The Relationship Between Secondary Students' Experiences With STEM Teachers and Their Choice of Postsecondary STEM Major

Amanda Taggart, Utah State University, United States

The Korean Conference on Education 2024
Official Conference Proceedings

Abstract
This study examined the influence of high school teachers' perceived treatment of students on their eventual choice of college major in a science, technology, engineering, or mathematics (STEM) field. Logistic regression was used to identify variables associated with choosing postsecondary STEM majors among students who considered STEM majors while in high school. Data were drawn from a nationally representative sample of students from the High School Longitudinal Study (HSLS: 2009) data set in the United States. Results indicated that high school students who considered majoring in a STEM field once they were in college were less likely to actually do so when they perceived their high school math and science teachers to exhibit disrespectful, differential, or discriminatory behavior toward different students. Findings suggest that such experiences with STEM teachers at the secondary level may contribute to the deterrence of choosing a STEM major at the postsecondary level. Given that STEM-related occupations are projected to grow at over double the rate of non-STEM occupations over the next several years and that a large percentage of STEM occupations require a bachelor's degree, it is imperative that education systems work to produce students who persist in STEM majors. Results of this study may help to offer a better understanding of the pre-college discriminatory experiences that may influence students' decisions to earn bachelor's degrees in STEM fields during college.

Keywords: STEM, Students, Teachers, Discrimination

Introduction

During the 2021-2022 academic year, nearly one-quarter of bachelor's degrees awarded in the United States (U.S.) were conferred in science, technology, engineering, or mathematics (STEM) (National Center for Education Statistics, 2024). Nevertheless, over half of postsecondary students who initially declare a STEM major change their field of study, which occurs at higher rates than for non-STEM majors (National Center for Education Statistics, 2017). Furthermore, since the COVID-19 pandemic, mathematics and science test scores for K-12 students have declined to their lowest levels in 20 years (National Science Board, 2024a). These events are occurring as the nation faces a projected STEM labor shortage (Boggs et al., 2022).

As such, there have been calls at both the private and governmental levels to improve educational success in STEM fields in order to augment workforce development and to assist the nation in remaining competitive at the international level (National Research Council, 2011; National Science and Technology Council, 2018; West, 2023). Recommendations to achieve these goals include diversifying the population of students and workers in STEM, including women and underrepresented minorities, who currently enter STEM fields at lower rates than White students and workers (National Center for Education Statistics, 2024; National Science Board, 2021; National Science Board, 2024a).

In response to the need for an increase in STEM participation, scholars have examined various factors that may impact STEM involvement among postsecondary students, including demographic variables such as gender, race, and socioeconomic status (SES; e.g., Chen, 2013; Crisp et al., 2009; Griffith, 2010); pre-college variables such as high school academic achievement and teacher influence (e.g., Leuwerke et al., 2004; Nguyen et al., 2017); and college variables such as success in STEM courses (e.g., Chen & Ho, 2012; Honken & Ralston, 2013) and interactions between higher education faculty and students (e.g., Dizon et el., 2023; Lee et al., 2020; Park et al., 2018). However, less is known about how students' experiences with their high school STEM teachers may influence their decisions to enter STEM majors in college. Therefore, the current study utilized logistic regression and a nationally representative data set to investigate how students' perceptions of their treatment by high school STEM teachers influenced their choice of college major.

Review of the Literature

The following review of the literature will synthesize the research to date on factors that influence students' decisions to major in STEM fields, which include demographic variables, socio-cultural variables, high school experiences, and instructor-student discriminatory experiences. Concerning demographic variables, female students have been found to be less likely to major in STEM fields than male students (e.g., Cherney, 2023; Ganley et al., 2018). In addition, research at both the national and state levels has shown that more White and Asian students than Black or Hispanic students have chosen to major in STEM (e.g., Mau, 2016; Zhang et al., 2021). Outcomes on the effect of SES on STEM have shown that students from schools with low levels of SES exhibit decreased levels of STEM participation and achievement (e.g., Murphy, 2020; Ramsay-Jordan, 2020), although a study in one state found that identifying as low-income was a positive predictor of majoring in STEM (Lichtenberg & George-Jackson, 2013). Moreover, receiving financial assistance for college has been shown to be a significant predictor of STEM major choice and credit completion (e.g., Castleman et al., 2018; Wang, 2013).

