Assessing Barriers to Pursing a Degree in Geomatics Technology among Geomatics Students at the University of Florida

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SUMMARY

The purpose of this study is to examine student experiences in the University of Florida Geomatics program, with a particular focus on students participating in the GeT-STEM project. The GeT-STEM project supports students pursuing a BS degree in Geomatics technology by providing both financial as well as a suite of academic and professional development support programs. We conducted interviews with ten students who agreed to participate in research regarding the UF Geomatics program in general and the GeT-STEM project more specifically. The interviews were the first step in a multi-step, mixed-methods approach to data collection for students in the Geomatics program. The objective of the interviews was to assess the barriers such as financial, professional, academic, geographical (including proximity to education center), and cultural factors affecting the enrollment of low-income students pursuing full-time education in Geomatics technology. Preliminary qualitative data analysis revealed that the interviewed Geomatics generally have high levels of support for their enrollment in the UF Geomatics program and for their career goals going forward. Some students noted financial constraints as a major obstacle and many of them address this by working full time or relying on student loans and scholarships, including the GeT-STEM stipend. However, students also noted a lack of time as an obstacle to their pursuit of a degree in Geomatics, especially if they had outside work. Further analysis of this data will include line-by-line coding using relevant social science theoretical frameworks. This analysis will not only inform the progression of the GeT-STEM program but will also provide important insights for recruiting students into the UF Geomatics program in the future. In addition, we believe that these results, coupled with future iterations of data collection from students will be useful for other STEM programs interested in increasing student recruitment, enrollment, retention, and successful graduation.

1. INTRODUCTION

The purpose of this preliminary research is to examine student experiences in the University of Florida Geomatics program, funded by the GeT-STEM project. The GeT-STEM project provides financial support and a variety of academic and development opportunities for undergraduate students enrolled in the Geomatics program at UF. The project is designed to support low-income students enrolled in the Geomatics program and expand their skills and professional capabilities. Throughout the project, the PI and Co-PIs plan to gather data regarding the barriers and opportunities facing Geomatics students, especially in the context of the recruitment and retention of low-income undergraduate students.

Previous research regarding the barriers facing low-income college students has established that a number of important factors can interact to shape students' ability to and perceptions of enrolling in college in general and STEM degrees more specifically. While much of this research has focused on the enrollment choice as an end goal, comparatively fewer studies have examined barriers and obstacles following enrollment (Cox 2016; also see Tierney and Venegas 2009). Our preliminary research regarding Geomatics students at the University of Florida, with a specific focus on those enrolled in the GeT-STEM project, builds on this research by asking: What are barriers, such as the financial, professional, academic, geographical (including proximity to education center), and cultural factors, affecting the enrollment of low-income students pursuing full-time education in Geomatics technology? To address this question, we conducted interviews with students who were in the UF Geomatics program in December of 2022. Students were asked about topics including their levels of confidence in Geomatics required courses, their motivations for applying to the UF Geomatics program, and what types of barriers or obstacles they faced in pursuing a degree in Geomatics.

Our findings suggest that students had generally high levels of support in their pursuit of a degree in Geomatics. They had varying levels of confidence in the required courses for the degree, but generally did not describe significant lack of confidence in any of the categories. Most barriers and obstacles faced included time constraints, financial constraints, and navigating full time employment while enrolled

2. THEORETICAL FRAMEWORK

We know that low-income students are less likely to graduate with a STEM degree than students who do not experience financial need (NASEM 2016). In addition, various support systems for low-income students can be a significant factor in determining whether they pursue and complete a STEM degree (Garrison and Vaughan 2008; Jones and Dindia 2004; Mooney and Rivas-Drake 2008; Whitney et al. 2005). Finally, a lack of meaningful institutional support can pose a considerable challenge for low-income and transfer students (Clancy et al. 2017; Nelson et al. 2017; Wang 2021). These types of support can include

mentoring, advising, and the availability of professional opportunities. The GeT-STEM project specifically investigates how utilizing a geographically distributed education system will mitigate barriers faced by low-income transfer students including, financial burdens, psychological and cultural perceptions, and structural constraints.

