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EXECUTIVE SUMMARY

This report details the accomplishments of the NSF DUE ATE (0801893) funded National Geospatial Technology Center of Excellence (GeoTech) during its third year of operation (Sept. 1, 2010—August 31, 2011). The major successes of the third year of operation are based on the carefully crafted recommendations of the National Visiting Committee, under the leadership of Deidre Sullivan, PI and Director of the MATE Center.

Geospatial Technology Competency Model (GTCM)

The Center was able to assist the Department of Labor (DOL) in helping to complete their Geospatial Technology Competency Model (GTCM). The GTCM was officially published on the Dept’s Competency Model Clearinghouse on June 17, 2010. Along with the GTCM, the Center has also completed its research on the Meta-DACUM Analysis of Common Core Competencies for GIS Technologist. This research supports the creation of new curriculum assessment instruments to align GIS curriculum with the GTCM. Using these new tools, along with the DACUM research, the Center is now able to consult GIS educators on better aligning their curriculum with a new national standard. Already, we have seen an impact on the educational landscape due to this work. The real impact of the GTCM begins in earnest in 2011, with the release of the online GTCM assessment tool, so colleges can begin implementing the GTCM and DACUM findings in their classroom. Plans are clearly underway to do so as witnessed by the following two communications made to the PI in December 2010:

That is a great opportunity. I’d love to develop a Colorado case study scenario with you. Time is appropriate for us, since I’m headlong into the opening movements of redeveloping the now 10 year old GIS curriculums for our college ( and the Colorado Community College System on which it is based ). I am putting energy into building an informal support network among my Colorado community college GIS teaching colleagues to help meet the rising wave of demand for quality GIS technician training. Because we sit on the frontline of the so called GIS Alley, there is a natural synergy here for which your leadership can open a longer, wider horizon for college recognition of the business opportunity and for employer recognition of the college’s qualified role in making geospatial manpower happen

--email from David Sikes, Front Range Community College, CO

Dr. Mary Beth Booth with the ACC Geography and GIS Departments suggested I contact you. I was hired last summer to chair the newly created GIS Department. I’m a little over six months in and am ready to take a more comprehensive view of our curriculum. I’m interested in comparing our courses and course outcomes with accepted institutional standards. If I utilize the GTCM Assessment Worksheets will I be in compliance with the TSSB and other institutional standards? Do you have any additional suggestions as I work through this process?

--email from Sean Moran GIS Department, Austin Community College
Technology Leadership

The Center has been successful in spreading the adoption of remote desktop access (RDA) and virtualization technology to allow learners and teachers in remote schools and colleges to access server-based GIS application software. For example, Del Mar College recently installed and configured its own RDA server to serve both its own campus students, online students, as well as secondary students in both Corpus Christi and Phoenix AZ. This new method of serving geospatial technology into schools and colleges where it was formerly unavailable allows learners in underserved areas to access the latest in GIS. It greatly simplifies the administration, and therefore adoption rate, of GIS technology for colleges and schools.

The Center has also led in the development of new web-based mapping technologies, such as Adobe FLEX and Microsoft Silverlight APIs to enable educators to publish their GIS maps on the Internet in a user-friendly manner. We provided several training webinars and presentations on this leading edge GIS technology for Internet and mobile-computing.

We continue to expand our promotion of alternative GIS software, such as Open Source, to better serve colleges and businesses unable to afford expensive proprietary solutions. We are partnering with the OpenGeo Foundation to provide access to free and open source GIS software (FOSS4G) and curriculum and training in order to introduce the two year college geospatial community to the world of FOSS4G. We are planning to sponsor a workshop at the forthcoming FOSS4G Conference in Denver in September 2011.

Broader Impact

In January 2010, the Center joined the NSF ATE Synergy Project, led by BATEC, and 14 other ATE Centers to develop our capacity to assist our GIS educator community to use best practices to scale-up their innovative ideas and projects. Our Center selected the RDA project, mentioned early, to develop our own Logic Model for scaling. We also continued our sponsorship of the ATE High Impact Technology Interchange Conference (HiTech) in Orlando in July 2010 and will do so again in San Francisco in July 2011, with workshops, presentations and poster sessions. We also currently serve on the executive organizing committee for HiTech. We extended the reach of the Center’s impact overseas in September 2010 when the Director and Associate Director attended both the FOSS4G International Conference in Barcelona and the European Union GIS Educators Symposium (EUGISES) in Serres, Greece. Two results from these visits include a possible EU Research Experiences for Undergraduates project (pending January 2011), where ten US two year college students and two GIS educators will spend two weeks in the Netherlands working on environmental technology projects as well as the Director being elected to the UK Open Source Foundation board of directors. The Center was able to secure an additional $150,000 HP Global Technology Grant to join the HP Global Collaboratory Consortium, along with two secondary schools in Corpus Christi and Phoenix AZ.

Professional Development

One of the top issues facing two year geospatial educators in their professional practice is the dearth of money and time to participate in meaningful professional development activities. In a
rapidly emerging technology field, such as GIS and remote sensing, this is a real detriment to America’s technology workforce in a global competition. The Center met this dire need in several important ways in 2010. First, we provided monthly webinars on technology and pedagogy in geospatial education, leveraging our own expertise and guest lectures.

