Increased wages as a result of mastered competencies
- Ability to advance in career
- Higher self-esteem based on enhanced skills and certifications

Industry in Brief

GEOSPATIAL

Geospatial technology, an information technology field, acquires, manages, interprets, integrates, displays, analyzes or otherwise uses data focusing on geographic, temporal, and spatial aspects of the world's environment. Geospatial technologies include remote sensing, geographic information systems (GIS), and global positioning systems (GPS) technologies.

- The technologies help humans identify where they are spatially on the earth and understand their impact on the earth's natural and man-made resources.
- Geospatial applications can be categorized into 12 major areas: Carbon management, public health, energy forecasting, aviation safety, water management, homeland security, coastal management, disaster preparedness, agricultural competitiveness, invasive species, community growth, and air quality.
- NASA predicts that geospatial technologies will change the way Americans work and live as much as the computer has since the 1950s.
- Experts foresee mainstream integration of geospatial technology as a decision-making tool by government and industry.
- The industry is an emerging high-growth sector of the economy with enormous market potential. It is expected to reach more than \$21 billion in national revenue, and \$30 billion worldwide, over the next few years.

Sources:
Geospatial Workforce Development Center, Southern Miss
U.S. Geological Survey
U.S. Bureau of Labor Statistics

Rapidly Expanding Industry Urgently Seeks Skilled Technologists

Project Overview

The University of Southern Mississippi's Workplace Learning and Performance Center is pilot-testing the nation's first Geospatial Technology Apprenticeship Program (GTAP).

GTAP began after NASA's John C. Stennis Space Center promoted an initiative to help meet the need for a skilled workforce in the field of geospatial technology. In May 2000, The University of Southern Mississippi was asked to participate with other partners in the National Workforce Development Education and Training Initiative. The Geospatial Technology Competency Model (GTCM), developed by the university as part of the NASA initiative, is the only such model that provides the framework for geospatial workforce development. OATELS considered the model a perfect fit with the Registered Apprenticeship program, and in fall 2003 provided a grant to the university under the President's High Growth Job Training Initiative. GTAP leverages the NASA-sponsored research completed at Southern Miss to build capacity within the community colleges to offer geospatial technology certificates and technology programs using the Registered Apprenticeship infrastructure.

The pilot was designed to bring together employers, educational institutions, and economic development partners to provide a model for replication throughout the United States. Employers in the geospatial industry for the most part need workers at the specialist level, rather than those with advanced degrees. The strong demand for skilled workers who understand geospatial technology applications requires training at the post-secondary level. Completers of the GTAP program will receive the "geospatial specialist" credential.

The GTAP pilot also provides a structured training program that gives participants the opportunity to count apprenticeship program course credits toward a two- or four-year degree. Apprentices who are not interested in pursuing a degree may pursue the "geospatial specialist," a portable DOL Registered Apprenticeship



credential that demonstrates to employers the geospatial technology skills they have acquired. This flexibility allows for fewer career development dead-ends.

Under the grant, Southern Miss was asked to:

- Establish an apprenticeship program that is research-based, instructionally sound, marketable, sustainable, replicable and evaluated systematically
- Develop state-of-the-art training methodologies and materials to engage today's workforce
- Implement most appropriate on-the-job training and classroom delivery for the apprenticeship program
- Measure return on investment of the apprenticeship program

Role of Registered Apprenticeship

The University of Southern Mississippi's apprenticeship project represents a timely, demand-driven response to the workforce needs of an emerging and rapidly evolving industry. A major goal of the initiative is to produce a model for training geospatial apprentices that can be exported throughout the United States.

Southern Miss developed a standard job description for "geospatial specialist" that applies to similar positions in various industries around the country. These include forestry, environmental studies, military, insur-

ance, municipal planners, and agricultural monitoring of soil changes due to wind and erosion, to name a few.

Once the pilot project is completed, the next step for the GTAP staff is to complete the prototype training model. This will need to be done before the model is ready for replication. The timeline for this to occur is fall 2005, with the understanding that further development and refinement of the model will be ongoing.

Employers who become sponsors of apprentices prepare what is called the GTAP individual competency development plan. In preparing the plan, the employer follows several steps:

- The employer defines the organization's need.
- The apprentice and the employer use an assessment tool to determine the outputs needed by the host company.
- From the chosen outputs, competencies for the apprentice are determined.
- Gaps between required and actual performance of the competencies are determined.
- A set of qualification cards specifying expected outputs for the apprentice is determined.
- The individual development plan is created for the apprentice.

Workforce Challenges

As a new and emerging high-growth industry, geospatial technology faces several challenges. Scientists and administrators at Southern Miss identified the following major challenges:

Recruitment and Retention

- There is a serious shortfall of professionals and trained specialists. As geospatial technology's capabilities have expanded, so have workplace needs for specialists with complex, enterprise-level, application expertise. Employers do not know how to identify and recruit skilled workers.
- A strategy is required to fill the training challenges while providing skilled geospatial workers to meet the tens of thousands of open positions.
- The National Imagery and Mapping Agency, for example, projects demand for remote sensing specialists will exceed 800 in a three-year period. An estimated 7,000 employees will require retraining.

Education and Training

- The growth of this market demands support of the education, training and development of geospatial professionals and specialists. Existing educational programs fail to provide enough graduates to meet needs and there is little effort to change this situation.
- While GIS academic programs are more widely available and more mature as a curriculum than remote sensing, no recognized standard geospatial technology curricula exist at any academic institutional level.

