

The Application of Geographic Information System (GIS) in Academic Success Center (ASC) of a Medium-sized Liberal Art University

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Abstract: *This research paper demonstrates the distribution and change of students' geographic origin in the Academic Success Center of a liberal art university from academic year 2015 to 2017. GIS (Geographic Information System) is used as the research tool, and maps are produced in accordance with the count of participants' home address zip code. Results imply that school districts, college recruitment offices and other centers or departments can attain straightforward images of the geographical distribution of their students. This research gives valuable insights on how educational researchers or administrators can use the GIS for recruitment and marketing purposes.*

Key Words: GIS, recruitment, marketing, educational research

INTRODUCTION

The Geographic information systems (GIS) are computer-based systems, which can be utilized to retrieve, analyze, synthesize, store, and represent graphical data for decision-making support. With the development of the GIS education, this research tool has gradually started to be employed in the field of educational research. On the other hand, demonstrating students' diversity on a regional map can provide a vision for school districts, institutions leaders and the associates. For example, internal use of maps of at-risk students origin might help recruitment staff tailor the fit-all design of the marketing plan, and might help teachers, tutors to redesign the teaching plan as well. As research has documented that at-risk and lower-achieve students are the ones who are more likely to drop out from school (e.g., Laskey & Hetzel, 2011; Valentine, Hirschy, Bremer, Novillo, Castellano, & Banister, 2011), many schools are trying hard to keep students in track and reduce the retention rate. However, very few or none internal or external research using spatial data and database attributes to reveal patterns and trends of student origins. Employing the GIS as the research tool, this paper demonstrated the geographic changes of the participants in the Academic Success Center (ASC) of the research site.

LITERATURE REVIEW

The GIS application has been found primarily in business, like for Walmart or other stores to locate a new site (e.g., Wiegand, 2001), and it is also widely used in Geography and transportation constructions (e.g., Gutiérrez, Condeço-Melhorado, & Martín, 2010). Unfortunately, quite a few social science studies in the field of education have employed the GIS as the research methodology. A search from the Google Scholar using key words “GIS” and “education”, results reveals that most majority of studies are demonstrating how to teach students and teachers using the GIS for education purposes (e.g., Johansson, 2003 June), with a small number of research with actual application of the GIS as the research methodology. These include an application in the public library services (e.g., Park, 2012), and two research used GIS to help institutions understand their students and improve the marketing strategy (e.g., Marble, Mora, & Herries, 1995, 1997; Price, 2004). Price’s (2004) applied GIS in educational recruitment and retention improvement. He evaluated the enrolled students in undergraduate engineering program of DeVry University to discover whether there was a relationship between retention and off campus residence, then he found and demonstrated the distance boundary around the Pomona campus of schools that met their criterion for marketing and recruiting purposes.

The GIS is functional and advantageous in display. The GIS uses spatial information in a set of layered maps, and this information on different layers can be manipulated and analyzed to show and compare to each other (Price, 2004). The GIS is a potential research and decision-making tool due to the unique ability to separate, manipulate and visualization of information into layers (Foote & Lynch, 2002). The GIS technology can integrate common database operations, including query and statistical analysis with the unique feature of maps for visualization and graphical analysis (Price, 2004), and also the GIS maps can display relationships between spatial data and database attributes to reveal hidden features and tendencies that are not apparent using basic spreadsheets or statistical packages.

RESEARCH QUESTIONS

This current research employed the GIS as the research tool to demonstrate the geographic changes of the participants in the Academic Success Center (ASC) of the research site. The research questions are: What are the geographic distribution features of the students in the Academic Success Center of the research site? What are the geographic features of the total number of ASC students in the three academic years?

RESEARCH METHOD

The research site is a medium sized private university, whose Academic Success Center is part of the Division of Academic Services. In this research, the author uses the data from the Academic Success Center, which consists of numbers of students and each of their home address zip code from academic year 2015 to 2017. By using Geographical Information System, a New-York-State-based zip code shape file is downloaded and utilized as the base map. The data explores the distributions of the participants with count number of participants from different zip code areas.

