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BOARD # 304: The Effect on Students' Attitudes toward Graduate Education and Transportation-related Fields in the Research for Inclusivity and Driving Equity (RIDE) REU Site

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Betty Annan is a PhD student in the Higher Education program at the College of Education at the University of Massachusetts Amherst. Betty is also the Research Assistant/Program Coordinator for the NSF RIDE (Research for Inclusivity and Driving Equity) REU Site. Her research centers on improving college access and success for students who are globally underrepresented in higher education systems. She focuses on uncovering institutional policies and practices that influence these students' persistence and completion while celebrating the strengths they bring to campuses.

Throughout her academic journey and career, Betty has actively contributed to projects and programs designed to support underrepresented students, helping them navigate their educational paths and achieve their goals. Her dedication stems from her unwavering belief in the transformative power of education. She is driven by her desire to foster inclusive environments where every individual can thrive.

The Effect on Students' Attitudes Toward Graduate Education and Transportation-related Fields in the Research for Inclusivity and Driving Equity (RIDE) REU Site

Introduction

It is of paramount importance for policymakers to reduce disparities in transportation access that disproportionately harm underserved and underrepresented groups. Barriers to access have detrimental effects on the employment, education, food, and healthcare of low-income households and underserved communities [1,2]. These communities are also more likely to delay medical care due to limitations in transportation services [2]. Additionally, involving Black, Indigenous, and Latino/a students in Science, Technology, Engineering, and Mathematics (STEM) research that improves the experiences of underserved and underrepresented communities is significant for their retention, as well as for their education and career advancement [3-5]. In line with its goal to support science and engineering research, the National Science Foundation funded the Research for Inclusivity and Driving Equity (RIDE) Research Experience for Undergraduates (REU) Site under grant number 2150204.

The RIDE REU Site aims to provide undergraduate students with an immersive and interdisciplinary experience in community-engaged research focused on improving the transportation experience of underserved and underrepresented communities. The site aims to **engage** a diverse pool of undergraduate students in transportation research; **expose and educate** undergraduate students on convergent research that affects their communities' transportation decisions; **encourage** undergraduate students to pursue graduate research in transportation-related fields; and **enrich** the undergraduate student experience through lifelong mentoring.

The RIDE REU Site in Context

A unique feature of the RIDE REU is its focus on *community-engaged research* that improves the transportation and travel experience for underserved and underrepresented communities. At the core of community-engaged research is the collaboration between researchers and community members throughout the research process [6,7]. Researchers gain in-depth insight into the interests and needs of the broader community, and community partners are empowered to participate in the production of scientific knowledge [6,7]. Thus, RIDE develops the next generation of scientists and engineers by providing them the knowledge necessary to design transportation systems that better serve communities, formulate transportation policies and regulations that lead to more equitable transportation outcomes, and help bridge communication gaps across disciplines, as well as between academia, transportation professionals, and communities of interest.

Furthermore, the RIDE REU interdisciplinary projects have their own intellectual value. They advance knowledge and understanding of an understudied problem or apply novel tools and techniques to solve real-world problems. Recent examples of RIDE REU projects include: 1) ***Quantifying the impact of bridge and road condition on drivers and residents in vulnerable***

communities: Through geospatial analysis using GIS, REU students examined Massachusetts Environmental Justice Communities and exposure to deteriorated infrastructure. 2) ***Developing a campus accessibility map:*** REU students worked with campus partners to enhance the existing campus map by digitizing detailed ADA-compliant features and facilities across the campus. 3) ***Improving safe driving media campaigns using psychology and demographic targeting*****:** REU students examined traffic safety campaigns and aligned psychological principles to enhance communication. They also analyzed crash data to explore which demographic groups are more susceptible to unsafe behaviors.

Another focus of the RIDE REU is its emphasis on student mentoring and interactions. RIDE students work with faculty and graduate student mentors, who supervise students' daily activities. Graduate student mentors work closely with RIDE students on methods, data collection, software training, and data analysis. Faculty mentors assist REU students in developing research questions and regularly meet with the REU student and graduate student mentor to discuss fundamental research progress and the best methods for team communication.

A distinctive program component is the RIDE REU student recruitment and selection process. Given the program's strong and deliberate focus on recruiting Black, Indigenous, and Latino/a students and women, its primary recruitment strategy is to develop and maintain relationships with faculty and administrators at diverse schools, including Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), Community Colleges, Women's Colleges, and high schools. In partnership with the College of Engineering DEI Office and the external evaluator, the REU site designs and implements a formative and summative evaluation [8,9] every year and at the end of the program.

Program Structure

The RIDE REU site has been active for two years (summer 2023 and 2024). Students arrive on campus in June and are housed in a dormitory for 9-10 weeks. Students also receive one free meal a day and a stipend for the 10 weeks. At the first session of the *professional development and communication* seminar, program directors define harassment and discrimination policies and articulate expectations of professional behavior. Responsible conduct of research is discussed, and the REU students complete an online training primer developed specifically for undergraduates participating in NSF-funded research. The other seminars focus on topics such as community-engaged research, implicit biases and microaggressions, technical communication skills, effective presentations, preparing effective research figures and images, and preparing technical posters. An additional seminar in week 10 covers effective science communication to non-scientists. REU students also engage in technical seminars focusing on *innovative transportation tools and techniques*. REU students take field trips to regional, state, and federal transportation agencies, as well as transportation design and consulting firms, and advocacy groups, to provide the background knowledge necessary for performing their research and situating their specific projects within a broader context. Beyond these formal activities, the DEI Office facilitates opportunities for RIDE participants to interact socially during their free time to build a supportive community. Additionally, at the end of the summer, students participate in a campus-wide poster presentation for all undergraduate students.