GTCM Curriculum Development Faculty Workshops—New Directions

Following the third annual NVC visit in Atlanta in February, 2011, the GeoTech CoPI team immediately convened to modify our professional development plans for the remainder of year three and year four. We canceled all of our planned activities of the usual GIS training for K-12 and college educators. Instead, we designed a new series of curriculum development workshops, focusing on the GTCM. These workshops will engage two year college faculty from around the nation in the task of building four (or more) new geospatial technology course outlines, based on the competencies identified in the GTCM. The first two workshops are already scheduled (and full) with 32 participants in two locations: Louisville, KY and San Diego, CA. Planning for a third workshop to build two more courses is in the planning stage and should occur in Denver, CO in September 2012. The outcome from these three workshops will result in three new products: a) four model course outlines, aligned with the GTCM, b) exemplary learning resources aligned with the outlines, and c) a model certificate outline composed of these new four (or more) courses. This will be accomplished within a highly compressed timeline by December 2011. Another new event which resulted from the NVC recommendations is the planned National Geospatial Educators Summit, May 21-23 at Georgia Tech in Atlanta. This 2.5 day summit will bring together educators from two year colleges with four year universities in order to educate them on the new GTCM-aligned courses and curriculum we will have developed, along with an opportunity to discuss and design new models of articulation between colleges and universities, based upon GTCM-assessed and aligned curriculum. It is hoped that this national summit will create a community of geospatial educators who will begin serious conversations between our education silos which traditionally have had little to do with one another. We have a rare opportunity to capitalize on the GTCM as a new foundation to build authentic articulation between colleges and universities like never before. The Center is committed to building this community of educators to truly expand the education & career pathway for America’s geospatial technology industry’s students and future workforce.
PARTICIPANTS

People

- **Phillip Davis**—Principle Investigator (PI). Professor Computer Science, Del Mar College, Corpus Christi TX.
- **Vincent A. DiNoto**—CoPI, Dean of College and Systemic Initiatives Professor of Physics and Astronomy. Jefferson Community and Technical College, Louisville KY.
- **Mike Rudibaugh**—CoPI. Geography/GIS Instructor, Lake Land Community College, Matoon IL.
- **Chris Semerjian**—CoPI. Assistant Director, Lewis F. Rogers Institute for Environmental & Spatial Analysis, Gainesville State College, Gainesville GA.
- **Ken Yanow**—CoPI. Ken Yanow Professor of Geographical Sciences, Southwestern College, San Diego CA.
- **Ann Johnson**—CoPI. Outreach Manager GeoTech Center, Del Mar College, Beatty NV.
- **David DiBiase**—CoPI. David DiBiase, Director John A. Dutton e-Education Institute College of Earth and Mineral Sciences, The Pennsylvania State University
- **Ming-Hsiang Tsou**—Senior personnel, Associate Professor Geography Department, San Diego State University, San Diego CA.
- **Christine Lewis**—Senior personnel.
- **Amy Ballard**—Senior personnel. CMS Instructor, GIT/Geomatics Applied Technologies Dept. Chair Central New Mexico Community College, Albuquerque NM.
- **Amy Work**—Senior personnel. GIS Analyst & Education Coordinator Institute for the Application of Geospatial Technology, Cayuga Community College, Auburn NY.
- **Rodney Jackson**—Senior personnel. Program Chair, Geospatial Technology Geomatics & Sustainability Division, Central Piedmont Community College, Charlotte NC.
- **John Johnson**—Senior personnel.
- **Angie Milakovic**—Senior personnel. Assistant Professor of Geographic Information Systems Bismarck State College, Bismarck ND

Organizations

**The Free and Open Source for GIS (FOSS4) Foundation.** PI Phillip Davis has been working with the FOSS4G organization in helping to organize an international conference in Denver, CO in September 2011 featuring free and open software for GIS. The GeoTech Center will be sponsoring a workshop on using FOSS4G for two year college educators during the conference, as well as presenting our research on the GTCM. This is the first time the FOSS4G International Conference has appeared in the US. It is anticipated this will lead to the wider adoption of FOSS4G application software in two year college geospatial programs in 2012 and beyond.

**The Penn State University.** CoPI David DiBiase of the Dutton e-Learning Institute @ Penn State University is our lead researcher on the effort to establish a Common Core Competency model within the well established GIS&T Body of Knowledge work. David is working with the Department of Labor, Employment Training Administration, Business Relations Group and the GIS Certification Institute (GISCI) to create entire new Standard Occupation Guidelines to precisely define the entry level GIS Technician standard. Through a series of DACUM
workshops, meta-analysis of previous geospatial workforce studies, and extensive vetting with professional organizations and societies, like GISCI, the GeoTech Center will establish national standards of GIS Technician Common Core Competencies that will form the basis of national articulation and certification models.

**Central New Mexico Community College.** Senior personnel Amy Ballard provides summer workshops for geospatial educators in the New Mexico region on behalf of the Center. Amy works closely with surveyors and other geospatial employers in the Albuquerque area to secure meaningful internships and work experience for your GIS students and graduates. She is an active member of the New Mexico Geographic Alliance and well-known throughout the area as a stellar geo-educator, supporting mapping projects throughout her area. She is also an active member of the ASPRS, Rio Grande Chapter.