THE GIS MODEL DESIGN

DATA INPUT

1. The home address zip codes of the students in academic year 2015-17 are put into Excel files. The five-digit zip codes are transferred in to nine-digit zip codes, for higher accuracy concern.
2. State zip code shape files are prepared for application.
3. Excel files are joined into the State shape files and a second layer for individual academic year data will be produced.
4. Noticeable colors are applied in symbology of the ArcMap 10 to show the distribution of the population.
5. The GIS model design is illustrated as in Figure 1.

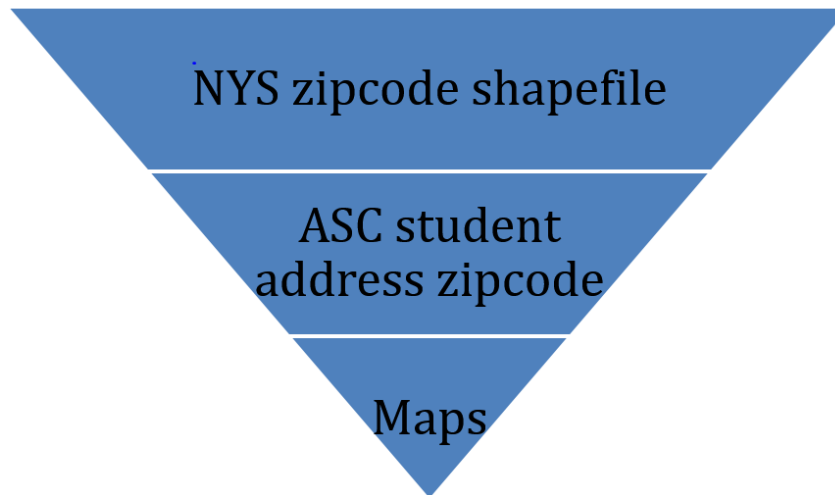


Figure 1. The GIS Model Design

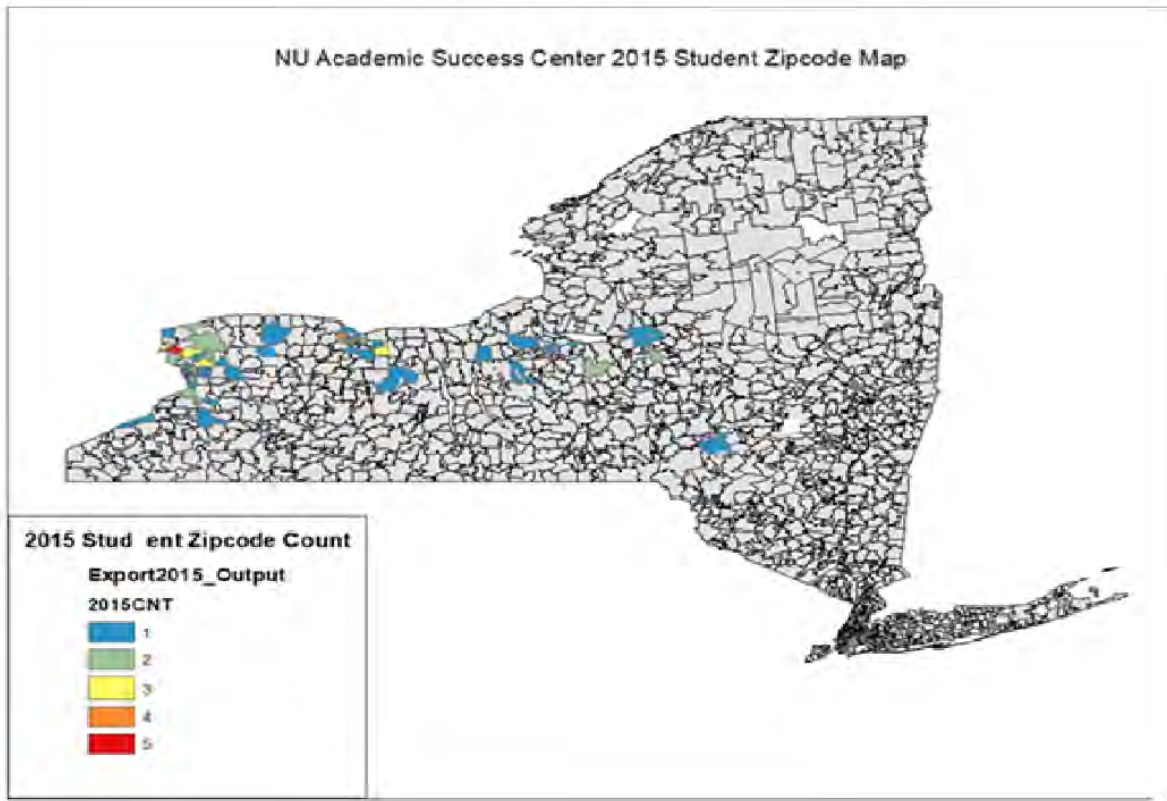
MAP OUTPUT

Four maps are generated using the data, which include:

- 1) One map shows the distribution of zip code count in academic year 2015.
- 2) One map shows the distribution of zip code count in academic year 2016.
- 3) One map shows the distribution of zip code count in academic year 2017.
