Geospatial Programs in Higher Education: Lessons Learned and Resources Leveraged by Current NSF-ATE Projects

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PI NSF-ATE Project Geospatial Advantage
DUE# 1304531
• The **education** of highly qualified science and engineering technicians for advanced-technology fields that drive the nation’s economy.
  
  • **Community colleges** have leadership roles on all projects.
  • Grades 7-12, 2yr- and 4-yr institutions can be supported. *(Pathways)*
  • **Partnerships** with Industry and Economic Development Entities
ATE Program Tracks

- **Projects** (up to $300,000 /yr, 3yrs.)
  - Program Development, Implementation and Improvement;
  - Professional Development for Educators;
  - Curriculum and Educational Materials Development;
  - Teacher Preparation;
  - Small Grants for Institutions New to the ATE Program ($200K, 3yrs);
  - Coordination Networks (ATE-CN) (up to $200,000/yr., 4 yr.)

- **Centers** National, Regional, Support ($1.6M-4M, 3-5 yrs.)

- **Targeted Research** on Technician Education (Planning, Exploratory, Full-Scale; $150,000-$800,000, 2-3 yrs.)
Program Overall: 20% (flat-funding)
Small, New to ATE: 60-70%
----consider the odds
Issues of a Strong Proposal

- Great problem facing STEM Education and Development
  - Updating or modernizing curriculum
  - Strengthening ties with unmet needs for technicians in your regional economy with local industry
  - Forming partnerships with other educational institutions in developing K-16 career pathways

- Building a strong team!
  - Principal Investigator (PI) – Faculty Lead (Reporting)
  - Co-Principal Investigator (Co-PI) – Faculty (Targeted Issues)
  - Administrative Lead – Key administrator directing the link back to college resources and departments
  - External Evaluator – Outside independent agency or group to verify the completion and work on the grant for the NSF in the form of a report documenting success with grant outcomes and objectives.
  - Internal Evaluator (optional) – Someone internal to organization to assist the team with gathering internal data for the external evaluator (i.e., surveys, data collection on student and classes, ect...).
  - Marketing (optional) – Someone to assist the team with developing and managing the project website and running any social media to connect the project to outside partners (dissemination).
# Grant Team

<table>
<thead>
<tr>
<th>Mike Rudibaugh, PI</th>
<th>Bruce Fink, Co-PI</th>
<th>Art Borum (GST Program Director)</th>
<th>Dr. Greg Labyak</th>
<th>Elaine Craft External Evaluator</th>
<th>Jeffery Ebel Internal Evaluator</th>
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</thead>
<tbody>
<tr>
<td>GST Adjunct Faculty – KC</td>
<td>Chair of Life Science Department (Faculty-KC)</td>
<td>Director of Industrial &amp; Continuing Education - KC</td>
<td>Vice-President of Instructional Services – KC</td>
<td>Co-PI for the SC ATE National Resource Center for Expanding Excellence in Technician Education</td>
<td>Dean of Institutional Effectiveness - KC</td>
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</table>

- **Curriculum development, professional development with teachers, and supervise interns with regional employers**

- **Coordinates GST STEM integration with college and high school faculty**

- **Coordinates grant outreach special events and GST Advisory Board for KC**

- **Administrative oversight on grant work, budgets, and college resources**

- **Gathers data and results to confirm grant objectives and goals are being met or not relating to the funded proposal**

- **Gathers data, survey, and institutional information needed by external evaluator**
National Science Foundation (NSF) – The Geospatial Technology Advantage: Preparing GST Technicians and GST-Enabled Graduates for Southern Illinois Business and Industry

**Goals**

- Establish Certificate/Associate Degree Program in GST
  - Leveraged GeoTech resources and products as a partner in our proposal
- Provide GST field internships with regional employers
  - Leverage regional advisory board
- Incorporate GST into STEM programs at KC and regional high schools
- Conduct outreach events
Grant Challenges and Opportunities

Challenges

- Institutional Awareness
  - Educational
  - Administrative
  - Student
- Technical
  - Access
- Cost
  - High cost and low enrollment programs

Opportunities

- Industry demand is growing
- More paid internship opportunities than students in programs
- Cross-disciplinary nature to be both a stand-alone and a supporting certificate program for numerous STEM fields
- Growth of geospatial programs at universities
  - Career pathway
ATE Grant Resources

