

The Status of GIS Education in North Carolina

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Abstract

This research considers the availability of GIS education at sixteen member institutions of the University of North Carolina (UNC) system, thirty seven private institutions and fifty-eight community colleges in North Carolina. Research of institutional web sites, direct e-mail, and telephone inquiries were used to develop a database of GIS courses and degrees and departments that offer them. The authors were especially interested in comparing GIS educational opportunities at ten Historically Black Colleges and Universities (HBCUs) in the state with other institutions.

Introduction

This paper examines offerings of GIS courses and degrees by the institutions of higher education in North Carolina. A total of one hundred and eleven private and public universities as well as community colleges were included in the study. Special emphasis was placed on comparing the opportunities for GIS education at HBCUs with that of other institutions. We also examined if “hot spots” of GIS education exist in North Carolina and possible differences between access to GIS education between students in rural and urban settings and private and public schools.

The initial motivation for this study was the ongoing revision of the geospatial sciences curriculum at North Carolina Central University (NCCU) initiated in part by recent National Science Foundation education grants received by the Department of Environmental, Earth and Geospatial Sciences, hiring of new faculty with GIS expertise

as well as a constant effort to produce graduates that are employable in the ever changing job market. An international study of employability of geography graduates identified major trend of graduates increasingly being employed in project-oriented fields, with more and more emphasis on transferable technical skills – like GIS (Maguire and Guyer, 2004). In addition, the UNC Tomorrow¹ initiative to identify the needs facing the North Carolina in the future, and role of individual campuses in meeting those needs, prompted our investigation of existing programs in an effort to better respond to the mandate. Several recent developments at NCCU, including the formation of new College of Science and Technology, merger of the Geography Department with the program in Environmental Science, and establishment of Geospatial Research, Innovative Teaching and Service (GRITS) Center on the NCCU campus, also encouraged scrutiny of other geoscience programs within the state.

North Carolina Central University, established in 1909, is the nation's first state supported public liberal arts college funded for African Americans with current minority enrollment of approximately 95%. Since 1972 NCCU has been a part of the UNC system that includes all 16 public universities and confers more than 75% of all undergraduate degrees in the state.² NCCU has aggressively pursued an increase in general enrollment of nearly 30% in the past two years, with a current record enrollment of about 8600 students. The main reason for limiting our study on the institutions in North Carolina is due to the fact that only about 12 % of NCCU students are categorized as 'out of state'. In fact, in 2006, more than half (52.5%) of NCCU students were either from Durham or neighboring counties.³ Thus, in finding our “niche” in GIS education landscape and in searching for students interested in careers in geospatial analysis and GIS, we are mostly competing with other institutions within North Carolina.

Although one can argue that demand for GIS instruction is increasingly being filled by institutions of higher education offering online GIS education, and thus location of the

¹ <http://www.nctomorrow.org/>

² Research Report 1-07(June 2007), The University of North Carolina at Chapel Hill, Chapel Hill, NC

³ Statistical Abstract of Higher Education in North Carolina, 2006-07, Research Report 1-07 (May 2007), The University of North Carolina at Chapel Hill, Chapel Hill, NC

institution is losing in significance, most online content is still targeted at nontraditional learners not necessarily concerned with receiving academic credit. Furthermore, additional technical, logistical and financial challenges placed on online students as well as lack of interaction with peers are some of the reasons why most educators agree that undergraduate students are still best served by face-to-face instruction (Onsrud, 2005). This is probably even truer for the type of student body that NCCU serves. Freshman class profile for 2006 shows that 82% of NCCU freshman qualified for need based financial aid, 43% were ranked in the bottom half of their high school class and 67% scored below 900 on the SAT (combined score, re-centered).⁴