- 4) One map shows the distribution of top areas with number of total students in the three years.

RESULTS

The origin dataset shows that there are 113, 112 and 93 students in Academic Success Center in 2015-17 respectively. After a close analysis of the data, the author found that majority of the students are from the State, therefore those students who are not from the State are deleted, and State 9-digit zip code shape file is employed. By joining the dataset into the state zip code shape file, three shape files regarding each academic year are produced and used as the second layer of each map. The count of the zip code demonstrates the students scattered in different places of the state. The following maps show the distribution features.



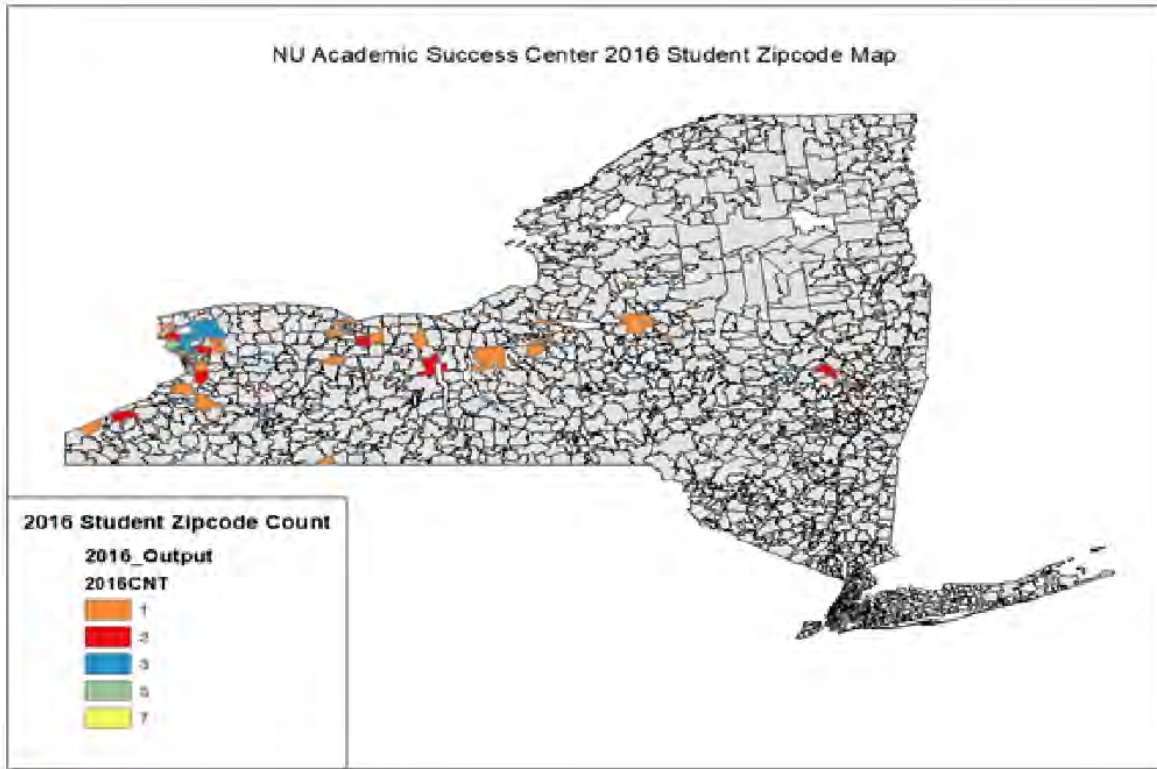
Map 1. ASC 2015 Student Zip code Map

Map 1 displays that the students are accumulated in the Greater Niagara¹, Finger Lakes² and Central New York³, with Niagara, Buffalo and Rochester are the cities with the most student count. However, only one or two students are from other areas.