**Institute for the Application of Geospatial Technology (IAGT).** Senior personnel Amy Work provides leadership in the areas of K-12 teacher education and development as well as our international program. She is responsible for the development of international research opportunities for college faculty and undergraduate students.

**Environmental Systems Research Institute, Inc.** (ESRI) is our major industry partner and provides unlimited access to its software, online training, campus facilities nationwide, and personnel to assist the GeoTech Center in training learners and educators about GIS application software.

**Central Piedmont Community College.** Senior personnel Rodney Jackson provides year-round training to workforce, K-12 educators, and learners on behalf of the Center. He also provides access to distance learning modules and courses that will become part of our professional development offering through the resource repository.

**Lake Land College.** CoPI Mike Rudibaugh is responsible for the creation of our national geospatial educator's map which will document the precise location and information of all existing community college geospatial programs. This map will serve as the foundation of our marketing, research, and dissemination efforts for our public-facing website.

**Kentucky Community & Technical College System (KCTCS).** CoPI Vince DiNoto leads the technology component of the GeoTech Center in our effort to demonstrate the use of desktop virtualization of GIS application software. Under Vince's leadership, the Center will create an online ArcGIS web service whereby we can demonstrate the use of virtualization to allow colleges and secondary schools to participate in GIS application software without the need for complex local installation, maintenance and support. All these services will be provided by the Center in a 'Software as a Service' (SaaS) demonstration mode. Vince also works with CoPI Mike Rudibaugh of Lake Land College to assist Dr. Arlen Gullickson on our effort to provide GIS advising services to the Evaluat|e Center.

**Southwestern Community College.** CoPI Kenneth Yanow leads our female recruitment and retention initiative for the GeoTech Center. Kenneth is creating a white paper series on best practices for the retention and recruitment of minorities and females into geospatial programs. Ken works closely with researcher Ming-Hsiang Tsou of San Diego State University on college-
to-university seamless articulation through the innovation of geospatial general education courses. One of the single largest barriers to expanding the geospatial programs of two year colleges is the lack of sufficient numbers of students in our introductory geospatial courses. Kenneth and Ming have perfected the method of offering GIS as a General Education course to: 1) increase the number of students in introductory geospatial courses and 2) improve the seamless transfer of courses from college to universities. Kenneth is performing national research on other methods of implementing GIS as a Gen-Ed course.

Gainesville State College. CoPI Chris Semerjian leads our efforts at recruitment and retention among the HBCU populations of the Southeastern US. He also provides critical support in our DACUM efforts by organizing regional DACUM workshops. He works with researcher Rodney Jackson of Central Piedmont Community College (NC) to develop DoL and NSF grants with HBCU institutions in their area. Chris is active in promoting professional development activities in the Southeastern US, including Metro Atlanta, through the URISA, Georgia Chapter.

San Diego State University. Senior personnel Ming-Hsiang Tsou leads our effort to promote two year college to university articulation methods and research. Ming works directly with CoPI Kenneth Yanow of Southwestern Community College across town in San Diego to articulate Southwestern College into the SDSU program. Ming is also our lead researcher on the use of Web 2.0 technology in recruitment activities. He is a leader in the use of iPhone, YouTube, and other technologies to engage the millennium generation.

Lake Land College. CoPI Mike Rudibaugh of has been working extensively with the Illinois GIS Association presenting workshops to their members to develop professional development opportunities to under-served GIS professionals in the rural areas of Illinois. The Illinois Statewide GIS Initiative will provide the vision for GIS leadership, coordination and services to public and private entities that serve the citizens of Illinois.

Georgia Institute of Technology (Georgia Tech). CoPI Chris Semerjian works in collaboration with the Georgia Tech in Atlanta to provide physical facilities for the GeoTech Center use. We will be partnering with Georgia Tech in 2012 to host our first annual Geospatial Educators Summit.

Urban and Regional Information Systems Association (URISA). URISA provides professional development opportunities for geospatial educators and practicing professionals. URISA is a non-profit professional and educational association that promotes the effective and ethical use of spatial information and information technologies for the understanding and management of urban and regional systems. It is a multidisciplinary association where professionals from all parts of the spatial data community can come together and share concerns and ideas.

Middle Georgia College. CoPI Chris Semerjian of Gainesville State College is meeting with Middle Georgia College to discuss articulation between MGC's surveying program and GSC's GIS program. Middle Georgia College will submit an Academic Partner Agreement to GeoTech. Two instructors from MGC will attend summer training at Gainesville State College in the summer of 2010. This partnership can provide a model of programs throughout the Southeastern US between high schools and colleges.
Corpus Christi Independent School District (CCISD). GeoTech Center GIS specialist, John J. Nelson, is working weekly with the Collegiate High School of campus of CCISD to infuse GIS and GPS throughout their high school curriculum. He has provided a series of presentations to their 4H club, demonstrating the use of GIS and GPS for community service project, such as mapping city parks and recreational areas.

American Society for Photogrammetry and Remote Sensing (ASPRS). CoPI Ann Johnson is working as the Center's national business and nonprofit liaison to establish a professional relationship with the ASPRS in order to create professional development opportunities for geospatial educators and practicing professionals. Ann is working with the Education Committee of ASPRS to recognized GeoTech Center as the voice for two year college educators and provides an outlet for our participation in the Societies conferences and workshops.

