

Briefing paper by Nekya J. Young for the Association of American Geographer's program for Catalyzing Research on Geographies of Broadening Participation

Title

Beyond Tutoring: Interactive Service Learning in GIS/Technology Education for K-16 Students

Background

A major challenge faced by service learning practitioners is quantifying the learning outcomes of participating collegians. In order for service learning to grow and gain “legitimacy” within the construct of the academy, methods for producing measurable results must be developed. Among the goals is to include service learning as part of the tenure-track formula, thus making it an attractive incentive for faculty. For institutions, service learning is becoming a potential area of consideration in the accreditation process; however, there is no general rule for quantifying its long and short-term impact upon college students’ disciplinary achievement. The project described herein is an effort to build upon a means to show that participating in service learning has academic merit, and goes beyond simple “public service” and/or “community outreach.” A specific focus is upon service learning in the science, technology, engineering and math (STEM) disciplines.

In 2007, Tennessee State University (TSU) Center for Service Learning and Civic Engagement was awarded \$800,000 from the HBCU HUD grant program to make improvements to its surrounding communities. The Center for Service Learning and Civic Engagement devoted \$15,000 of the grant funds to the Pearl Cohn Ninth Grade Academy (referred to as the McKissack School) to upgrade educational and technology access by purchasing educational materials and improving technology. Through this grant funding, eight new computers and one printer was purchased. The McKissack School is 98% African American, located in the heart of North Nashville, which is no stranger to crime, low performing schools, and low educational attainment. Much of the population lives under the poverty rate.

Tennessee State University’s Center for Service Learning and Civic Engagement (CSLCE) and Geographic Information Sciences (GISc) Laboratory partnered in a cooperative service-learning outreach effort at Nashville’s newly created Pearl-Cohn High School Ninth Grade Academy. The CSLSE lead staff, Nekya Young, Program Coordinator, and Susan West, Assessment Coordinator, administered a series of computer literacy improvement courses to 132 participating ninth grade students. Dr. David A. Padgett, Director of the TSU GISc Lab, and Ms. Young led the ninth graders through a series of GIS-based exercises, assisted by TSU students enrolled in Padgett’s service-learning designated Cartography course.

Research Questions

Our research questions are as follows:

- a.) Will the ninth graders exposed to the computer competency training and GIS training fare better on the computer skills assessment tests than those only exposed to the computer competency training? The hypothesis herein is that the students exposed to GIS will fare better, as working with geospatial technology requires active application of basic computer skills.
- b.) Will the TSU student volunteers have improved GIS skills as a result of training the ninth grade students? The hypothesis herein is that the college students will increase their GIS capabilities as a result of having trained the younger students.
- c.) Will there be any long-term impacts upon the TSU students as a result of their service learning experience on this project? The hypothesis herein is that the TSU students will be positively affected in the long term as a result of their involvement.

Analysis

While all of the readings within the catalyzing geographies reader raised all of the issues as it relates to the plight of increasing the numbers of underrepresented populations in Science, Technology, Engineering and Mathematics (STEM) fields, especially and the spatial sciences. The scholarly articles all had different approaches to discussing their concerns as to the “whys” and “how comes”. It was clear that there is not one answer as to what can or needs to be done to increase the number of underrepresented populations. However, the most relevant approach to increasing underrepresented populations is outlined in the following statement: *“Building “pipeline” relationships among educational institutions serving students at different stages from grade school, middle school, secondary, community colleges, undergraduate to graduate levels continues to characterize efforts to broaden participation of underrepresented groups in higher education in STEM, health sciences, geosciences, law, biosciences, engineering, mathematics, and education, as well as in private sector professions”* (Hinton, et al. 2010; Subotnik, et al. 2010; Cullinane 2009; Calleros 2007; Levine, et al. 2007; Alfred, et al. 2005; McCarty, et al. 2005; Jackson 2003; Chang 2002; Tienda 2001; Thomson & Denk 1999).”

“Building a pipeline” is exactly what I did as HUD Grant Manager/Program Coordinator when I designed the Geographic Information Sciences (GIS) computer lab at the McKissack school. The primary purpose of this lab was to create a model for meaningful service learning partnerships between higher education institutions and K-12 schools. Among the goals was to quantify the “learning” portion of the service learning experience for all across the K-16 landscape. Tennessee State University’s Center for Service Learning and Civic Engagement (CSLCE) and Geographic Information Sciences (GISc) Laboratory partnered in a cooperative service learning outreach effort at Nashville’s newly created Pearl-Cohn High School Ninth Grade Academy. The CSLSE staff, Nekya Young, HUD Grant Manager/Program Coordinator and Susan West, Assessment Coordinator, administered a series of computer literacy improvement courses to 132 participating ninth grade students. Dr. David A. Padgett, Director of the TSU GISc Lab, and Ms. Young led the ninth graders through a series of geographic

information systems (GIS)-based exercises, assisted by TSU students enrolled in Padgett's service-learning designated Cartography course.

