AGILE Short Paper
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Geospatial Technologies For All – What Does Everyone Need to Know?

Introduction

Is it possible to define the geospatial skill and competency needs for the majority of academic disciplines or workforce domains? Are there specific core skill and competency needs that are essential for effective and accurate use of geospatial technology? Are there levels of knowledge needed for different types of geospatial use? Over the last several decades, multiple organizations have tried to determine the knowledge, skills and competencies that should be included in academic programs to produce a well-qualified geospatial workforce. This presentation will review past efforts to create a comprehensive list of needed geospatial knowledge and suggest how a subset of the comprehensive list might be used to provide a core or at least minimum set of skills and competencies that should be part of any academic curriculum wishing to effectively use geospatial technology.

Historical Efforts

Many organizations, academic disciplines, and industries have tried to identify the knowledge that should be provided and utilized by its own cohort. One of the first widely used was the Core Curriculum created by the National Center for Geographic Information and Analysis (NCGIA). Karen Kemp describes how the Core Curriculum began as a collaborative effort by three universities, funded by the National Science Foundation, included input from faculty at 35 academic intuitions (Kemp, 2012). The outcomes were edited and formatted and sent out to 100 institutions for review and revision resulting in 75 topics finalized into the 1990 version of the Core Curriculum. While the materials were used by 100s of academic programs, it did not define what was needed for a full program or workforce domain.

The University Consortium for Geographic Science (UCGIS) education committee undertook a project to define the domain of Geographic Science and Technology (GIS&T). The work was begun by Duane Marble in the early 1990’s and continued under the direction of David DiBiase culminating in the publication in 2006 of the Body of Knowledge (BoK) by the Association of American Geographers (AAG). David DiBiase explained how the UCGIS BoK organized the needed GIS&T knowledge into 10 Knowledge Areas that were further subset into Units, Topics and educational objectives defining the domain of GIS&T (DiBiase, et al, 2006). While it does identify core Units within the KA’s, it still has wide latitude for what a core of knowledge would include for specific applications or workforce domains.

Government agencies in the U.S.A, Australia, and Japan have also sought to define the skills and competencies needed by working geospatial professional. In 2001, the U.S.A. National Aeronautics and Space Administration (NASA) funded a long-term project at the University of Southern Mississippi to identify the competency needs of the geospatial workforce. Cyndi Gaudet explained the working of the study to identify 12 roles and associated competencies needed by the workforce (Gaudet, et al, 2003). The project grouped the skills and competencies into four clusters based on whether the it fit into a Technical, Analytical, Business or Interpersonal framework.
Australia also began work in the late 1990’s on identifying needed skills and competencies that could serve as guidelines throughout the country rather than having different standards in different regions.

(Australia, 2001). The work done in Australia influenced early development of the UCGIS BoK. Japan also began working on identifying skills and competency needs and used as a basis the UCGIS BoK. Morishige Ota described why the efforts in Japan to standardize geospatial practices and codify the skills and competencies needed by workers were given impetus after a large earthquake occurred in Japan. The earthquake caused extensive damage and rescue and recovery efforts were hampered by not having a centralized system with common geospatial standards across the country (Ota, 2014).

The U.S.A. Department of Labor Employment and Training Administration (DoLETA) began work in 2003 to meet the needs of High Demand workforce domains by creating Competency Models identifying the skills and competencies needed by different professionals. For GIS&T, Cyndi Gaudet as part of the University of Southern Mississippi workforce development project funded by NASA, collaborated with DoLETA to create a Geospatial Technology Competency Model. David DiBiase explains how the initial GTCM was finalized with support from the National Geospatial Center of Excellence (GeoTech Center) funded by the U.S.A National Science Foundation in collaboration with industry experts and DoLETA in 2010 (DiBiase, et al, 2010). It was updated by the GeoTech Center in 2014 and is undergoing review again in 2018. The GeoTech Center also undertook studies to identify the skills and competencies needed by entry-level geospatial workers. The outcome of the efforts is a document that integrates outcomes from several Developing a Curriculum (DACUM) events and is referred to as a Meta-DACUM. The process of combining and validated the outcome was developed by John Johnson (Johnson, 2010). The Meta-DACUM has been used to develop a Program Content Tool list of competencies that should be covered in curriculum for entry-level technicians.

Ola Alqvist described how the First Edition of the UCGIS BoK is currently undergoing an extensive review and a new structure as a digital BoK (Alqvist, 2016). Authors are being solicited to add content to the newly revised KA’s and to expand the Units and Topics from the original document and content to new KAs.

Educators and industry in Europe have also been very active in creating its own BoK with resources and structure available online. The project, Geographic Information – Need to Know (GI-N2K) BoK was initially based on the UCGIS BoK, but was modified by outcomes of surveys that identified what the EU industry deemed as essential skills and competencies for its workforce (Vandenbroucke, 2016). The project has produced interactive online resources in different formats. Workgroups have expanded on the original 10 KA’s with up to five levels of sub-concepts to more fully define the needed competencies. Links between topics were also investigated with more complete descriptions and learning objectives.

Certification

Karen Kemp has outlined some efforts undertaken to determine if an individual has the needed competencies to be considered a geospatial professional and have their knowledge recognized through a process awarding them Certification for their geospatial expertise (Kemp, 2016). An early 1990’s effort to provide Certification was developed by the American Society for Photogrammetry & Remote Sensing (ASPRS) for photogrammetry and remote sensing. It has expanded to include multiple options for mapping and geospatial technology workers. It includes an exam and has resources to help individuals review their knowledge prior to taking one of their geospatial related exams (ASPRS, 2018). In 1997 a process began as part of the Urban and Regional Information System Association (URISA) organization to investigate the possibility of creating a Certification program. The outcome
was the formation of the GI Certification Institute (GISCI). GISCI over the next several years developed a portfolio based method for individuals to qualify to become Certified GIS Professionals (GISP). This included self-documentation of the applicant’s education, work experience and contributions to the field. The GISCI has now instituted an exam as part of the process to become Certified. The exam is based on competencies derived from six of the UCGIS BoK 2006 KAs. A more recent effort has been through the US Geospatial Intelligence Foundation (USGIF). The USGIF has created its own Essential Body of Knowledge (eBoK) based on job-analysis to identify critical skills for workers in geospatial intelligence organizations (USGIF, 2018). The eBoK is divided into four Competency KA and three Cross-Functional Knowledge and Skills categories. Its Certification also includes an exam and is based on its eBOK list of skills and competencies.

Geospatial Technology For All

Today, GIS&T and more broadly defined geospatial technology applications, have expanded into almost all fields and disciplines. It truly is “Geospatial Technology For All.” The problem now is identifying what common skills and competencies are essential for entry-level users from different disciplines so that they are able to apply and use geospatial technology effectively and provide results from their applications that are accurate, valid and in a format that is as useful as possible.

This presentation will look at those previous projects that have identified skills and competencies and review what the industry has to say it feels is most important. It will compare and contrast the different outcomes and discuss those that appear to be common to most efforts to define the needed skills and competencies. It will also discuss if a core basic skill set can be identified that can serve as the minimum core for all levels of users as well as those that are most needed by industry in geospatial professionals. While Browser Based mapping (Google Earth, ArcGIS Online and others), make it possible for almost anyone to investigate and create maps, it is still important that users and viewers understand some of the basic rules for data presentation (cartography and map projections) and collection, along with a basic understanding of limitations due to differing types of data and scale.

References


9. Vandenbroucke, Danny, 2016. GI-N2K Geographic Information – Need to Know, A network for co-designing geospatial concepts, at AGILE Workshop,