Geospatial Advantage

Grant Resources

Grant Website Resources: http://www.kcgst.com/

- GeoTech Model Courses –
  - Certificate Program
  - Mini-Certificate
- Counselors support brochure
- STEM Teacher Professional Development Modules (Biology, Law Enforcement, Earth Science, Information Technology and Agriculture
  - ArcGIS Online
  - Student Versions
  - Teacher Versions (Answer Keys - Password Protected)
- Evaluation Surveys
  - Advisory Board
  - Teacher Professional Development
  - Student and Faculty Surveys
- YouTube Video Series on Employer Testimonials in Agriculture and Utilities (COMING SOON)
Northern Utah Geospatial Technology Education Program (NUGeoTec)

Geospatial Programs in Higher Education: Lessons Learned and Resources Leveraged by Current NSF-ATE Projects

Eric C. Ewert, PhD, Weber State University, GeoTECH Webinar, Oct. 2015

Co-PI: Michael Hernandez, PhD

The NUGTEP development project is funded through a NSF-ATE DUE-1304888 grant.
About WSU: 126-year-old, 24,000 student public university offering 250 Certificate and Degree Programs, and 11 Graduate Degrees as part of its Dual Mission (2 and 4-year).
Located primarily in Ogden, Utah, WSU serves northern Utah and parts of adjacent states.
NUGeoTec Objectives

- Develop a Geospatial Training Program
- Make it Two-tiered: Technician & Analyst
- Be Guided by the Geospatial Technology Competency Model (U.S. Dept. Labor)
- Use the Best Practices as Compiled by the National GeoTECH Center (Louisville, Kentucky)
- Assemble a Geospatial Advisory Board
- Administer a Workforce Needs Survey
- Build Appropriate Curriculum
- Offer Classes and Evaluate
Geospatial Technology Competency Model
(US. Department of Labor and GeoTECH, 2014)
GeTech Center Model Courses

Stand Alone Geospatial Awareness Course:

GST 100 – Exploring Our World Fundamentals of Geospatial Science – Content

Certificate Module Course

GST 191 – Introduction to Geospatial Technology – Content
GST 192 – Spatial Analysis – Content
GST 193 – Data Acquisition & Management – Content
GST 194 – Cartographic Design – Content
GST 195 – Introduction to Remote Sensing – Content
GST 196 – Introduction to Geospatial Programming – Content
GST 197 – Geospatial Web Applications and Development – Content
GST 198 – Capstone in Geospatial Technology – Content
GST 199 – Internship in Geospatial Technology – Content

Elective Model Courses

Assessments
Assignments
Course Outline, Sy...
Lecture_VoicOvers
Lectures
Projects
Readings & Cours...
Study Guide & Ge...
Syllabus
**Survey**

**NUGeoTec**

**Demographic Information**

Note:
GIS/Geospatial TECHNICIANS may also have the following job titles: Engineering Tech, CAD Tech, Survey Tech, GIS Specialist, Cartographer, GIS Coordinator, Planner I/Tech, Technical Support Specialist.

GIS/Geospatial ANALYSTS may also have the following job titles: Geospatial Analyst, GIS Data Specialist, GIS Specialist, GIS Mapping Assistant, GIS Application Specialist, Planner II, Planner III, Engineering Aide

5. Please enter the number of GIS/Geospatial Technicians and Analysts currently employed in your organization.

   Total number of GIS/Geospatial TECHNICIANS:

   Total number of GIS/Geospatial ANALYSTS:

6. Select all the minimum education levels for your current GIS/Geospatial TECHNICIANS and ANALYSTS:

<table>
<thead>
<tr>
<th>High School with GIS experience</th>
<th>Vocational/Technical School</th>
<th>2-year Community College: GIS-focused degree</th>
<th>2-year Community College: non-GIS degree</th>
<th>4-year College/University Degree: GIS-focused major</th>
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<tbody>
<tr>
<td>GIS Technician</td>
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<td>GIS Analyst</td>
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7. Select the minimum education level required by your organization if hiring an entry-level GIS TECHNICIAN and GIS ANALYST

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Survey Summary

Northern Utah Geospatial Technology Workforce Needs Assessment—Survey Highlights:

Nineteen (19) Organizations participated in the preliminary survey were from State, Federal, and Private Sectors working in northern Utah.