Literature Review

Literature review of papers published on the topic produced only a few publications that focus on availability of GIS courses at the university level. With the exception of one ESRI Professional Paper on the status of GIS at the institutions of higher education in the U.S. by Tas (2002) and unpublished thesis (Tas, 2003) authors could not find any systematic treatment of the subject. Tas (2002, 2003) analyzed type of GIS education offered by US colleges and universities relative to Carnegie Foundation's classification, enrolment, region and other criteria. Some of the major findings of the study were general similarity of programs among institutions; for example, GIS curriculum was not found to vary between rural and urban schools. However, great differences were present among institutions. For example, more than 87% of geography departments offering GIS were in public institutions; doctoral universities also had more and larger GIS programs. One interesting finding was generally uniform geographic distribution of GIS programs, when number of programs is adjusted for population density. However, this study was based on data that is now more than 6 years old and data was not analyzed on level of individual states.

As part of literature review we also searched the internet for databases of GIS programs. However, such databases although available were incomplete, out of date, and with

⁴ Only freshman with reported SAT score and high school rank;
http://intranet.northcarolina.edu/docs/assessment/Profiles/2007-08/NCCU_Inst_Profile_07-08_20.pdf

information content varying widely depending on the mode of data collection and update. One example is “ESRI Online Database of Academic GIS Programs” where responsibility is on the academic institutions to create and update information about GIS educational opportunities they offer.⁵ A quick search for all academic institutions in North Carolina offering any GIS education (certification, degree, graduate program, or online education) produced a list of 12 institutions of higher education (6 UNC system schools, 4 community colleges, and two private schools). Only two schools (NC State University and UNC Greensboro) were listed as offering graduate programs in GIS and two schools as offering undergraduate degrees in GIS (NC State University and Haywood Community College). On the other hand, “Geo Community” website lists only three UNC system schools as having undergraduate and graduate GIS programs (East Carolina University, Elizabeth City State University and NC State University).⁶ A search on the other popular website, GradSchools.com, returns no results for GIS graduate programs in North Carolina.^{7,8}

In contrast to the very limited number of publications about the type and availability of GIS programs in the US, there are many articles reviewing the pedagogical and technical aspects of GIS education. Several studies investigated the presence of GIS across the curriculum, in departments other than geography and in disciplines that are not necessarily campus leaders in GIS education. Wayne (2002) gave overview of challenges that working professionals from other disciplines (realtors, foresters, city planners, etc) face trying to get GIS education. A paper by Brickley and Mincken, (2007) studied availability of GIS in undergraduate curriculum of four academic disciplines: marketing, environmental studies, criminal justice and political science. One of the major findings of their study was that, except for environmental science faculty, faculty from other disciplines overwhelmingly stated that there is no room for GIS courses in their curriculum (76% of criminal justice faculty, 88% of political science faculty and 96% of marketing faculty). Estaville (2007) researched the degree to which business schools in

⁵ <http://gis.esri.com/university/onlinedb.cfm>

⁶ <http://www.geocomm.com/>

⁷ <http://www.gradschools.com/>

⁸ All searched conducted June 8, 2008

institutions of higher education in the US embraced GIS as part of their course offering. Out of sample of 140 public and private institutions he found that only five colleges of business offer GIS in they curricula, thus, most business college graduates miss the additional edge they could have in the job market with a huge demand for a combination of business and geotechnical skills. In their article Vincent and Levine (2004) lobby to require remote sensing and GIS courses in geology departments, in part to prepare the geology graduates to capitalize on an emerging high growth job sector.⁹

Methodology & Analysis

This study was initiated by the GRITS Center in 2006. Base data for this study (educational institutions and enrollment) were derived from the University of North Carolina General Administration's thirty seventh annual "Statistical Abstract of Higher Education in North Carolina, 2004-05" (Yang 2005). This was the latest dataset available at that time. The data were compiled as a spreadsheet (Excel format) and additional columns added to include address, telephone number, and county. This information was retrieved from each institution's website, direct e-mail, and telephone inquires. The educational institutions were classified as Historically Black College or University (HBCU) or non-HBCU, public or private, college or university, community or non-community college. Next, each institution was researched and the presence or absence of a geography department recorded in the database. The bulk of this research was conducted during the 2006-07 academic year. If a geography department was not present, allied departments were considered to see if they offered related course work that utilized GIS. Course offerings, degree programs, and certification information was then compiled for all institutions that taught GIS. Finally the latitude and longitude of each institution was added to help create statewide maps. The lat-longs were then used to create a feature class (layer) in a geodatabase. In addition to this layer, a state boundary and a county boundary layer were added to the geodatabase.