American Association of Geographers (AAG). CoPI Ann Johnson, along with senior researchers Amy Ballard, Amy Work, and Christine Lewis are working with the AAG to promote collaboration with the AAG and GeoTech to encourage and promote professional development opportunities for geospatial educators and professionals. The AAG is one of the largest professional organizations in American for geospatial technology and can provide events nationwide relevant to the education and professional needs of two year college educators.

Business Relations Group of the Dept. of Labor's Employment Training Administration (BRG/DoL/ETA). PI Phillip Davis and CoPIs David DiBiase and Ann Johnson are working with the BRG to develop a set of job competencies for the geospatial workforce. Currently the BRG has developed only 4 of the 9 levels required for their industry profile model, and we have agreed to assist them in completing the top 5 remaining levels of their model through the work of David DiBiase and researcher John Johnson. Through our extensive DACUM workshop meetings and findings, and the wider researcher of workforce and education alignment efforts by David DiBiase of Penn State University, the GeoTech Center will develop a set of nationally recognized job descriptions for GIS Technician, GIS Manager, GIS Analyst and Remote Sensing Technician and Remote Sensing Analyst.

GIS Certification Institute (GISCI). PI Phillip Davis and CoPIs David DiBiase and Ann Johnson are collaborating with the GISCI to develop and vet nationwide, a set of common core competencies for the GIS Technician level job description. The GIS Certification Institute (GISCI) is a 501(c) nonprofit organization established to provide professional standards for GIS professionals on a national level. GISCI provides the world's most recognized professional certification, the GISP, exam. GISCI has developed a working group, hosted by the GeoTech Center, to work collaboratively with education and professional groups in the creation of industry-driven job descriptions for the GISCI and Dept. of Labor.

University Consortium of Geographic Information Science (UCGIS). CoPI David DiBiase from Penn State is leading our effort to work with UCGIS to create career pathways through the UCGIS sponsored GIs&T Body of Knowledge. This research effort will provide well-defined pathways for occupation-specific sets of knowledge, skills and abilities (KSA) that can be used by both industry and academic organizations to evaluate performance and articulation. CoPI Ann
Johnson is also working with the UCGIS Education Committee to get two year colleges recognized as legitimate partners with UCGIS.

ACTIVITIES AND FINDINGS

Activities/Findings

In year two, the Center engaged in several noteworthy research initiatives which have gone very well and should provide a solid foundation for further work going into year three of operation beginning September 1, 2010. These research initiatives are directly attached to specific recommendations for last year’s NVC annual report and indicate the genius behind those recommendations and the years of prior experience of the NVC chairperson and other members. These major initiatives include:

1. Dept. of Labor’s Geospatial Technology Competency Model (GTCM)
2. Meta-DACUM Analysis of the GIS Technologist Core Competencies (Meta-DACUM)
3. Remote Desktop Access to Virtual GIS Applications (RDA)
4. GIS as a General Education Elective (GISGenEd)
5. Web Map of Community College Geospatial Academic Programs through Adobe FLEX (FLEXaMap)

Each of these five major initiatives is briefly described below.

GTCM—the Department of Labor’s Geospatial Technology Competency Model (GTCM) initiative started in March 2009 with an initial meeting between GeoTech Center CoPIs (Davis/DiBiase/Johnson). From this a series of meeting with the DOL was held through July 2009. A protocol to complete the GTCM was proposed by David DiBiase. This methodology was approved by the DOL and concluded in an unprecedented two day national forum of geospatial industry experts in February 2010. This meeting resulted in a proposed set of critical GTCM industry sector definitions which were widely disseminated for vetting among the broadest possible range of geospatial industry experts and public comment. The GTCM was published by the Dept. of Labor in June 2010. The GTCM is paramount to the Center. With this document, we can begin completing the upper tiers (6-9) of the GTCM in order to precisely define the industry sectors, such as GIS Technologist, Remote Sensing Technologist, Survey Technicians, etc. From these highly detailed occupation descriptions, the Center can create a matching baseline curriculum guide for colleges that can assist in curriculum development, college to college and college to university articulation, etc. The GTCM may also lead to advances in professionalizing the geospatial industry through certification. Currently the only nationally-recognized certification, the GISP, is a lengthy portfolio-based document that is only appropriate for 10+ year experienced professionals with Bachelors + degrees. It completely lacks a competency-based examination, or entry-level provisional certification for two year college graduates. Our work with the GIS Certification Institute, the GISP provider, may result in such examination and provisional certification.
Meta-DACUM—the work of researcher John Johnson has led to our completed Meta-DACUM analysis of the Core Competencies for the GIS Technologist occupation. To reach this Meta-DACUM report, the Center conducted three two-day DACUM workshops in 2008 and 2009 at locations across the country. These workshops extracted the common core competencies of GIS Technologists in both rural and urban settings in several fields, such as Agriculture, Government, and Engineering to provide the broadest possible representation of the field. In addition to these three funded studies, the analysis included a review of historical DACUM results conducted across the country over the past ten years. These results were then normalized through a statistical algorithm developed exclusively by John Johnson for the GeoTech Center. This methodology has never been applied to such a comprehensive and exhaustive set of data on the field. To further validate the findings, the results were vetted and validated by a group of 900 GIS experts across the country in a detailed online survey instrument. The final results were then validated in a series of interviews with current GISP-certified experts from the GISCI working group. This Meta-DACUM document will provide the basis for completing the first GTCM Tier 6-9 occupation: GIS Technologist and provide a model for further work on remote sensing that is being completed later this year (2011).
Remote Desktop Access—the leading edge technology research into using Remote Desktop Access (RDA) to virtual GIS application software has bridged one of the last technical barriers to expanding GIS technology into America’s K-12 and higher education labs and classrooms. GIS software, such as ESRI’s ArcGIS, has traditionally required extensive technical expertise and financial resources to properly install and maintain. The high level of technical expertise in both IT, networking, and GIS, along with the prohibitive licensing costs, have long prevented the wider adoption of the technology in America’s rural and poorer schools and colleges. Using RDA technology, GeoTech partners Gainesville State College (GA), Jefferson College (KY), and Central Piedmont Community College (NC) have successfully deployed GIS to middle schools, high schools and college partners in their respective areas. We are able to provide technical support to teachers in these schools, requiring a zero-footprint installation on school computers. Schools can now provide real GIS application software to their students requiring little more than a computer and Internet connection. The testing now extends to a rollout to five other GeoTech Center partners: Del Mar College (TX), Southwestern College (CA), Lake Land College (IL), Central New Mexico Community College, and Bismarck State College (ND).