Regarding socio-cultural variables, parent educational level and having parents who hold a degree in STEM have been shown to increase students' likelihood of majoring in STEM (e.g., Luo et al., 2022; Main et al., 2023). Student aspirations and/or expectations have also been found to be positive predictors of STEM major choice, as have community resources (e.g., Arciniega & Holtzman, 2024; Lichtenberger & George-Jackson, 2013; Tran et al., 2023). For example, choosing a STEM major has been shown to be likelier for students who reside near universities with outreach programs and/or who live in communities with STEM-related summer camps (Arciniega & Holtzman, 2024).

Apart from demographic and socio-cultural variables, academic achievement in high school has been found to impact students' choice to major in STEM or to complete a STEM degree, including earning higher grade point averages (GPAs; e.g., Bazelais et al., 2018; Mau, 2016) and achieving in STEM courses, especially in mathematics (LeBeau et al., 2012; Main et al., 2023; Wang, 2013). High school course-taking also has been found to affect students' interest in and choice to major in STEM, including enrolling in AP STEM and non-STEM courses (e.g., Bohrnstedt et al., 2023; Jewett et al., 2022; Warne et al., 2019) and taking more STEM credits (e.g., Tran et al., 2023).

Prior studies have also examined the importance of secondary teachers on student interest, knowledge, academic achievement, and choice to major in STEM (e.g., Ekatushabe et al., 2021; Han et al., 2021). Results have shown that teacher knowledge, encouragement, help, experience, support, self-efficacy, and motivation have impacted students' choice to major in STEM fields (e.g., Arcieniega & Holtzman, 2024; Lee, 2013; Lichtenberger & George-Jackson, 2013). Finally, research has shown that STEM teachers who act as mentors influence STEM major choice for female students, as have teachers who allowed female students to participate in research (Luo et al., 2022).

Method

Database and Sample

This study used data from the High School Longitudinal Study (HSLS:09). HSLS:09 tracks a nationally representative sample of students as they advance from ninth grade through four years post-high school. The sample used in this study included students who had considered STEM majors while in high school (n = 4,014).

Predictor Variables

Two sets of predictor variables were hypothesized to be related to students' decisions to major in a STEM field in college. Four student perceptions of high school mathematics teachers and four student perceptions of high school science teachers were included in the model. These were comprised of the students' perceptions that their mathematics and science teachers thought all students could be successful, treated every student fairly, treated some students better than others, and treated students with respect.

Outcome Variable

The dichotomous outcome examined in the study was whether a student first majored in a STEM field in college versus whether a student first majored in a non-STEM field in college. A STEM field was considered to be in computer and information sciences; engineering and engineering technology; biology and physical science, science tech, and mathematics; or health care fields.

Data Analysis

Data were analyzed utilizing PowerStats, which is a publicly available set of data analysis tools provided by the National Center for Education Statistics that does not require the use of a restricted license (National Center for Education Statistics, n.d.; Taggart, 2022). Descriptive statistics were computed to explore the characteristics of students who considered STEM majors while in high school. Logistic regression was used to identify the odds of these students choosing to major in STEM in college.

Results

Descriptive Findings

Of the students who considered a STEM major while in high school, nearly 73% initially majored in STEM in college. A descriptive comparison of students who did choose to major in a STEM field in college (n = 2,918) versus students who did not choose to major in a STEM field (n = 1,096) revealed the following notable differences between the two groups.