⁹ US Department of Labor, 2004, Employment and Training Administration, Geospatial Technology: High Growth Industry Profile, online at <http://www.doleta.gov/BRG/pdf/pdf10.pdf>

Results

The report “Statistical Abstract of Higher Education in North Carolina, 2004-05” (Yang 2005) comprised of 117 educational institutions spread over the entire state of North Carolina. Of these, 6 religious institutions (1 Theological Seminary and 5 Bible Colleges) were excluded from this study. The remaining 111 institutions included the North Carolina University system made up of sixteen member institutions with the flagship “University of North Carolina” located in Chapel Hill. In addition, the state also had 37 private educational institutions and 58 community colleges. Of these 111 institutions, 10 were HBCUs out of which only two listed a Geography department (North Carolina Central University and Fayetteville State University) and two other HBCUs offered classes in GIS (North Carolina A&T University and Elisabeth State University). North Carolina A&T University has a full fledged program offering a Bachelor’s degree in Geomatics. Of the other 101 non-HBCU institutions, 8 had geography departments and offered a wide range of studies in GIS. An additional 11 institutions offered GIS courses. The community college system had 5 schools that offered certificate programs in GIS. Overall only 10% of the educational institutions in the state have a geography department. These range from Appalachian State University in the west to East Carolina University in the East. Of the 37 private institutions in the state, only one (Elon University) has a Geography department. While 40% of HBCUs offer some form of GIS education only 19% of other institutions do the same.

A geographical analysis of the data showed pockets of higher educational opportunities. For example, Guildford County and Mecklenburg County, with a total of seven educational institutions per county topped the list. These were followed by Wake (6 institutions), Forsyth (5 institutions) and Buncombe (4 institutions). Guildford, Mecklenburg and Durham counties record the most GIS educational opportunities with 3 educational institutions in each county offering at least a course in GIS. Interestingly, all 3 educational institutions in Durham County offer some form of GIS education. Most of the institutions were located in the middle of the state (the Piedmont). Of the 100 counties in North Carolina, 35 did not have any institutions of higher learning. This distribution seemed to radiate away from these clusters out across the rest of the state east and west

(Figure 1). Further analysis showed that GIS opportunities were more evenly distributed throughout the state than the results of the educational hot spots. A total of 23 institutions of higher education (4 HBCUs and 19 non-HBCUs) offered some form of GIS education (Figure 2). Next a comparison between rural and urban areas based on the availability of GIS opportunities in these areas was undertaken. The results showed that while GIS education was more prevalent in the urban and suburban areas (central North Carolina) GIS education opportunities also exist in rural parts of the state (Figure 3).

Conclusion

Geographic Information Systems is rapidly becoming a tool used for research and planning in all disciplines of study. The institutions of higher education in the state recognize the importance of GIS and offer educational opportunities (degree, certificate, courses). While opportunities to pursue GIS education are not widespread, they are evenly distributed throughout the state and readily available to individuals wanting to pursue GIS training. HBCUs surprisingly keep up with GIS (a relatively new technology) better than non-HBCUs. The university system as well as private educational institutions should step up their efforts to increase GIS course availability and awareness.