GIS as a General Education

One major struggle for two year geospatial technology programs is to attract and retain sufficient numbers of students to justify their faculty and infrastructure resources. In some areas of the country, two year colleges struggle to meet the minimum number of students in their GIS and related courses. There are only a limited number of students on many campuses that are sufficiently aware and motivated to fill-up a geospatial technology program. What is needed is a mechanism for extending the reach of GIS and related technology into more programs and students. To this end the GeoTech Center has made significant gains in promoting GIS as a general education option to new programs across the nation.

The Center has successfully utilized the existing models at Southwestern College, San Diego State University, and Gainesville State College. CoPIs Ken Yanow, Ming Tsou, and Chris
Semerjian have provided numerous white papers, webinars, and conference presentations on their successful models. The impact is just now beginning to gain traction around the country, aided in some part by the current political and budget-crisis climate in many states where legislators are demanding more accountability and productivity of their community colleges. For example, through extensive collaboration with the Center PI, a geospatial educator’s working group for the California Community Colleges GIS Collaborative (www.cccgis.org), through its chairperson, Allison Meezan. The Center has provide Ms. Meezan with the results of our Meta-DACUM and GTCM results, along with the white papers by Tsou and Yanow, to assist this group in formulating a state-wide recommendation to incorporate geospatial technology as one component of California’s mandatory general education requirement. This California model, if successful at their 100+ colleges, would be a powerful demonstration model for the rest of the country through the GeoTech Center dissemination.

Along with this work, the PI has been working with new university faculty, including Rich Shultz of Elmhurst College (IL) and John Ritter of the Oregon Institute of Technology (OIT, Klamath Falls, OR) who are pioneers in the use of geospatial technology in general education. These university professors have participated in several of the Center’s webinars on the topic and are working with two year college faculty in developing their own GIS as a general education elective.

**FLEXaMap**

One of the most difficult aspects in technology education is the constant change in the underlying technology that occurs at an ever-increasing rate. In the geospatial technology field, the industry’s leading vendor, ESRI, for example, has made a major revision to its flagship product ArcGIS every two to three years, with incremental versions annually. This rapid change leaves most two year college educators behind their commercial peers in industry. One of the major responsibilities of the Center is to provide technical updates for college educators in the most relevant changes in technology. Certainly one of the largest shifts in GIS technology is from the desktop to the Internet or “Cloud Computing”. GIS software is rapidly becoming an Internet-based technology, allowing users to reach GIS technology through a simply browser and Internet connection. ESRI has moved in this direction in a major way with the new Adobe FLEX and Microsoft Silverlight API (application program interface) standards. In order to demonstrate the use of the latest Adobe and Microsoft API technologies, the Center undertook a crash training and development program for two of its partners (Del Mar and Jefferson College) following the July 2010 ESRI User’s Conference, where the technology was first demonstrated. Throughout the fall of 2010, the Center trained two technicians at Del Mar College and Jefferson, and developed a mapping research group comprised of several CoPIs (Rudibaugh @ Lake Land College and DiNoto @ Jefferson and Davis @ Del Mar College). The map ([http://216.69.2.35/flexviewer/index.html](http://216.69.2.35/flexviewer/index.html)) displays an interactive database of Community College Geospatial Program in the US. The map is a useful tool for anyone researching the location and course offerings for two year colleges in the US. For the Center, the map is the first of a number of planned implementations of the Adobe FLEX API including an NSF ATE Impacts map of past and present ATE-funded projects and Centers, an interactive map for the EvaluA|T|E
Center, and other geo-databases. Through extensive use of the Adobe FLEX technology, the Center will demonstrate the use of this important technology for geospatial educators.