Similar percentages of students from all races chose STEM or non-STEM majors while in college except for two groups. Just under half the percentage of Black students majored in STEM compared to Black students who did not major in STEM (8.2% vs. 15.1%). Conversely, Asian students chose STEM majors in larger numbers in college compared to those who did not (11.2% vs. 6.8%). Regarding other socio-demographic variables, while nearly all students not enrolled in STEM majors in college were born in the U.S. (99.8%), under 90% of STEM majors were born in the U.S. (87.2%). In addition, over double the number of students who chose to major in STEM came from families living below the poverty threshold in high school compared to those who did not major in STEM (8.7% vs. 3.7%).

Concerning high school experiences, students who chose STEM majors in college earned A's or mostly A's and B's in high school (73.7%), while only half (50.9%) of students in non-STEM majors did so. However, both groups of students had taken AP courses in high school at almost equal rates (87.6% vs. 86.2%).

In examining how students perceived the behavior of their high school STEM teachers, STEM major and non-STEM major students felt similarly, except that larger numbers of STEM majors agreed that their mathematics teacher treated every student fairly (90.2% vs. 82.5%). Moreover, a larger percentage of STEM majors disagreed that their mathematics teacher treated some students better than others (24.7% vs. 19.8%) while a smaller number of students in STEM majors disagreed that their science teacher did so (19.9% vs. 26%). Descriptive findings are summarized in Table 1.

Table 1: Descriptive Comparison of Students Who Did and Did Not Choose STEM Majors

Variable	% of students[a] who chose to major in STEM (n = 2,918)	% of students who chose not to major in STEM (n = 1,096)
Socio-demographic Variables		
Gender		
Male	65.3	62.8
Female	34.7	37.2
Race		
White	81.0	80.0
Black or African American	8.2	15.1
Hispanic/Latino/Latina	15.3	13.3
Asian	11.2	6.8
Native Hawaiian/Pacific Islander	2.8	3.7
American Indian/Alaska Native	5.2	5.8
Student born in the U.S.	87.2	99.8
English Language Learner	2.2	0.3
Poverty Indicator		
At or above poverty threshold	91.3	96.3
Below poverty threshold	8.7	3.7
Parent Education Level		
Bachelor's degree or higher	62.3	57.8
Less than a bachelor's degree	37.3	42.2
High School Experiences		
GPA		
Mostly A's, A's and B's	73.7	50.9
Mostly B's, B's and C's and below	26.3	49.1
Enrolled in AP courses	87.6	86.2
Student Perceptions of High School STEM Teachers		
Mathematics Teacher		
Thinks all students can be successful	94.1	93.0
Treats every student fairly	90.2	82.5
Treats some kids better than others	19.8	24.7
Treats students with respect	92.8	90.2
Science Teacher		
Thinks all students can be successful	93.6	93.0
Treats every student fairly	84.9	87.8
Treats some kids better than others	26.0	19.9
Treats students with respect	91.3	93.8

[a] All student participants considered majoring in STEM while in high school.

Logistic Regression Analysis

Table 2 displays the parameter estimates, significance values, standard errors, odds ratios, and fit statistics for the regression model. Results indicated that one variable showed a statistically significant effect. Among students who considered majoring in a STEM field while in high school, the likelihood of ultimately choosing to major in STEM in college was influenced by students' agreement that their high school mathematics teacher treated every student fairly. Specifically, an examination of the direction of the odds ratios indicated that students' odds of majoring in a STEM field in college were nearly two-and-a-half times greater for students who believed all students were treated fairly by their high school mathematics teacher.

Table 2: Logistic Regression Model

Variable	*b*	*SE*	Odds ratio[a]
Student Perceptions of High School STEM Teachers			
Mathematics Teacher			
Thinks all students can be successful	-0.179	0.427	
Treats every student fairly	0.915*	1.039	2.496
Treats some kids better than others	0.184	0.327	
Treats students with respect	-0.507	0.302	
Science Teacher			
Thinks all students can be successful	0.202	0.525	
Treats every student fairly	0.073	0.510	
Treats some kids better than others	0.175	0.742	
Treats students with respect	-0.375	0.292	

[a] Odds ratios only presented for significant variables.
*$p < .05$.