Extant research regarding low-income students' barriers to college education in general has traditionally and historically relied on linear, logic-based frameworks to analyze this populations' experiences and perceptions of college enrollment (see CITES). Yet, more recent work has suggested taking a step away from traditional choice models to embrace a more cultural ecological model for understanding how students navigate various barriers to college enrollment in a variety of contexts (Tierney and Venegas 2009). In addition, previous work has focused on the choice of college program and enrollment for students experiencing financial instability or need, but gloss over the barriers and obstacles they need to navigate following the choice to enroll. Cox (2016) noted that transportation, housing costs, and expenditures associated with pursuing education (e.g., books, materials, fees) were ongoing issues low-income students needed to manage, affecting the likelihood they would remain enrolled to graduation. Additional and potentially complicating factors such as first-generation college student status, geographical background (i.e., rural versus urban), gender, and racial/ethnic background can affect students' choices to pursue, enroll, and graduate from STEM programs (see for examples Acevedo-Gil 2017; Holland 2020; Sims and Ferrare 2021).

Our research regarding Geomatics students at the University of Florida, with a specific focus on those enrolled in the GeT-STEM project, builds on this research by asking: What are barriers, such as the financial, professional, academic, geographical (including proximity to education center), and cultural factors, affecting the enrollment of low-income students pursuing full-time education in Geomatics technology?

3. METHODS

To begin answering this question, the first and second authors conducted interviews with ten students who agreed to participate in research regarding the Geomatics program at UF in general, and the GeT-STEM project more specifically. The interviews were the first step in a multi-step, mixed-methods approach to data collection for students in the Geomatics program. The objective of the interviews was to assess the barriers such as financial, professional, academic, geographical (including proximity to education center), and cultural factors affecting the enrollment of low-income students pursuing full-time education in Geomatics technology. Students ranged in ages, backgrounds, and experience, including traditional college-age students and working professionals who are going back to school mid- or late-career. Students were asked about topics including their levels of confidence in Geomatics required courses, their motivations for applying to the UF Geomatics program, and what types of barriers or obstacles they faced in pursuing a degree in Geomatics. The interviews were conducted via Zoom in December of 2022. The interviews lasted between 20 minutes and one hour. The data collection instrument and procedures were approved by the University of

Florida Institutional Review Board, and all participating students were made aware of their rights as participants in this research.

Students were first asked to describe themselves including topics such as their educational and professional backgrounds, race/gender identity/age, their families' socio-economic status, and their interest in STEM topics. After the introductory exchange, the following questions were posed to interview the participants:

1. What has contributed to your success as a person?
2. What has contributed to your success in being admitted to the UF Geomatics program?
3. How confident are you in your ability to succeed in the subjects required for transfer admission or to start upper-level Geomatics coursework? (mathematics, computer programming, communication, physics, economics)
4. What kinds of extracurricular activities have you been involved in that helped you be admitted to the Geomatics program?
5. What kinds of extracurricular activities would you be interested in getting involved in going forward?
6. What is your main motivation for pursuing a degree in Geomatics technology?
7. Did scholarship opportunities influence your decision to pursue this major/career area?
8. Are you enrolled in the GeT-STEM program? If yes, what are your goals for your engagement in the GeT-STEM activities? What do you hope to learn/get out of your time here?
9. What do you want to do after you graduate?
10. What do you think would help you to be successful in this program?
11. Are you interested in mentorship?
12. What would a successful mentoring relationship look like to you?
13. What are some of the barriers and motivations you've had when deciding to pursue a degree in Geomatics?
14. Do you know others in this field or program?
15. How supportive are your friends, family members, or academic advisors in your pursuit of a degree in this program? Please explain.