Two Year College Academic Geospatial Programs
Project Training Development

The Center provided a number of educational workshops and institutes around the country in third year. The Center divided its efforts into two categories: national and regional efforts. National efforts included those aimed at the broadest possible reach and leverage partnerships with other Centers and private industry to offset the expense of travel. The regional efforts leverage the widely dispersed geography of the Center’s ten college and university partners coast to coast. A brief summary of our activities is provided:

National Training Development Activities

High Impact Technology Exchange Conference—Orlando, FL., July 2010. The HiTec conference was a joint ATE Centers & Projects conference meant to provide a synergy of ATE Centers in a single event. The conference provided two days of workshops plus two days of conference presentations, and impacted 500 participants. The GeoTech Center was a producer, expending some $10,000 in participant support towards this conference. The Center sponsored 10 participants in workshops on geospatial education, along with several presentations and exhibit. The Center has further committed to participate in the 2011 HiTec Conference scheduled for San Francisco.

ESRI—GeoTech Joint Teachers Teaching Teachers GIS Institute (T3G)—Redlands CA, June 2010. The Center partnered with leading GIS software vendor ESRI, Inc. for a third year to provide an intensive week long institute for secondary and college geospatial educators. Unique to the T3G Institute is its training-the-trainer emphasis on improving experienced geospatial educator’s use of geospatial technology. Applicants are required to be highly proficient with the technology prior to joining the institute in order to focus on pedagogical issues and techniques. This highly selective institute enrolled only 40 of the more than 100 applicants who submitted a competitive application. The institute enjoys the team-teaching of the most recognized group of geospatial educators, including a number of ESRI’s K-12 and Higher Education Team, and commercial educators, Roger & Anita Palmer. To further broaden the impact of the institute, the Center engaged the graduates in a year-long series of workshop and presentations they provided to students and fellow educators in their area, covering the entire US. The 40 educators choose their own activities through a GeoTech grant application that paid them to perform dissemination of their T3G experience through presentations or projects. The Center is partnering with ESRI again in June 2011 to repeat the T3G Institute another year.

Regional Training Activities

GeoEd’10 Conference and Workshops—Louisville KY, June 2010. CoPI Vince DiNoto led the GeoEd conference at his home campus of Jefferson College in a three day conference and workshop event that provided workshops in GIS and GPS technology to teachers and technicians to approximately 140 participants. The preconference workshops enrolled some 100 participants in four two day workshops, followed by a daylong conference addressing geospatial education research in the Kentucky and Indiana
Gainesville State College Geospatial Workshop—Gainesville GA, July 21-25, 2010. The workshop was attended by 25 educators and education administrators from various universities, the Technical College System of Georgia and local school districts. These education professionals were exposed to geospatial technology including Geographic Information Systems (GIS), the Global Positioning System (GPS) and remote sensing. All attendees were then asked to submit an action plan on how they would utilize or demonstrate geospatial technology in their schools or classrooms.

GIS Teachers Summer Workshop—San Diego CA, June 2010. CoPIs Ken Yanow and Ming Tsou from Southwestern College and SDSU combined their efforts to provide a 3 day intense workshop to 30 K-12, college, and university-level geospatial educators, using the professional services of Roger & Anita Palmer to provide best-practices in geospatial education pedagogy. With the success of the first workshop, the Center invited back 24 of the original 30 participants back to continue with their training.

Outreach Activities

The Center provided numerous outreach activities in all areas of the country where campuses are located. The activities range from simple classroom presentations by a single faculty member to full-day GIS Day Events, involving dozens of presenters and hundreds of participants, usually secondary school students. Events in year two included:

National GTCM Student Competition—a national competition to replace the discontinued SkillsUSA Geospatial Competition, this unique three round competition focuses on the skills and competencies outlined in the GTCM. By creating this new national competition the Center will accomplish two broad objectives: a) increase student and faculty awareness of the GTCM and b) provide a platform for promoting the awareness of two year geospatial programs and graduates to universities and industry. This is the first national competition focused exclusively on the two year college level. The first round of the competition was recently completed (April 15, 2011), and we are currently into round two. The third and final round will witness the top six student competitors presenting their projects before a live audience at the 2011 Esri Educator’s User Conference July 10, 2011 in San Diego.

GIS Day Event @ Del Mar College—Corpus Christi TX, November 16, 2010. Del Mar College and Texas A&M University—Corpus Christi combined forces, along with Texas A&M—Kingsville, the City of Corpus Christi, and several private engineering and surveying firms, provided demonstrations and presentation of geospatial technology to more than 400 secondary and middle school students from more than one dozen school districts from a four county area.
Piedmont Community College - Charlotte NC. Senior researcher Rodney Jackson and his staff presented the following events throughout year three:

NC State Geographic User Committee 04/15/2010: Rodney Jackson gave a presentation at the North Carolina State Geographic User Committee in Raleigh, NC on April 15th, 2010 addressing GIS education in the Community College System. Topics included curriculum education, continuing education, and partnerships that would mutually benefit state GIS users and CPCC.

San Diego State University

November 16, 2010 participate on the GIS Day activity at SDSU. The major event is the Careers in GIS/Geography Panel Presentation. This panel brings together various professionals to speak about their GIS job experiences, career opportunities, job searching tips and much more.