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¹⁰ <http://gis.esri.com/library/userconf/proc02/abstracts/a0790.html>

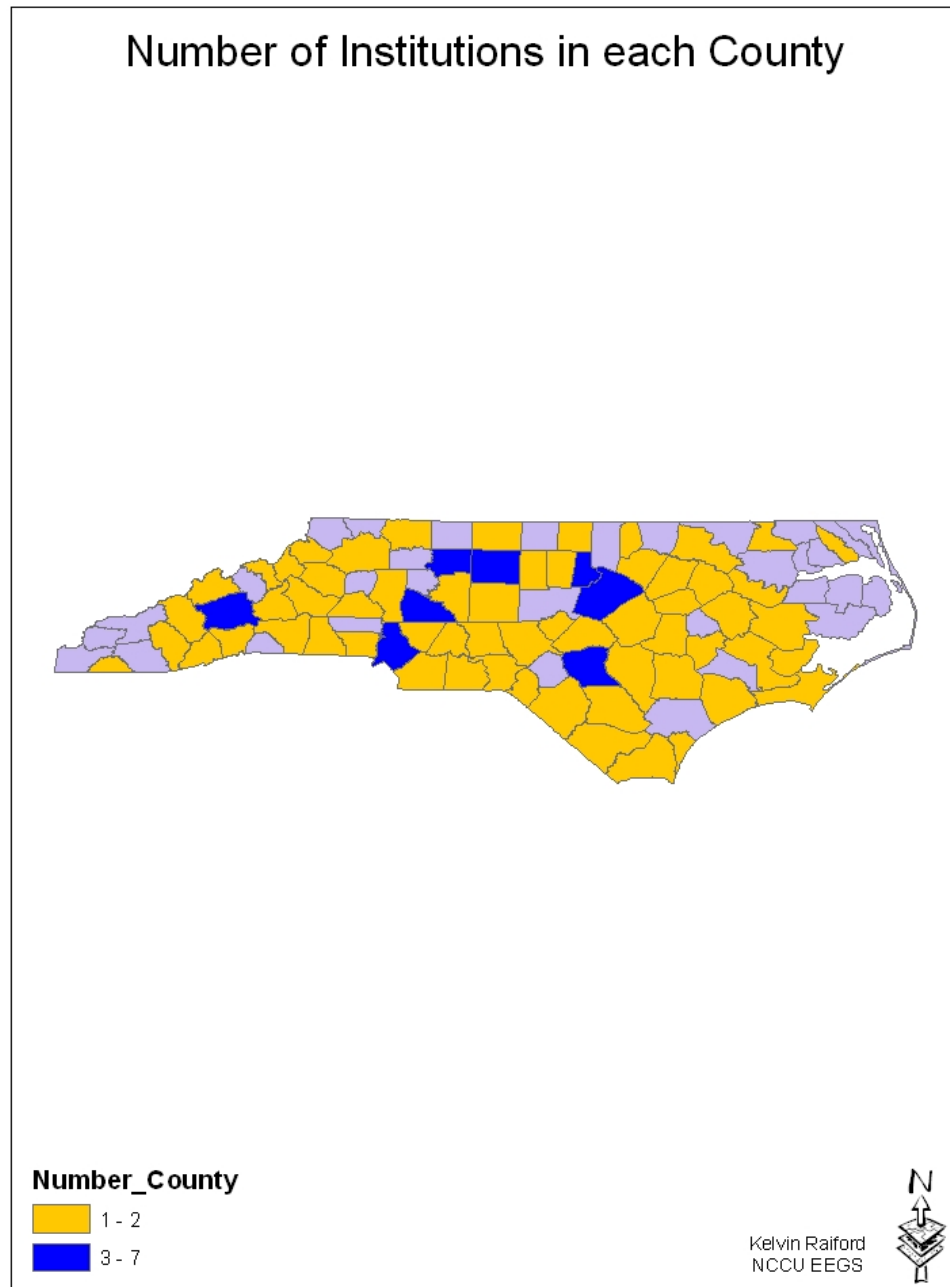


Figure 1. Institutions of Higher Education in North Carolina (county distribution)

