Retrospective Analysis of Minority Students' Knowledge Change After Watching the Recorded Virtual Diversity in Entomology and Ag STEM Careers Symposium.

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Introduction and Background

Embracing diversity and equity in agricultural and natural resource sciences presents a challenge, as Black and Hispanic students consistently comprise only 3-8% of graduate students enrolled in these programs (Dika & D'Amico, 2016). The lack of access to meaningful research experiences in STEM for underrepresented minority (URM) students contributes to these low numbers. Increasing access through undergraduate internships can help bridge this gap (Schultz et al., 2011). Moreover, typical institutional practices do not sufficiently accommodate nontraditional students, who make up a large portion of students at Minority Serving Institutions (MSIs), such as first-generation students or those from disadvantaged socioeconomic backgrounds (Choy, 2002). These students often lack the academic, financial, and social support necessary for success in higher education programs (National Academies of Sciences, Engineering, and Medicine [NASEM], 2019). To address these challenges, integrating diverse disciplinary fields—including agricultural education, plant science, ecology, landscape architecture, communication arts, and engineering— is crucial (Didham et al., 2020). Such integration can drive convergence research, where deep knowledge shared across fields fosters innovation in questions, approaches, techniques, and outcomes (NASEM, 2019). Conducting convergence research requires the strategic application of team science principles (National Research Council, 2015). These approaches and skills are highly transferable, making graduate training in entomology a gateway to careers in agriculture, conservation, public health, biotechnology, medicine, and education. URM students have demonstrated innovation at higher rates than their peers (Hofstra et al., 2020), underscoring the importance of creating a diverse workforce for addressing complex and transdisciplinary research topics. Additionally, URM students are more likely to pursue science careers when they can apply the scientific method to solve global challenges (Kalev et al., 2006). By exploring the biodiversity crisis, students can engage in meaningful work that provides sustained, positive societal contributions (Whittaker & Montgomery, 2012; Estrada et al., 2011).

Purpose and Objectives

The evaluation research aims to assess the change in minority students' knowledge after viewing the recorded virtual Diversity in Entomology and Ag STEM Careers Symposium. This study focuses on their career pathway decisions, interest in pursuing a graduate degree in Entomology or an Ag STEM field, and future career preferences. The research is guided by two objectives: (1) To determine the participants' knowledge change regarding their career path decisions after watching the recorded symposium, and (2) To evaluate the participants' knowledge change concerning their graduate degree program in Entomology or an Ag STEM field and their future career preferences following the symposium.

Method

The Careers Symposium team invited approximately 300 undergraduate students from five minority-serving institutions to participate in the recorded virtual Diversity in Entomology & Ag STEM Careers Symposium. Following the event, the study aimed to assess the students' knowledge regarding career path decisions, Entomology and Ag STEM graduate programs, and career opportunities within these fields. To evaluate the knowledge change among minority students after watching the recorded symposium, we employed a retrospective (post-pre) online survey design. The survey focused on students' understanding of career paths after completing their undergraduate education, knowledge of graduate school and programs in Entomology and Ag STEM, and career interests within these disciplines. We used the Lexis et al. (2021) scale to

measure participants' perceptions of their career paths post-graduation and the Adedokun et al. (2013) scale to assess their preferences for graduate education and careers. Both scales utilized a 4-point Likert-type format, ranging from 1 (strongly disagree) to 4 (strongly agree). Data collection followed the Dillman et al. (2014) method, where the online survey link was shared with the recorded symposium. Four email reminders were also sent to all prospective participants on the listserv over six weeks. Fifty-six participants completed the survey. After data cleaning, 41 responses (73.2%) were retained for analysis. Cronbach's alpha for the two scales was .76, .92, and .94, respectively. We applied the paired t-test to measure the change in participants' perceptions based on their understanding of career path decisions after completing their undergraduate program. The paired t-test was also used to determine the change in participants' knowledge about their graduate degree program in Entomology or an Ag STEM field and their future job or career preferences before and after watching recorded symposiums. The symposium aimed to determine how students' decision-making regarding education and career paths changed before and after participation.

Results and Implications.

The findings revealed a significant increase in participants' career path decision-making scores, with a mean difference of .172 ($p = .046$). Specifically, the pre-test mean score of 2.95 ($SD = .76$) increased to 3.14 ($SD = .77$) in the post-test. This result suggests the symposium positively impacted participants' clarity and direction concerning their educational and career choices. The second research question assessed how students' knowledge about pursuing graduate education changed after the symposium. The results showed a significant increase in participants' knowledge, with a mean difference of -.334 ($p = .007$), as their scores improved from a pre-test mean of 2.97 ($SD = 0.85$) to a post-test mean of 3.30 ($SD = .71$). This improvement indicates that the symposium was effective in enhancing participants' understanding of key aspects of graduate education, including the application process, program requirements, and potential career paths Study limitations were unexpected attrition during the test, with some participants dropping out due to unforeseen circumstances. Also, participants were not exposed to other programmatic treatments during the recorded symposium time frame. This sequestering condition suggests that the increase in post-test scores compared to pre-test scores likely resulted from the symposium's influence on participants' career path decisions. By offering structured guidance and diverse perspectives, such programs can help URM students make more informed decisions about their education and careers. This aligns with Lipuma and Leon (2022), who emphasized the importance of inclusive and interdisciplinary educational practices in fostering diversity within STEM fields. The increased knowledge observed in this study suggests that the symposium successfully addressed critical gaps in participants' understanding of graduate education, which is essential for URM students who may lack access to comprehensive guidance on these topics. Furthermore, Diaz et al. (2023) highlight the importance of such interventions in helping students navigate the complexities of graduate education, particularly in STEM fields. By focusing on demystifying the graduate school application process and providing detailed information on the distinctions between master's and doctoral degrees, such programs can play a crucial role in increasing the number of URM students who pursue advanced degrees, thereby contributing to greater diversity within STEM fields (Marshall et al., 2022).

Future Plans and Resources Needed

The research team plans to pursue larger graduate training grants to design a robust pipeline for recruitment and training for URM students to Penn State graduate Ag STEM programs. We plan to incentivize prospective program participants to continue measuring the program's effect.

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