Conference and other events

July 2010 ESRI Users Conference in San Diego CA: a team of 6 CoPIs attend the annual event and present a series of papers on the Center’s initiatives. The Center sponsors an all day expo at the Educator’s sub-conference and a half-day booth at the Academic Fair. A total of more than 300 college and university geospatial educators are directly impacted over a period of 4 days.

July 2010 HiTec ATE NSF Conference in Orlando, FL: a team of 4 CoPIs attends this annual event as producers. We provide a full day workshop to 15 educators and workforce professionals, conduct three presentations, and exhibit at the two day expo over a period of four days. More than 450 attendees are impacted.

October 2010 National Science Foundation Annual ATE PIs Conference in Washington DC: The Center, represented by a team of six CoPIs, hosted a Birds of a Feather session for Geospatial Technology which was attended by 40 participants, mostly two year college GIS faculty. The Center demonstrated the new RDA technology, the GTCM research, along with the Meta-DACUM results at the time.

December 2010 National Academy of Sciences Geosciences Advisory Board Meeting in Washington DC: CoPI David DiBiase presented the GTCM results to the members of the board in order to disseminate the research to the highest levels of the professional and solicit feedback.
February 2011 University Consortium of Geographic Information Science Annual Winter Meeting in Washington DC: CoPI Ann Johnson presented the GeoTech Center work on the GTCM before the UCGIS Board of Directors as evidence of our research agenda and worthiness to be considered for associate membership in this prestigious university research consortium.

PRODUCTS

Articulation Agreements

Dr. Ming Tsou, SDSU Geography Department, submitted a model articulation agreement to the California State University Chancellor’s Office entitled:

LOWER-DIVISION TRANSFER PATTERN
California State University (CSU) Statewide Pattern

Journal


Special educational Issue of the URISA Journal, Volume 22, Number 2.

Books

Ming Tsou of SDSU has a book chapter in the new AAG book [Practicing Geography: Careers for Enhancing Society and the Environment]. This is a new book in 2011 being produced by the AAG’s Enhancing Departments and Graduate Education in Geography (EDGE) project with funds from the National Science Foundation. The book chapter will focus on the preparation, skill requirements, and challenges for teaching GIS contents in K-12 schools and community colleges. We are creating an on-line survey for asking the needs of GIS teacher preparation in K-12 and community colleges (reported by Ming Tsou, SDSU).
Internet Dissemination

The Center has produced the following live webinars in recorded format:

**GeoTech Webinar Series: Free & Open Source FOSS4G**

Kurt Menke & Amy Ballard of Central New Mexico Community College describe a new FOSS4G course developed and taught in the summer of 2010. Learn how you can adopt their course material for your own organization or classroom use.

**GeoTech Webinar Series: ePortfolios Webinar**

Adam Dastrup provides us an overview of their use of ePortfolios for GIS students at Salt Lake Community College.

**Adam Dastrup ePortfolio Webinar (Part 2 of 2)**

GIS instructor Adam Dastrup discusses his use of ePortfolios for students at Salt Lake Community College.

**GeoTech Webinar Series: Innovative Approaches to Using GIS in Colleges**

Presenter Mike Rudibaugh of Lake Land Community College in Mattoon, IL shares his experience in using geospatial technologies, like GIS, to engage your local workforce development agencies.

**GIS Modules for K12 Educators**

San Diego Mesa College provides us a description of their recently complete GIS modules for K12 and College educators.

**GeoTech Webinar Series: Multi-Tiered Internship Model**

**Web 2.0 Uses of GIS Technology**

Dr. Ming Tsou of San Diego State University explains the use of new Web 2.0 social media in GIS education.
GIS as a General Education Course Across the Disciplines

Ken Yanow describes his success at Southwestern College of getting GIS accepted as a general education course across the discipline. This move has enlarged his program enrollment several fold.

Integrating GIS Across the Disciplines

Amy Work, of the Institute for the Application of Geospatial Technology, explains the role of GIS technology across the K-12 curriculum.

Remote Desktop Access to GIS for K-12 Educators

Chris Semerjian explains the Gainesville State College (GA) technology effort to bring GIS application software into the K-12 classroom using nothing more than a browser and Internet.

Latest Happenings on the GISC1 GISP Certification Exam

Rodney Jackson explains the new Geospatial Technology Competency Model (GTCM) and how it relates to the GISC1 efforts to update the GISP certification.

What's New in ArcGIS 10 for Educators?

Ann Johnson, formerly of Esri, explains the most significant features for the new Esri ArcGIS 10 for educators.

Expanding Two Year Geospatial Programs: A Three Campus Story

Listen to the stories of Lake Land College, Southwestern College, and Central Piedmont Community College as they expand their GIS programs.

2010 Esri Technical Sessions

The 2010 Esri International Conference Technical Sessions are available for free to our registered members and partners. The sessions cover every possible aspect of ArcGIS, from mobile to server platforms. The topics include all possible sectors of the geospatial industry: Surveying, Land Management, Public, Safety, Petroleum, etc. This service requires a userid and password available to our members.
The New Geospatial Jobs and How to be Ready for Them!