4. RESULTS AND CONCLUSIONS

Students ranged in ages, backgrounds, and experience, including traditional college-age students and working professionals who are going back to school mid- or late-career. Preliminary qualitative data analysis revealed that the interviewed Geomatics students generally have high levels of support for their enrollment in the UF Geomatics program and for their career goals going forward. Some students noted financial constraints as a major obstacle and many of them address this by working full time or relying on student loans and scholarships, including the GeT-STEM stipend. However, students also noted a lack of time as an obstacle to their pursuit of a degree in Geomatics, especially if they had outside work.

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Further analysis of this data will include line-by-line coding using relevant social science theoretical frameworks. This analysis will not only inform the progression of the GeT-STEM program but will also provide important insights for recruiting students into the UF Geomatics program in the future. In addition, we believe that these results, coupled with future iterations of data collection from students will be useful for other STEM programs interested in increasing low-income student recruitment, enrollment, retention, and successful graduation.

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BIOGRAPHICAL NOTES

Alison E. Adams is Assistant Professor of Community & Environmental Sociology in the School of Forest, Fisheries, and Geomatics Sciences and the School of Natural Resources and Environment at the University of Florida. Her work has been published in sociological journals such as *Social Forces* and *Social Currents*, sub-disciplinary journals such as *Environmental Sociology* and *Environmental Justice*, and interdisciplinary journals such as *Environmental Politics* and *Agriculture & Human Values*. In 2021, she was selected for the UF College of Agricultural and Life Sciences' *Early Career Excellence in Teaching Award*, and in 2022 she was selected for the Southern Sociological Association's *Junior Scholar Award*.

Deb Barry has been a faculty member in the Department of Agricultural Education and Communication at the University of Florida since 2016. She is located at the UF/IFAS GCREC in Plant City, Florida. Before her current role as an Assistant Professor, she was a Lecturer and Academic Advisor. Before coming to UF, Deb was a high school agriscience teacher for thirteen years. She has published peer-reviewed journal articles in a variety of journals, including the Journal of Agricultural Education and Advancements in Agricultural Development. Deb is an active member of NACTA and AAAE, and most recently recognized in 2022 with a NACTA Educator Award.

Amr Abd-Elrahman is a Geomatics Professor and Program Advisor at the University of Florida's (UF) Gulf Coast Research and Education Center (GCREC) Abd-Elrahman earned his BS in Civil Engineering and MS in Surveying/Digital Mapping from Ain Shams University, Cairo, Egypt. He received his Ph.D. in Civil Engineering - Geomatics concentration, with a minor in Computer and Information Science Engineering, from the University of Florida. Dr. Abd-Elrahman leads the NSF-funded GeT-STEM project at the University of Florida. He serves as the Vice President of the American Society for Photogrammetry and Remote Sensing (ASPRS). Dr. Abd-Elrahman is the recipient of the ASPRS Fellow Award, the Florida Surveying and Mapping Society Professional Excellence Award, the UF College of Agricultural and Life Sciences Graduate Advisor of the Year

Award, North American Colleges and Teachers of Agriculture (NACTA) Teaching Scholar Award, the UF Term Professorship Award; and the NACTA Teacher Fellow Award.

Henry Hochmair is a Professor of Geomatics with UF. His research expertise includes the analysis big data, such as social media data or GPS tracking data, and the quality assessment of such data. He published over 65 peer reviewed journal papers and is an Associate Editor of the ISPRS International Journal of Geo-Information. He is a recipient of a University Term Professorship Award and a NACTA Excellence in Teaching and Learning with Technology Award.

Ben Wilkinson is an Associate Professor in the Geomatics Program at the University of Florida. He is a coauthor of 50 peer-reviewed journal articles, and has served on over 50 graduate student committees. At UF, he is the instructor for the intro and advanced photogrammetry courses, a course on UAS mapping, and senior project. He is a coauthor of the textbook Elements of Photogrammetry with Applications in GIS. He is currently the director of the Photogrammetric Applications Division in the American Society for Photogrammetry and Remote Sensing.

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