Conclusions

The results of this study provide insight into our understanding of high school experiences that may influence students' decisions to choose a STEM major. Results of this study shed light on the importance of secondary mathematics teachers' efforts to model just behavior toward students, as it was found that students' perceptions that mathematics teachers' fair treatment of all students more than doubled their odds of choosing to major in a STEM field in college.

This finding extends to the secondary education level previous research that has been conducted at the post-secondary level. It supports college-level research which has shown that discriminatory, or unfair, treatment of students by their teachers negatively affected students' educational outcomes, including in STEM (e.g., Ali et al., 2019; Dizon et al., 2023; Lee et al., 2020; Park et al., 2018). For example, in a study at two universities, Kahveci (2023) found that undergraduate students conveyed high levels of negativity toward "unfair attitudes and behaviors" (p. 299) demonstrated by their instructors that they also felt negatively affected their own progress. Furthermore, Hall et al. (2017) found that discrimination was negatively related to mathematics and science self-efficacy in two cohorts of incoming freshmen at one university.

Given the nation's ongoing need for qualified individuals to work in STEM fields, with STEM jobs projected to grow at faster rates than non-STEM jobs (National Science Board, 2024b; U.S. Bureau of Labor Statistics, 2024), it is crucial to understand the schooling experiences that may influence students' choice to participate in STEM. One major strategy to increase the STEM workforce and thus remain globally competitive is to increase its ranks to include those who are currently underrepresented in STEM fields (National Research Council, 2011). These include women as well as Black, Latinx, and American Indian or

Alaska Native racial/ethnic minority groups (National Science Board, 2021). Doing so would be beneficial for both the country and the individual because it would expand the American workforce that could fill necessary STEM jobs and affect individual standards of living. For instance, STEM workers have higher employment rates and median earnings, as well as greater job security, than workers in non-STEM jobs (National Science Board, 2024a; National Science Board, 2024b).

According to West (2023), “If there are few opportunities for women and minorities, we limit the job possibilities for almost two-thirds of the American population, which robs people of economic opportunities but also limits current and future innovation opportunities” (para. 20). Such opportunities must be extended to these students before they enter postsecondary education and actually choose a college major. Therefore, their high school experiences are extremely important to their STEM development. For example, a literature review conducted by Bottia (2021) showed that inferior preparation in secondary school is associated with racial minority students’ underrepresentation in STEM. In addition, Granato (2023) found in a study of over a half million participants that college “students’ high school experience explains up to half of the gender gap in STEM graduation rates” (p. 511). Consequently, it is critical that STEM teachers give fair opportunities to all their students, including those who may not have traditionally participated in STEM fields in large numbers.

References

Ali, M. R., Ashraf, B. N., & Shuai, C. (2019). Teachers' conflict-inducing attitudes and their repercussions on students' psychological health and learning outcomes. *International Journal of Environmental Research and Public Health, 16*, 1-16. https://doi.org/10.3390/ijerph16142534

Arciniega, Y., & Holtzman, M. (2024). The pursuit of STEM: Factors influencing minority entrance and persistence. *Journal of Underrepresented and Minority Progress, 8*(1), 1-23.

Bazelais, P., Lemay, D. J., & Doleck, T. (2018). Examining the link between prior achievement in secondary education and performance in college: Using data from pre-university physics courses. *Journal of Formative Design in Learning, 2*, 114-120. https://doi.org/10.1007/s41686-018-0020-x

Boggs, G. R., Dukes, C. M., & Hawthorne, E. K. (2022). Addressing the STEM workforce shortage. U.S. Chamber of Commerce Foundation. https://www.uschamberfoundation.org/education/addressing-stem-workforce-shortage

Bohrnstedt, G. W., Ogut, B., Yee, D., Bai, Y. (2023). AP Calculus and science coursetaking: Their relationships with choosing a STEM major and expecting to be in a STEM occupation. *AERA Open, 9*(1), 1-19. https://doi.org/10.1177/23328584231184426

Bottia, M. C., Mickelson, R. A., Jamil, C., Moniz, K., & Barry, L. (2021). Factors associated with college STEM participation of racially minoritized students: A synthesis of research. *Review of Educational Research, 91*(4), 614-648. https://doi.org/10.3102/00346543211012751

Castleman, B. K., Long, B. T., & Mabel, Z. (2018). Can financial aid help to address the growing need for STEM education? The effects of need-based grants on the completion of science, technology, engineering, and math courses and degrees. *Journal of Policy Analysis and Management, 37*(1), 136-166.