Join experts from industry, the Department of Labor, and higher education to learn about the impact of formally defining these geospatial occupations and how the competency model will support the expected high level of growth for jobs in the geospatial enterprise. Speakers will include David DiBiase from Penn State University, Rich Serby of GeoSearch, Brad Wiggins from the Department of Labor, and Wes Stroh, Penn State’s series moderator.

Other specific products

The Center made several significant contributions to the geospatial field in year two including:

Geospatial Technology Competency Model—the GTCM is the foundational document used by the Dept. of Labor’s Employment & Training Administration to define the scope and occupations that comprise the geospatial technology industry. This comprehensive document was developed through collaboration with industry and professional societies representing the broadest possible range of groups within the geospatial industry. Once this document is complete in early June 2010, it will provide the nation with a definitive description of the industry and serve as the basis for future work to define each emerging occupation, such as GIS Technologist, within the industry. Schools and colleges may use the GTCM to guide their curriculum development, articulation agreements, and other educational activities. Professional accrediting agencies, such as the GIS Certification Institute or American Society of Photogrammetry and Remote Sensing (ASPRS), may use the GTCM to perfect existing credentials, such as the GISP, or create new ones.

Meta-DACUM of Common Core Competencies for GIS Technologists—this document is the result of research conducted in year two that produced three DACUM workshops combined with an exhaustive review of previous DACUM dating back 10 years. The unique feature of this document is that it identifies every possible task performed by a GIS Technologist in every segment of the industry and in every region of the country. From this comprehensive list, a rank-order list of tasks, based on frequency and rank by experts, identified a common core set of competencies that should be considered essential for any GIS technologist to possess. With this document, we can now for the first time, provide a list of items that are essential knowledge in this occupation, which may become the basis for future certification, testing, and curriculum guidelines for community college geospatial educators.

Community College Geospatial Academic Program Mapping Portal—the Center has created an ArcGIS spatial database of all known GIS and geospatial academic programs at America’s 1134 community colleges. This database is presently linked with an ArcGIS Webserver that provides online access to the database through a browser and Internet connection. The server utilizes the latest in Adobe FLEX API technology to provide the end-user with an easy to navigate interface. The direct purpose of the database is to provide students, parents, educators, and the public with knowledge about...
America’s two college geospatial programs. Its secondary purpose is to demonstrate the latest in server-based technology to encourage two year college educators to adopt the technology into their academic programs. This site is accessible by clicking on the map on the Center’s website: [http://geotechcenter.org](http://geotechcenter.org).

CONTRIBUTIONS

Within Discipline—the Center has made the following contributions:

**Year Three (2010)**

1. Geospatial Technology Competency Model (GTCM) for the Dept. of Labor.

**Human Resources Development**

The Center sponsored several of its own staff for training at various partner colleges in order to better prepare them to support the advanced technology we are engaging in to better serve our role as leading edge in geospatial technology. In year two this included:

**Del Mar College**—GIS Analyst John J. Nelson was provided week-long workshop at ESRI in Redlands, CA. to learn the new Adobe FLEX API technology to build and maintain Del Mar College’s ArcGIS Web server.

**Jefferson College**—GIS Analyst Ross Allen was provided a week-long ESRI workshop on the Adobe FLEX API technology to build and maintain the public-facing Two Year Community College Academic Geospatial Programs map ([http://216.69.2.35/flexviewer/index.html](http://216.69.2.35/flexviewer/index.html)).

**Del Mar College**—GeoTech Center Coordinator Minerva Borger has completed an Introduction to ArcGIS 10 online course to acquaint her with the technology foundation of the Center.

**Lake Land College**—GIS Technician Brooke Ferguson completed an ESRI online course on ArcGIS 10 to assist her in creating the Community College Academic Geospatial Programs geo-database.

**Research and Education**

The Center conducted fundamental educational research into the best practices for building and sustaining two year college academic geospatial technology programs including:

**CoPI David DiBiase**—conducted several workshops and forums on the development of the Dept. of Labor’s [Geospatial Technology Competency Model (GTCM)](http://geotechcenter.org). This research will result in updating the GTCM with the latest definition of the geospatial industry as a
whole as well as define the various industry sectors, such as GIS, Surveying, etc, as well as the occupation definitions at the upper tiers of the GTCM model.

**Senior researcher John Johnson**—conducted three DACUM workshops on the GIS Technician occupation and performed a statistical meta-analysis of the results producing the first-ever Meta-DACUM Analysis of Common Core Competencies for GIS Technician. This work will be incorporated into the GTCM as one of several tier 6 occupation definitions. It is also being reviewed by the GIS Certification Institute as the basis for an exam-based certification to improve their existing GISP (GIS Professional) certification and potentially develop a provision certification, such as a GISA (for “associate”, versus “professional”).

**CoPI Kenneth Yanow**—produced a white paper on best practices for recruitment and retention of minorities and women into geospatial technology fields. This white paper provides the basis for his webinars on the topic.

**CoPI Vince DiNoto**—produced a white paper on Remote Desktop Access to Virtual GIS Application software that provides a technology roadmap for educators wishing to adopt this solution to providing access to GIS technology to students in remote locations.

**CoPI Ann Johnson**—produced a chapter on the development and history of geospatial higher education in the US. The chapter describes the historical and technology drivers in the development of two year community college academic geospatial programs in America’s 1150 two year colleges.