ENTRY-LEVEL GIS/GEOSPATIAL TECHNICIANS
Participants have hired GIS/Geospatial technicians with these education levels:
- High School with some GIS
- Vocational/Technical School
- 2-year and 4-year colleges with non-GIS majors
- 2-year and 4-year colleges with GIS majors
- None have military as only education

Participants in the future, would hire ONLY entry-level GIS/Geospatial technicians with 2-year community college or 4-year college/university GIS-focused major.

Top three technical skills needed:
- Maintaining good credible data and having established effective review processes built into their work or recognize when one needs to be established
- Proficiency in creating good maps that display information
- Basic understanding of how GIS can be integrated with other programs used

Current skills/proficiencies that will INCREASE five to ten years in the future:
- COGO Legal descriptions
- Perform data conversions
- Georeference data
- Create scripts
- Create charts
- Create tables
- Archive/retrieve data

New skills that will be NEEDED when entering the job market five to ten years from now:
- A physical relationship and understanding of what they are truly doing.
- Mobile GIS
- Some application development/programming
- Internet mapping skills
- Some database administration and programming

Basic programming/language/software skills you expect entry-level GIS Technicians to have at time of hire: Java, Basic model builder, attribute field calculations

ENTRY-LEVEL GIS/GEOSPATIAL ANALYSTS
Participants have hired GIS/Geospatial Analysts with these education levels:
- 4-year College/University with non-GIS majors and GIS majors

Participants in the future, would hire ONLY GIS/Geospatial Analysts with 4-year College/university with non-GIS majors and GIS majors

Top Three Technical Characteristics/Competencies:
- ArcGIS/ESRI experience
- Data management skills
- Desire to seek out data

Skills/proficiencies that will INCREASE five to ten years in the future:
- Research available data
- Purchase new data
- Develop databases
- Define feature behaviors
- Determine data conversions
- QA/QC data
- Perform image analysis
- Develop a data maintenance
- Develop GIS procedures
- Create models
- Pre-process data
- Conduct Geoprocessing
- Generate statistics
- Interpret results
- Define user software needs
- Determine applications
- Enhance existing customers applications
- Establish data custodianship
- Organize file structure
- Train GIS end-user(s)
- Coordinate GIS projects
- Represent GIS at meetings
- Supervise interns
- Develop project timelines/schedules
- Acquire professional credentials
- Review job related resources

GIS/Geospatial Analysts will need some database administration and program skills when entering the job market five to ten years from now.
Welcome to Geog/Geo 2810/4810: Exploring Our World Through Geospatial Science

Full Class Syllabus
Videos
Geospatial Revolution Questions
Readings
Lectures
Assignments/Exercises
Master Study Guide and Questions

COURSE OBJECTIVES
This exploratory course introduces you to the fundamental concepts of geospatial science and how geospatial technologies are used to solve real-world problems across both space and time. You will learn the basic techniques of mapping, GPS (global satellite navigation system or GNSS), GIS (Geographic Information Systems), spatial analysis, cartography, and remote sensing. Geospatial science incorporates powerful tools and
Website: NUGeoTec

What is NUGeoTec?

Weber State University, with support from the National Science Foundation, is developing the Northern Utah Geospatial Technology Education Program (NUGeoTec).

Geospatial Technology includes:
- Geographic Information Systems (GIS)
- Remote Sensing (airborne and satellite imagery)
- Computer Cartography (digital mapmaking)
- Global Positioning and Navigation Systems (e.g., GPS).

There is great demand for these skills among employers nationwide. WSU has a unique dual role mission as the regional community college for much of northern Utah and also as a large, public, comprehensive university. NUGeoTec will prepare post-secondary students for successful employment in the rapidly growing geospatial workforce, and will also create advanced educational opportunities for people with existing training and experience in the geospatial technologies fields. These goals will be achieved by developing a new Certificate and a related Associate Degree in Geospatial Technology (Community College Tier) and updating the existing Certificate and Minor in Geospatial Analysis at WSU (University Tier). A local advisory board (comprised of university, industry, government, and community leaders) is assisting in the development of these programs, guided by the U.S. Department of Labor Geospatial Technology Competency Model and the best practices recommendations compiled by the national GeoTech Center. NUGeoTec is expected to serve a broad and growing group of students, educators, and employers in northern Utah.