Chen, X. (2013). *STEM attrition: College students' paths into and out of STEM fields.* (NCES 2014-001). U.S. Department of Education, National Center for Education Statistics, Institute of Education Sciences. https://nces.ed.gov/pubs2014/2014001rev.pdf

Chen, X., & Ho, P. (2012). *STEM in postsecondary education: Entrance, attrition, and course taking among 2003-04 beginning postsecondary students.* (NCES 2003-152). U.S. Department of Education, National Center for Education Statistics, Institute of Education Sciences. https://nces.ed.gov/pubs2013/2013152.pdf

Cherney, I. D. (2023). The STEM paradox: Factors affecting diversity in STEM fields. *Journal of Physics: Conference Series, 2438.* https://doi.org/10.1088/1742-6596/2438/1/012005

Crisp, G., Nora, A., & Taggart, A. (2009). Student characteristics, pre-college, college, and environmental factors as predictors of majoring in and earning a STEM degree: An analysis of students attending a Hispanic Serving Institution. *American Educational Research Journal, 46*(4)*,* 924-942. https://doi.org/doi:10.3102/0002831209349460

Dizon, J. P. M., Salazar, C., Kim, Y. K., & Park, J. J. (2023). Experiences of racial discrimination among STEM majors: The role of faculty. *Journal of Student Affairs Research and Practice, 60(*5), 653-670. https://doi.org/10.1080/19496591.2022.2144742

Ekatushabe, M., Kwarikunda, D., Muwonge, C. M., Ssenyonga, J., & Schiefele, U. (2021). Relations between perceived teacher's autonomy support, cognitive appraisals and boredom in physics learning among lower secondary students. *International Journal of STEM Education, 8*(8), 1-15. https://doi.org/10.1186/s40594-021-00272-5

Ganley, C. M., George, C. E., Cimpian, J. R., Makowski, M. B. (2018). Gender equity in college majors: Looking beyond the STEM/non-STEM dichotomy for answers regarding female participation. *American Educational Research Journal, 55*(3), 453-487. https://doi.org/10.3102/0002831217740221

Granato, S. (2023). Early influences and the choice of college major: Can policies reduce the gender gap in scientific curricula (STEM)? *Journal of Policy Modeling, 45*, 494-521. https://doi.org/10.1016/j.jpolmod.2023.04.006

Griffith, A. L. (2010). Persistence of women and minorities in STEM field majors: Is it the school that matters? *Economics of Education Review, 29*, 911-922. https://doi.org/10.1016/j.econedurev.2010.06.010

Hall, A., R., Nishina, A., Lewis, J. A. (2017). Discrimination, friendship diversity, and STEM-related outcomes for incoming ethnic minority college students. *Journal of Vocational Behavior, 103*, 76-87. http://dx.doi.org/10.1016/j.jvb.2017.08.010

Han, J., Kelley, T., & Knowles, J. G. (2021). Factors influencing student STEM learning" Self-efficacy and outcome expectancy, 21st century skills, and career awareness. *Journal for STEM Education Research, 4*, 117-137. https://doi.org/10.1007/s41979-021-00053-3

Honken, N., & Ralston, P. (2013). Freshman engineering retention: A holistic look. *Journal of STEM Education, 14*(2), 29-37.