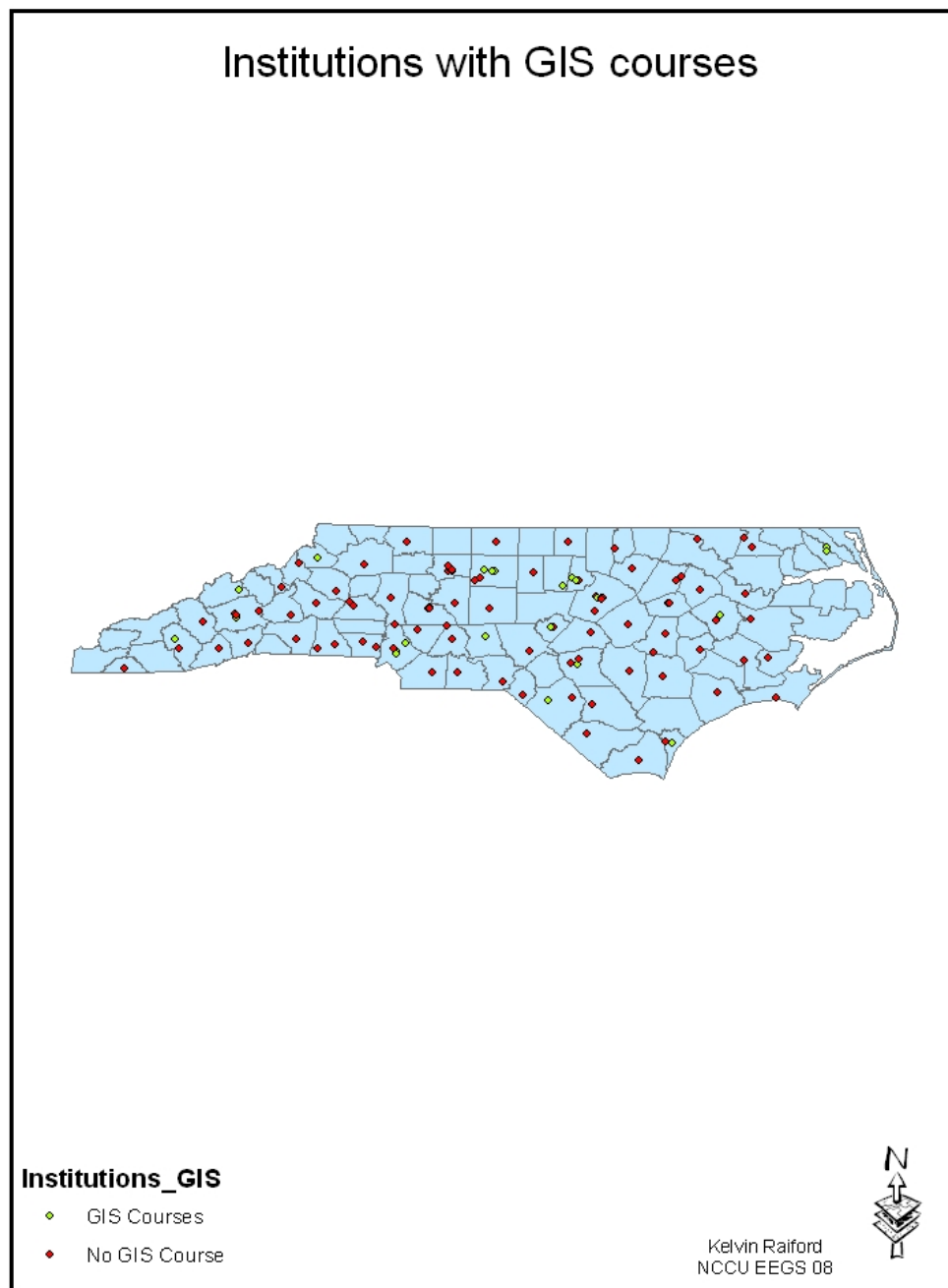


Figure 2. Institutions of Higher Education offering GIS Courses.