Program Evaluation

The RIDE REU site collects data from multiple sources to assess the program's impact on students' attitudes and knowledge about graduate education, transportation-related fields, and STEM education in general. Each year, before the REU program begins, students complete a pre-survey that helps RIDE administrators understand students' perspectives and backgrounds. At the end of the program, REU students participate in a post-survey related to their experiences and perspectives. In addition to the post-survey, the external evaluator leads a focus group discussion with REU students to gather further information. Data from student applications is used to collect critical information, such as student demographics. Faculty mentors and graduate student mentors complete a survey about their mentoring experiences at the end of the program. Mentors also provide feedback on REU student research, including poster presentation sessions.

Results

The major goal of the RIDE REU site is to recruit a diverse group of students. The objective is to recruit at least 50% women, 50% Black, Indigenous, and Latino/a students, 60% from outside the host university, and 50% from institutions with limited STEM research opportunities. In 2023, the site recruited 7 (70%) women, 7 (70%) Black, Indigenous, and Latino/a students, 9 (90%) students from outside the host university, and 3 (30%) students from institutions with limited STEM research opportunities. In 2024, 8 (50%) women, 8 (50%) Black, Indigenous, and Latino/a students, 10 (63%) students from outside the host university, and 7 (44%) students from institutions with limited STEM research opportunities participated in the RIDE REU program.

Another goal of the RIDE REU program is to expose undergraduate students to convergent research that affects their communities' transportation outcomes. Drawing on survey data, the program increased participants' knowledge of the research process in 2023 and 2024. Specifically, a vast majority of our 2023 cohort (90%) and everyone in the 2024 cohort indicated they were "not at all knowledgeable," "slightly knowledgeable," or "somewhat knowledgeable" about the research process before participating in the RIDE REU program. However, after completing the program, 90% and 82% in 2023 and 2024 respectively, indicated they were "knowledgeable" or "very knowledgeable" about the research process. One participant of a RIDE REU focus group explained, "I didn't know what research was before I got here. I learned what it is and that I want to do it. Now I'm a lot more interested in research. I know the parts I like and the parts I don't like." Another said that the "hands-on approach" of the program facilitated their learning, and they enjoyed working in a setting where they could make mistakes without worrying about grades. Three peer-reviewed publications are under review/have been published with RIDE REU students as co-authors. One REU student and her graduate student mentor won a poster competition at a professional association poster symposium in 2023.

To assess students' research skills after the program, faculty and graduate students are asked to provide informal feedback on the REU student poster session. During the summer 2024 poster session, one faculty mentor said, "I am genuinely impressed by how much these students were able to complete in such a short time. They really know their research project in and out. I never heard [my REU student] practice their elevator pitch before today, but [the student] did a great job explaining the research to a lay audience."

The third goal of RIDE is to encourage undergraduate students to pursue graduate studies in transportation-related fields. Survey data from our 2023 cohort reveal that before the program, 40% were "somewhat likely" or "very likely" to attend graduate school. This proportion increased to 80% post-survey, indicating the program effectively encouraged students to pursue graduate school. This finding contrasts with data from summer 2024, which shows that participants' interest in enrolling in graduate school declined during the program. Before the program, 100% of participants said it was either "somewhat likely" or "very likely" that they would attend graduate school. This proportion decreased to 75% in the post-survey. The decrease could be due to a variety of factors, including a ceiling effect or a response-shift bias. Additionally, it is possible that students' exposure to research through the RIDE REU program enabled them to discover alternative career paths beyond graduate school.

The RIDE REU program assessed participants' likelihood of pursuing a degree in a transportation-related field if they were to pursue graduate school. In 2023, 20% of respondents indicated that it was "somewhat unlikely" or "very unlikely" that they would enroll in a transportation-related graduate program on the pre-survey. This proportion grew to 60% in the post-survey. One individual remarked, "I learned that this field isn't right for me. It was a formative experience, and I'm grateful I did it." However, survey data from our 2024 cohort show a small increase in the reported likelihood that respondents would pursue a graduate degree in a transportation-related field. Specifically, the proportion of respondents who said it was "somewhat unlikely" that they would study a field related to transportation decreased from 33% to 17%, while the proportion who indicated it was "somewhat likely" increased from 17% to 25%.

The final goal of the RIDE REU program is to enrich the undergraduate experience with lifelong mentoring. Evaluation data from 2023 and 2024 reveal that program participants made meaningful connections with their faculty and graduate student mentors. In both years, RIDE REU program participants said they generally had positive relationships with these mentors. Most respondents praised their availability, support, and communication. Likewise, the annual mentor survey reflects that faculty and graduate student mentors made meaningful connections with their RIDE mentees. Specifically, all mentors said they were genuinely interested in understanding the interests and goals of their mentees. Similar proportions of mentors also reported that they provided regular feedback to their RIDE mentees (96%), welcomed feedback from RIDE mentees (98%), supported RIDE mentees in their professional development (96%), and their relationships with RIDE mentees added meaningful value to their experiences in the program (92%).

Conclusion

Over the past two years, the RIDE REU site has successfully evolved into a program that offers undergraduate students the opportunity to engage in research while exploring careers in STEM fields. The RIDE REU program has engaged Black, Indigenous, and Latino/a students, women, and students from non-R1 institutions, in community-engaged research and has supported them in developing research and other professional skills. The program has also provided these undergraduate students with information about pursuing graduate education and careers in

transportation-related fields. The relationships that students build with their faculty mentors, graduate student mentors, and peers foster a supportive community that promotes lifelong learning.

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