¹ Including Erie, Genesee, Niagara, Orleans and Wyoming county

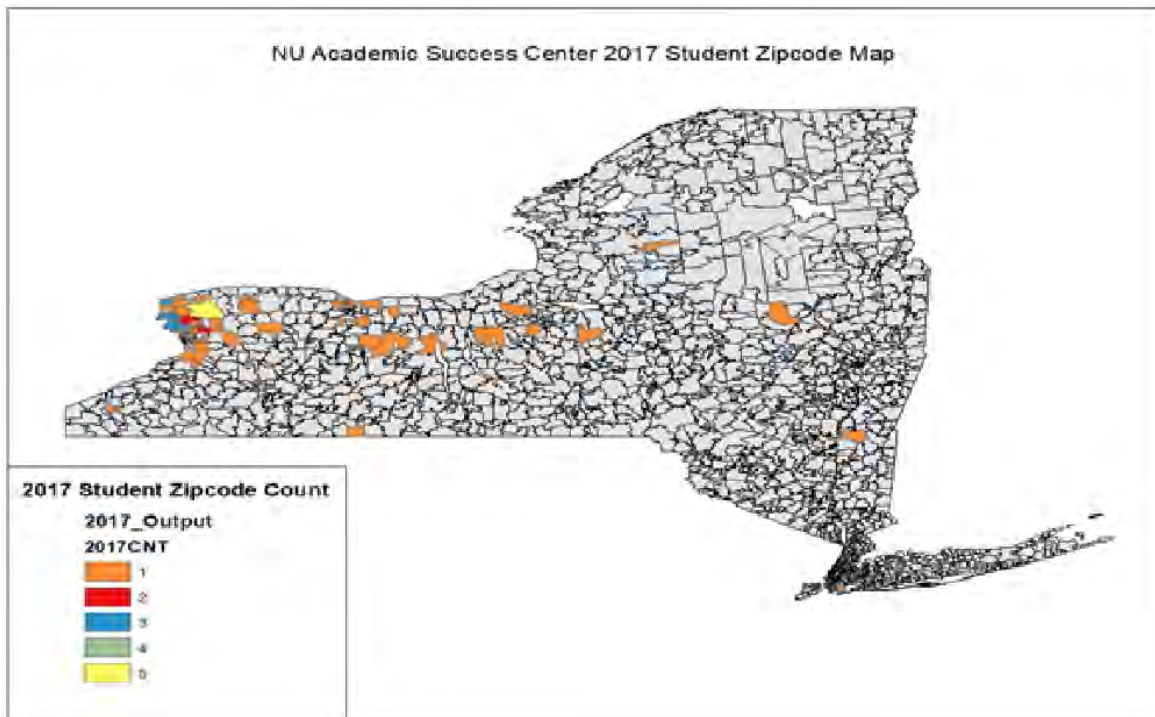
² From west to east they are: Conesus, Hemlock, Canadice, Honeoye, Canandaigua, Keuka, Seneca, Cayuga, Owasco, Skaneateles, and Otisco

³ Including Broome County, Chenango County, Herkimer County, Madison County, Montgomery County, Oneida County, Otsego County, Schoharie County; Binghamton, Norwich, Little Falls, Oneida, Amsterdam, Utica, Rome, Sherrill, Oneonta, Cooperstown, Cobleskill