Go to our website to find out more.
www.weber.edu/nugeotec
Expanding Geospatial Technician Education Through Virginia’s Community Colleges (GeoTEd)

Geospatial Programs in Higher Education: Lessons Learned and Resources Leveraged by Current NSF-ATE Projects

Chris Carter (PI)
Deputy Director, Virginia Space Grant Consortium

Chérie Aukland (Co-PI)
Program Head for GIS, Thomas Nelson Community College
Who Else is GeoTED?

- **David Webb (Co-PI; GeoTED Consultant)**
  - Retired Program Head (Mechanical Engineering Technology and GIS), Virginia Western Community College

- **Dr. John McGee (Co-PI)**
  - Virginia Geospatial Extension Agent, Virginia Tech

- **Sandy Stephenson (Co-PI)**
  - Professor of Information Systems Technology, Southwest Virginia Community College

- **6-state Region (NC, TN, KY, WV, MD)**
- Many industry, government, and education partners
Geospatial Technology Initiatives

- 3 NSF-ATE awards
- Increase Number of Trained GIS Technicians
  1. Planning Grant (2007) (1.5 yrs)
     • Statewide needs survey; DACUM for GIS Technician
  2. Statewide Project Grant (2009-12)
     • Pathways; curriculum; faculty and teacher professional development; webportal
  3. GeoTEd (2012-16) – Regional Project
Major Components

- Courses and Pathways Aligned with National Geospatial Technology Competency Model
- Distance Learning Courses in GIS
- Professional Development for Community College Faculty and High School Teachers
- Faculty Mentoring and Webinars
- Mobile App for Campus Navigation (CampusNav)
- Service Learning Courses and Virtual Internships
Resources for Instruction

VCCS Geospatial Institute - Summer 2015

June 22 - June 24, 2015
Cheatham Hall
Dept. of Forest Resources and Environmental Conservation, Virginia Tech
Blacksburg, Virginia

Hosted by the Virginia Geospatial Extension Program at Virginia Tech, Thomas Nelson Community College, Southwest Virginia Community Consortium.

Instructional Resources from the 2015 GeoTEd Institute:
• Handouts (pdf's) (link is external)

VCCS Geospatial Institute - Summer 2014

May 31 - June 6, 2014
Micro Lab and CERS Lab, 2nd Floor Cheatham Hall
Dept. of Forest Resources and Environmental Conservation, Virginia Tech
Blacksburg, Virginia

Hosted by the Virginia Geospatial Extension Program at Virginia Tech, Virginia Western Community College, Thomas Nelson Community College, Southwest Virginia Community College, and the Virginia Space Grant Consortium.

Instructional Resources from the 2014 GeoTEd Institute:
• Handouts (pdf's)
• Data for exercises
• PowerPoint Presentations

Map & Compass Resources
• US Orienteering
• NOAA Magnetic Declination

Data Sources
• National Map Viewer: View and download Geographic data (elevation, topo, many others) for any area of the US
• National Map Program: Information and metadata for National Map products
• VDEP: Virginia Economic Development Program GIS Data Resources pace

Collector & Geospatial Apps
• Collector Resources: tutorials and videos
• GPS Kit
• Trimble Outdoor
Resources for Instruction

Virginia View - Educational Resources

Here is a list of remote sensing resources to support Virginia’s educational community. Some of these resources will support the awareness of remote sensing. Other resources can provide educators with images, posters, and data.

Remote Sensing Educational Awareness Resources

- The Virginia Geocoin Adventure
- ArcGIS Online Tutorials
- Spectrometer Resource Kits
- Tutorials
- Other Educational Resources (videos, data, etc...)
- Digital Atlas of Virginia: The Digital Atlas of Virginia has been developed to support the efforts of formal and informal educators across the commonwealth. Access the Digital Atlas of Virginia [here](http://virginiaview.cnre.vt.edu/education.html)

[http://virginiaview.cnre.vt.edu/education.html](http://virginiaview.cnre.vt.edu/education.html)
Resources for Instruction


These lesson plans and online videos can be acquired as a Kindle eBook. The Workbook is ~348 pages in length, and costs $2.99. You can access the eBook from here: You can also browse and view videos associated with each chapter in the Remote Sensing Workbook below, or via the *View / Virginia Geospatial Extension YouTube Channel*.