Methodology

In September and October of 2010, TSU staff members Susan West and Nekya Young administered pre- and post-assessment tests for computer skills to determine baseline knowledge and experience level for the ninth grade students. The Simple Assessment/Pre- and Post Assessment Student Technology Proficiency (NETS-S 2007) tests for Windows/Office 2007 (developed by the Simple Assessment Group of the National No Child Left Behind program) were from Info Source Incorporated and based on national student computer competencies in six areas:

1. **Creativity and Innovation** (students' ability to generate new technological ideas, products or processes).
2. **Communication and Collaboration** (students' ability to communicate information and ideas effectively to multiple audiences using a variety of media and formats).
3. **Research and Information Fluency** (students' ability to process data; locate, organize, analyze, evaluate, synthesize and ethically use information from a various sources and media).
4. **Critical Thinking, Problem Solving, and Decision Making** (students' ability to collect and analyze data to identify solutions and/or make informed decisions using technology).
5. **Digital Citizenship** (students' ability to demonstrate personal responsibility for lifelong learning).
6. **Technology Operations and Concepts** (students' ability to select and use applications effectively and productively; understand and use technology systems).

Students from eight classes participated, including Geography courses taught by Ms. Charlie Hall and Ms. Gwendolyn Adams, and Physical Science courses, taught by Mr. Vincent Alexander. In addition to the computer literacy courses, the students were exposed to geospatial technology via a series of GIS lessons developed and taught by Dr. Padgett and Ms. Young including, but not limited to:

- The Nashville Floods of 2010 (students learned about GIS and emergency preparedness within the Nashville Community).
- Tornado-spotting training (students mapped tornado patterns across Tennessee using GIS).
- Rural Stem modules from James Madison University (students used GIS data modules to map and learn about global infant death mortality rates and world population) <http://www.isat.jmu.edu/stem/>.
- Global Warming and Climate Change (students used infrared temperature tools to map climate patterns and motor vehicle emissions).

- GIS Day/Pearl Cohn Ninth Grade Academy Open House Event (students presented their GIS mapping skills learned throughout the semester) http://www.gisday.com/apps/successstory_search1.cfm.

Padgett's Cartography (GEOG 3100) students committed approximately 50 hours of service primarily instructing the ninth graders in the GIS portions of the lessons.

Results

The test required a passing score of 75% in order to prove competency in computer skills among their age and grade level. None of the students achieved a passing score in spite of the fact that the test was based on seventh grade standards of computer competency. With these results, TSU staff redesigned their computer and GIS mapping training to include basic computer competencies that the students were lacking. The general expectation was that students exposed to both the GIS lessons and computer training would perform better on the tests. TSU staff, faculty and students worked with the students throughout the year to improve their computer and mapping skills. To evaluate the impact of the computer lab and training, ninth graders were given both an attitudinal and competency test in the spring of 2011. Over 81% of the students responded that they found it "useful" or "very useful" to have TSU students working with them to advance their computer/technology skills. Twenty one percent (21%) of the students that took both pre- and post-competency tests passed with a score above a 75%. Of those students who passed the post-test, there was an average increase of 41% in the students' scores compared to the pre-test.

Conclusion

Involving college students in service learning outreach projects in K-12 schools has great potential to elicit positive impacts for the younger students. When asked if they personally knew a college student, the overwhelming majority of the ninth graders participating in this project said they did not. Thus, simply exposing them to college students close to their age presents to them attainable positive role models. A 14 year-old ninth grader can more easily see him or herself four years in the future on a college campus such as TSU, than fulfilling the role of a teacher, or other adult professional. Currently, an African American male ninth-grader at Pearl-Cohn has only about a one-in-three chance of graduating.

College/K-12 service learning projects offer to collegians opportunities to impart discipline-specific knowledge upon a novice audience; a skill that any professional needs to develop. College volunteers may also engage in problem solving and critical decision-making when required to take a leadership role in planning lessons and learning exercises. Projects emphasizing the science, technology, engineering and math (STEM) disciplines are sorely needed in schools similar to Pearl-Cohn. The outcomes of this research are expected to provide a roadmap for faculty wishing to build meaningful

college/K-12 service learning programs that go beyond the common “after school tutoring” models.

Research shows that students who engage in service learning exhibit greater confidence in addition to lowering the risks of dropping out. To date, over 25 TSU student volunteers have committed over 400 hours of service to the Pearl-Cohn High School GIS education project. The TSU students devote their time by helping instruct the younger students in GIS lessons, sharing their experiences as a college student, and explaining why they chose to attend college. As a result, several ninth-graders have begun to take greater interest in attending college, particularly TSU’s Engineering program. Several of the TSU student volunteers, following graduation, have chosen teaching as a profession.

The project is currently sustained with remaining funds from the State Farm Good Neighbor Service Learning Grant as the HUD HBCU grant-funding cycle ended June 2011. Dr. Padgett’s service learning students will continue to volunteer at the ninth grade academy. The equipment and software will be maintained and upgraded when necessary by the Nashville Metropolitan Area school system. Additional funding from HUD and NASA is being actively pursued. The results of the project have been submitted to The Journal of Geography, the journal published by the National Council for Geographic Education (NCGE). The GIS-focused project results will be presented at the 2012 Environmental Systems Research Institute (ESRI) Education User’s Conference, the world’s largest conference on geospatial technology.

References

Hinton, et al. 2010; Subotnik, et al. 2010; Cullinane 2009; Calleros2007; Levine, et al. 2007; Alfred, et al. 2005; McCarty, et al. 2005; Jackson 2003; Chang 2002; Tienda 2001; Thomson & Denk 1999. *Catalyzing Research on Geographies of Broadening Participation*: 1.