Insider's Profile



Dr. Cyndi Gaudet

Director & Associate Professor
Workforce Training &
Development
The University of Southern
Mississippi

During development of The University of Southern Mississippi's Geospatial Technology Apprenticeship Program, principal investigator Dr. Cyndi Gaudet, prepared an assessment overview of the fast-growing industry.

In the assessment, Dr. Gaudet wrote, "The world-wide market for geospatial technologies has enormous market potential. Currently estimated at \$5 billion, the market is projected to have annual revenues of \$30 billion by 2005."

She added that as an emerging growth industry, there is a serious shortfall of professionals and trained specialists who can use geospatial technologies in their

jobs. "The growth of this market," she said, "demands support of the education, training and development of geospatial professionals and specialists."

Dr. Gaudet went on to say that "a strategy is required to meet the challenge of providing a well-trained workforce while at the same time perpetuating an expanding market of persons trained, familiar and ready to apply geospatial technologies when solving workplace and societal challenges."



In addition to the process of developing the plan, a mentor is assigned to the apprentice. The mentor supervises the apprentice as part of the on-the-job learning component of the apprenticeship.

The process of developing a plan sets up a system to provide feedback and accountability. It also establishes a way for the employer and mentor to support and reinforce an apprentice's new skills and behaviors.

Role of Educational and Training Organizations

Mississippi Gulf Coast Community College and Pearl River Community College provide related instruction to GTAP apprentices. The pilot training curriculum consists of 21 credit hours, five required courses, and two elective community college courses.

Apprentices gain the benefit of receiving technical training and hands-on experience at the same time. The training also encompasses organizational and interpersonal skills. In response to the curriculum's dynamic content, apprentices are allowed to waive up to nine hours based upon previous experience and knowledge. This flexibility allows the GTAP to respond to constantly changing industry standards.

Role of Workforce Development System

Southern Miss's focus on capacity-building is intended to ensure that models developed in the GTAP pilot will be widely disseminated, replicated, and sustained through the infrastructure of the One-Stop system.

It also appears that Southern Miss's partnerships with NASA, Lockheed Martin, and regional economic development and technology organizations will help ensure that the project will continue to be driven by the industry and guided by the industry's developing workforce needs.

Preliminary Observations

The apprenticeship program established by Southern Miss addresses the workforce needs of the geospatial industry in many ways.

Recruitment and retention:

The demand for skilled workers is mostly at the specialist level, indicating that most jobs in the industry do not require advanced engineering degrees, but training at the post-secondary level. GTAP provides a model for training geospatial apprentices, which potentially impacts both recruitment and retention. Employers prepare an individual competency development plan for the apprentice, based on industry needs and employee performance gaps.

Southern Miss is ideal for implementing the apprenticeship program because it already was working with NASA to develop core competencies for geospatial specialists. It developed a standard job description for "geospatial specialist" that could apply to similar positions in other industries.

Skills development:

The process of developing a competency plan establishes a system that provides skills advancement with feedback and accountability. Supervisor workshops, which are being provided, enhance the quality of apprenticeship training. The systematic process for performance improvement results in trained workers who hold a nationally recognized credential.

Technology for innovative mentoring:

Interviews with program staff indicated that the complexity of rapidly evolving geospatial technology, and the resulting fluid nature of the work, has made it difficult to identify qualified journeyworkers to serve as mentors to apprentices.

Having a large number of companies involved in geospatial technologies near the Stennis Space Center has made this training model unique in that there are many workers who are capable of serving as mentors. The project is challenged to find ways to mentor apprentices in remote and rural locations.

One way GTAP staff members and employers are responding to this challenge is by developing a virtual mentor. Virtual contact will be maintained through e-mail and weekly meetings with apprentices and their immediate supervisors.

Training curriculum:

Keeping the training curriculum current is an issue to ensure that the skills of geospatial specialists remain up-to-date. As geospatial technology becomes more widely adopted by employers, and is integrated into diverse academic and professional training disciplines, the training content of the Geospatial Specialist Certificate must continue to evolve.

Participating Employer Sponsors:

About 30 private-sector employers associated with the NASA John C. Stennis Space Center, representing more than 5,000 employees, are involved in some phase of the geospatial industry. The high-profile association of the apprenticeship with NASA has allowed program staff ready access to the employers.

Industry participation can be generalized into three groups: utility companies, county government, and NASA contractors. Companies currently participating in the apprenticeship are:

- Coast Electric
- 3001
- Southern Company
- Pearl River County
- ESRI
- Planning Systems, Inc.
- Naval Oceanographic Office

Apprenticeable Occupation:

- Geospatial specialist

Prepared by
**McNeil Research and
Evaluation Associates**

February 2005



McNeil Research Authors

Ed Miller
Nadia Libbus

McNeil Research Editorial Staff

Dwight Peebles
David Prickett
Peggy Richmond
Robert Stone-El

McNeil Research Design & Graphics

David Prickett

McNeil Research Contributors

Carlotta Joyner
Dan Kaczynski
Janice Johnston

Contributor

Cyndi Gaudet
(The University of Southern Mississippi)



U.S. Department of Labor
Employment and Training Administration
Office of Apprenticeship Training,
Employer and Labor Services
200 Constitution Avenue, NW
Washington, D.C. 20210

www.doleta.gov/atels_bat
1.877.872.5627

For More Information

Office of Apprenticeship Training,
Employer and Labor Services
Employment and Training Administration
U.S. Department of Labor

www.doleta.gov/atels_bat
202-693-3812

Geospatial Technology
www.geowdc.com