Remote Sensing in an ArcMap Environment

*Remote Sensing Analysis in an ArcMap Environment* Kindle Edition
by Tammy Parece (Author), James B. Campbell (Author), John McGee (Author)

New Chapter! Streaming and Displaying Landsat Imagery (accompanies Chapter 10 of the above text)

Access Video Tutorials that Accompany Each Chapter

* Video - Opening an Existing Map Document in ArcMap
* Video - Adding Data to a Map Document
* Video - Connecting to a Drive in ArcMap
* Video - Saving and Exporting Map Documents in ArcGIS
* Video - Repairing a Data Address in ArcG

Virginia Geospatial Extension
Resources for your campus

Mobile App for Campus Navigation
The current GPS location of the device can be used or the starting location and destination can both be set from a list displayed. The user can also scan QR Codes on maps or buildings.
Geospatial Service Learning Courses

- Cross discipline: GIS and Forestry
- Faculty from 3 community colleges:
  - Virginia Western, David Webb (GIS)
  - Thomas Nelson, Chérie Aukland (GIS)
  - Dabney S. Lancaster, Brian Kelling (Forestry)
- Students from all 3 colleges
- Funded by GeoTEd grant
  - student tuition
  - travel expenses
Geospatial Service Learning Course

Announcements

Week 5

Finals Exam: Thu 4/17, 9-11 AM

Couple more things to review before the final:

- Review the union, intersection and difference operations for Week 4. You just used these concepts in the Lab 4 work.
- Review the database concepts for Week 3. You will test on them in the exam.
- Review the spatial operations for Week 5. You will test on them in the exam.

Finals are this week! What do you need to do to get ready:

- Read the final exam review packet
- Take the final exam

I have added a link just below the “Weekly Activities” that has directions on what to do to prepare for our trip this Thursday. On a numerical:

1. Most important: Complete the photo release form and the Assumption of Risk form and email them. Send email to David Bailey by tomorrow morning. If you can, if you do not have

NASA Langley Tree Survey 7/18/14

Legend:
- Crown Can
- Crown Thin
- Further Evaluation
- Hazard Evaluation
- Too High
- Structural Prune
- Raise off of Street or Structure
- Structural Replace
- Building
- Sidewalk
- Road

NASA Langley

Source: GIS 195 NASA Service Learning Project students from Thomas Nelson Comm. College (GIS), Virginia Western Comm. College (GIS), and Dabney S. Lancaster Comm. College (Forestry).
Geospatial Service Learning Course - NASA Wallops Island, 2016

SERVICE LEARNING COURSE OPPORTUNITY AT NASA WALLOPS ISLAND

HELP NASA INVESTIGATE SEA LEVEL RISE AND INVASIVE SPECIES

Thomas Nelson Community College is offering a three-credit Sea Level Rise Service Learning course. All expenses paid for course tuition and four days of fieldwork including travel, lodging, and food. Open to Virginia community college. Competitive application process: students from all disciplines are encouraged to apply. Sponsored by Virginia Space Grant Consortium (VSGC) and offered through the STEM Takes Flight Program in partnership with NASA Wallops Flight Facility and Thomas Nelson Community College.

GIS 295 - Topics in Service Learning in GIS.

This online course contains four days of outdoor fieldwork at NASA Wallops on Virginia’s Eastern Shore. Field work will likely be completed over a weekend (Thursday-Sunday) in April 2016.

Faculty-led student teams will engage with NASA scientists to tackle the issue of sea level rise, invasive species, and their impact on coastal communities and ecosystems including NASA Wallops. Using GIS, global positioning system (GPS), unmanned aircraft systems, and other technologies students will model various sea level rise scenarios and gauge their impacts to NASA infrastructure and habitats. Students will compare data with existing datasets and develop a report to be presented to NASA staff.

Application: https://www.surveymonkey.com/r/9HXDL88
Application Due Date: December 1, 2015
Notification of acceptance by December 5

http://www.vsgc.edu/STEMtakesFlight/sealevelrise.html

During the course you will
- Learn about service learning.
- How to use and operate an Unmanned Aircraft Systems (UAS) to collect data.
- Develop or acquire geographic information system (GIS) skills in analyzing data collected with a UAS.
- Prior GIS knowledge is not a pre-requisite for this cross-discipline course.
- Learn about remote sensing and how to use regular imagery, near infrared imagery, and LiDAR to answer questions using a GIS.
- Gain real-world experience collecting and analyzing data.
- Tour the facilities and observe the research being completed at the site.