What Do Students Need to Know For A Successful Career

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Empowering Colleges: Growing the Workforce

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Can we identify the geospatial skills and competencies needed by students to successfully enter the geospatial technology workforce?

Can we create courses and programs to focus on those identified needs?

First let's look at the entire geospatial technology user community and the domain of their knowledge!
What are the Domain Knowledge Needs?

Skills and Competencies:
What each level needs to know or do

Ratio
1
10
100
1,000
10,000
1,000,000

Viewers /Virtual Users
Casual or Tool User
Technician
GIScientist
GIO Specialist
Analyst
Manager
All Users

What are the resources available to fill in the right triangle?
Many past and on-going efforts to define skills and competencies of a “Geospatial Technology Domain”
Core Geospatial Abilities and Knowledge

Critical Work Functions

- Earth Geometry and Geodesy
  - Discuss the roles of several geometric approximations of the earth's shape, such as geoids, ellipsoids, and spheres
  - Describe characteristics and appropriate uses of common geospatial coordinate systems, such as geographic (latitude and longitude), UTM, and State Plane Coordinates
  - Explain the relationship of horizontal datums, such as North America Datum of 1983 (NAD 83) or the World Geodetic System of 1984 (WGS 84), to coordinate system grids and geometric approximations of the earth's shape
  - Describe characteristics and appropriate uses of common map projections, such as Transverse Mercator, Lambert Conformal Conic, Albers Conic Equal Area, Azimuthal Equidistant, and Polar Stereographic

- Data Quality
  - Discuss the elements of geospatial data quality, including geometric accuracy, thematic accuracy, resolution, precision, and fitness for use
  - In the context of a given geospatial project, explain the difference between quality control and quality assurance
  - Identify data quality and integration problems likely to be associated with geospatial and attribute data acquired with legacy systems and processes
  - Calculate and interpret statistical measures of the accuracy of a digital data set, such as Root Mean Square Error (RMSE)

- Positioning Systems
  - Describe the basic components and operations of the Global Navigation Satellite System (GNSS), including the Global Positioning System and similar systems
  - Explain the role of GNSS in location-based services
  - Collect and integrate GNSS/GPS positions and associated attribute data with other geospatial data sets
  - Describe characteristics and appropriate uses of inertial measurement systems

U.S. Dept of Labor
Geospatial Technology Competency Model

• Industry defined competencies
• Building Block Tiers:
  - Personal
  - Academic
  - Workplace
  - Industry
  - Industry Wide
• Each block “links to full” description
• Updated in 2014 and in process of updating in 2018
• Out for Public comment soon
• http://www.careeronestop.org
Domain, Core and Occupation Competencies

Increasing Geospatial Knowledge

Ratio
1
10
100
1,000
10,000
100,000
1,000,000

Geospatial Competencies

Core

Occupation Specific Competencies

Occupation Title or Level of Use

Manager
Specialist
Analyst
Technician
Casual or Tool User
Viewers /Virtual Users

GIScientist

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Entry Level Competencies

- Increasing Geospatial Knowledge
  - Ratio
  - 1
  - 10
  - 100
  - 1,000
  - 10,000
  - 1,000,000

- Occupation Title or Level of Use
  - Viewers/Virtual Users
  - Casual or Tool User
  - Technician
  - Specialist
  - Analyst
  - Manager
  - GIScientist
  - CIO

- Geospatial Competencies
- Occupation Specific Competencies

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Finding the Entry Level Competencies:
GeoTech Center “DACUM” Job Analysis

- Panels of expert workers are used to precisely describe & define job tasks + knowledge, skills, behaviors, tools, equipment
- 8 to 12 GIS Technicians, over two - 8 hour days

DACUM: Developing A Curriculum used regionally for competency based education & training by industry, government & education
Meta-DACUM Methodology

By consolidating validated results from multiple DACUM analyses for a single occupation taken at various USA locations, we can identify a comprehensive list of competencies.
# Program Content Tool – 311 Competencies

<table>
<thead>
<tr>
<th>Competency</th>
<th>Rating</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>Not important for this course - do not include in this course</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Slightly important for this course, include only if time permits:</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Important - include at an awareness level</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Very Important; should be included at some level above awareness</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Critically important, must be included in depth</td>
<td></td>
</tr>
</tbody>
</table>

- **14** Units and geoids
- **C3** Validate spatial and tabular data (e.g. topology, build, verification)
- **C** Define data’s spatial reference
- **C** Transform spatial data (e.g. reprojections)
- **C** Apply appropriate projections
- **KN** Describe different methods of indicating locations (e.g., decimal degrees, UTM)
- **G** Calculate scale transformations.
- **G** Resolve spatial conflicts.
- **G** Determine appropriate scale and projection
- **T2** Number Operations and Computation - addition, subtraction, multiplication, and division
- **T2** Number Systems and Relationships - whole numbers, decimals, fractions, and percentages
- **T2** to obtain approximate solutions when necessary
- **T2** Geometry - size, shape, and position of features using geometric principles to solve problems
- **T2** Mathematical Reasoning and Problem Solving - inductive and deductive reasoning, conjectures, generalizations, strategies, and interpretation of results

Go to the GTMC Competency Model
GeoTech Center Model Course Content

• Geo 100 – Awareness Stand alone Model Course
• “Model Courses & Certificate”
  • GST 101 – Introduction to Geospatial Technology
  • GST 102 – Spatial Analysis
  • GST 103 – Data Acquisition and Management
  • GST 104 – Cartographic Design and Visualization
  • GST 105 – Introduction to Remote Sensing
  • GST 106 – Introduction to Geospatial Programming
  • GST 107 – Geospatial Web Application and Development
  • GST 108 – Capstone
  • GST 109 – Internship
  • GST 201 - Crime Analysis
Additional Curriculum Resources

• Concept Module Videos
  • Map projections, Datums, Statistics, Data Management

• Demonstration Videos
  • How to carry our specific tasks

• MOOC – Introductory Course

• Meta-DACUM

• Program Content Tool and Program Assessment Tool

• Starting a Geospatial Program
Welcome to the National Geospatial Technology Center of Excellence

The National Geospatial Technology Center of Excellence ("GeoTech Center") is a collaborative effort between 2-year colleges, universities, and industry to assist in the expansion of a well-qualified geospatial technology workforce. Center partners work together to provide professional development opportunities, curriculum resources (for both educators and students), document career pathways, and research core competencies for the new and incumbent geospatial technology workforce. The Center has served as the national, unifying voice and support system for 2-year colleges, and is recognized by the U.S. Department of Labor as a leader in supporting geospatial technology education.

GeoEd ’18

Monthly Calendar

Regional Workshops and Registration Open

2018 National Drone Conference at Palomar College

Geospatial Education Program Finder

Personal Assessment

Model/Course

OTM

LGOS
Thank You!

Questions?

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