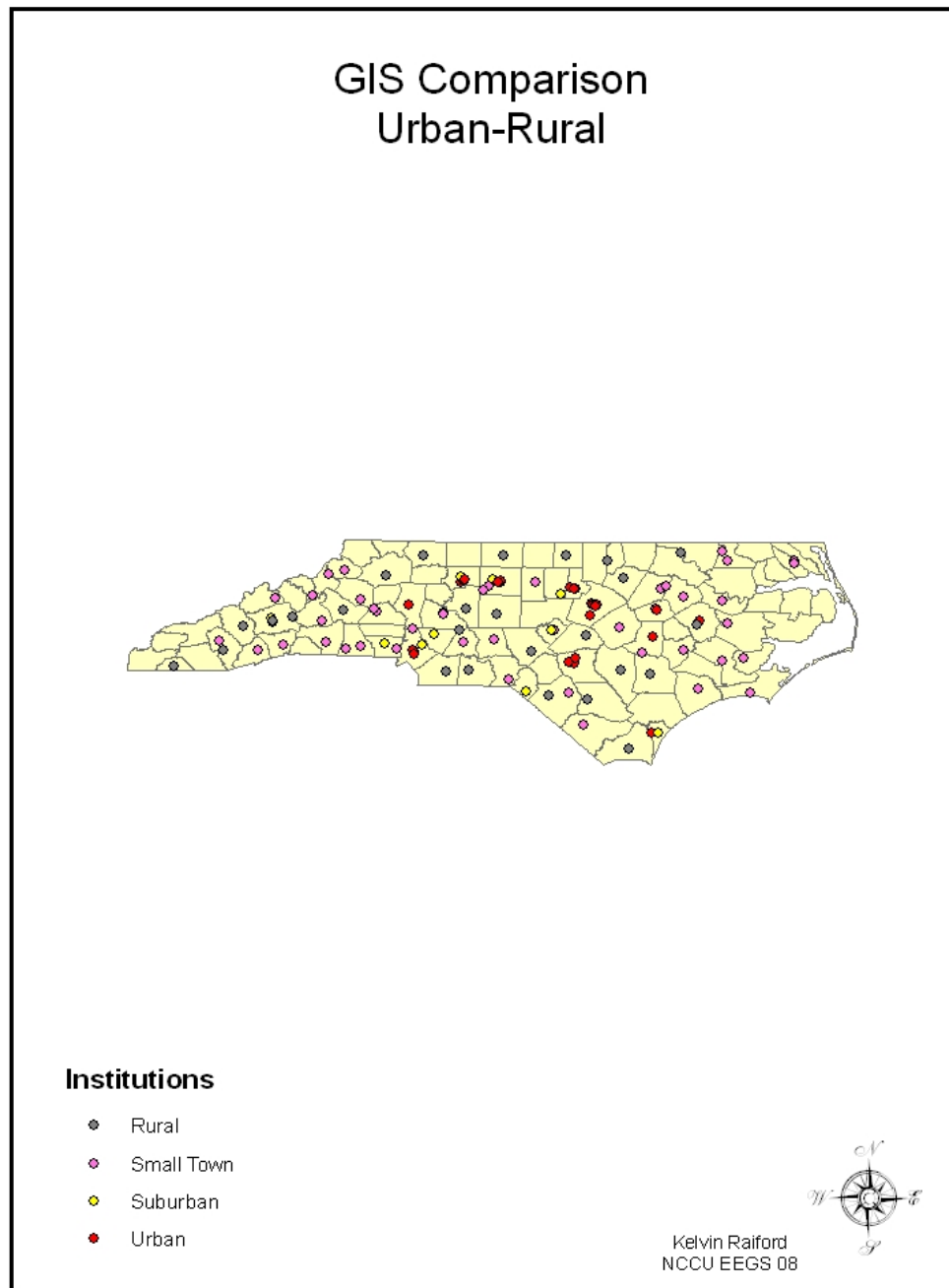


Figure 3. Urban / Rural comparison of Educational Institutions offering GIS courses.