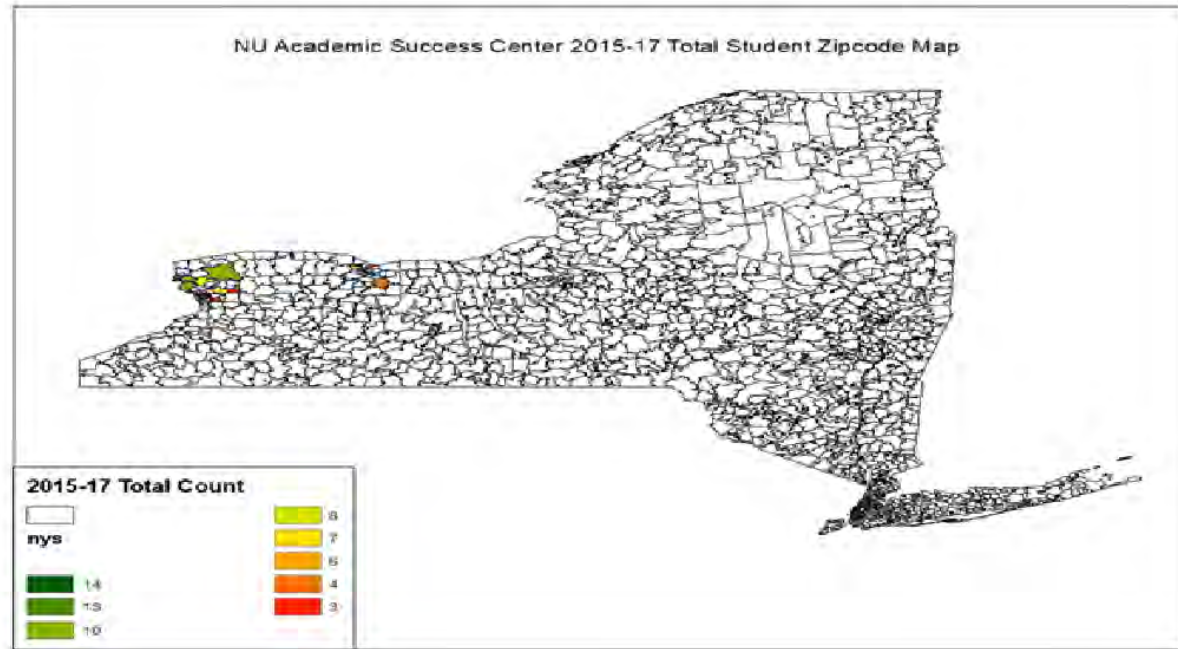
Map 2. ASC 2016 Student Zip code Map

Map 2 shows a similar feature, with Niagara, Buffalo and Genesee having the most count of ASC students, followed by Rochester and Erie. One or two students are from other areas.



Map 3. ASC 2017 Student Zip code Map

Map 3 displays the count of ACS students in 2017, which peaks in Niagara, Buffalo and Genesee areas with student scattering in some places Great Niagara, Finger Lakes and Central New York regions. One student representative is from most of the areas.



Map 4. Top Count Areas of ASC 2015-2017 Total Student Zip code Map

Map 4 summarizes the total count of the ASC students in 2015-17, and it demonstrates the overall feature of each academic year, with Great Niagara Region and Rochester city having the most student.

CONCLUSION

This research applied the GIS in the demonstration of academic success center students' origin of a medium-sized liberal art university. The results show that Greater Niagara, Finger Lakes and Central New York are the three main areas where academic success center students originated. One possible reason why the ASC students accumulated in Greater Niagara, Finger Lakes and Central New York is that these three areas are the actual major origin places of students. Another possible reason for this accumulation could be that students from these areas are of lower achievers due to the lower level of education, but further research is needed to prove this prediction. As a private regional university, it is reasonable that most students are from local or close area Great Niagara, followed by the Finger Lakes and Central New York. However, due to small number of the dataset and the lack of the total student zip code of the university, the research can neither generate the map of the whole student origins nor the locations of the ASC center students on the total student shape file, thus it fails in predicting the trend of the at-risk students of the research site. Another limitation is that the data from each of the three years are likely to be counting some of the same students, and students using the center may not all be at-risk or lower-achieving students.

Aside from the limitations, this research contributes to the insufficiency of educational literature using the GIS as research tool and implies that the GIS could be a useful tool for policy makers in educational field. Future studies can apply the GIS on the shape file of total student zip code of a school district or an institution to illustrate the diversity or other specific purposes like marketing and recruitment.

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