Jewett, E. C., & Chen, R. (2022). Examining the relationship between AP STEM course-taking and college major selection: Gender and racial differences. *Journal of Engineering Education, 111*(3), 512-530. https://doi.org/10.1002/jee.20464

Kahveci, H. (2023). The positive and negative effects of teacher attitudes and behaviors on student progress. *Journal of Pedagogical Research, 7*(1), 290-306. https://doi.org/10.33902/JPR.202319128

LeBeau, B., Harwell, M., Monson, D., Dupuis, D., Medhanie, A., & Post, T. R. (2012). Student and high-school characteristics related to completing a science, technology, engineering, or mathematics (STEM) Major in college. *Research in Science & Technological Education, 30*(1), 17-28. http://dx.doi.org/10.1080/02635143.2012.659178

Lee, A. (2013). Determining the effects of pre-college STEM contexts on STEM major choices in 40year postsecondary institutions using multilevel structural equation modeling. *Journal of Pre-College Engineering Education Research, 3*(2), 13-30. https://doi.org/10.7771/2157-9288.1059

Lee, M. J., Collins, J. D., Harwood, S. A., Mendenhall, R., & Hunt, M. B. (2020). "If you aren't White, Asian or Indian, you aren't an engineer": Racial microaggressions in STEM education. *International Journal of STEM Education, 7*(48). https://doi.org/10.1186/s40594-020-00241-4

Leuwerke, W. C., Robbins, S., Sawyer, R., & Hovland, M. (2004). Predicting engineering major status from mathematics achievement and interest congruence. *Journal of Career Assessment, 12,* 135-149. https://doi.org/10.1177/1069072703257756

Lichtenberger, E., & George-Jackson, C. (2013). Predicting high school students' interest in majoring in a STEM field: Insight into high school students' postsecondary plans. *Journal of Career and Technical Education, 28*(1), 19-38.

Luo, L., Stoeger, H., & Subotnik, R. F. (2022). The influences of social agents in completing a STEM degree: An examination of female graduates of selective science high schools. *International Journal of STEM Education, 9*(7), 1-17. https://doi.org/10.1186/s40594-021-00324-w

Main, J. B., Dang, T., Johnson, B., Shi, Q., Guariniello, C., & Delaurentis, D. (2023, June 25-June 28). *High school student academic factors associated with college-going and STEM major choice*. [Paper presentation]. American Society for Engineering Education 2023 Annual Conference, Baltimore, MD, United States.

Mau, W. J. (2016). Characteristics of US students that pursued a STEM major and factors that predicted their persistence in degree completion. *Universal Journal of Educational Research, 4*(6), 1495-1500. https://doi.org/10.13189/ujer.2016.040630

Murphy, S. (2020). Participation and achievement in technology education: The impact of school location and socioeconomic status on senior secondary technology studies. *International Journal of Technology and Design Education, 30,* 349-366. Education (2020) 30:349–366. https://doi.org/10.1007/s10798-019-09499-4

National Center for Education Statistics. (2017). *Data point: Beginning college students who change their majors within 3 years of enrollment.* (NCES 2018-434). U.S. Department of Education, Institute of Education Sciences. https://nces.ed.gov/pubs2018/2018434/index.asp#:~:text=Whereas%2035%20percent%20of%20students,care%20fields%20(26%20percent)

National Center for Education Statistics. (2024). *Condition of education*: *Undergraduate degree fields*. U.S. Department of Education, Institute of Education Sciences. https://nces.ed.gov/programs/coe/indicator/cta

National Center for Education Statistics. (n.d.). *DataLab tools: QuickStats, PowerStats, and TrendStats.* U.S. Department of Education, Institute of Education Sciences. https://nces.ed.gov/training/datauser/COMO-06.html

National Research Council. (2011). *Successful K-12 STEM education: Identifying effective approaches in science, technology, engineering, and mathematics.* The National Academies Press. https://doi.org/10.17226/13158

National Science and Technology Council. (2018). *Creating a course for success: America's strategy for STEM education.* The Office of Science and Technology Policy, Committee on STEM Education. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.energy.gov/sites/default/files/2019/05/f62/STEM-Education-Strategic-Plan-2018.pdf

National Science Board. (2021). *The STEM labor force of today: Scientists, engineers and skilled technical workers*. *Science and Engineering Indicators 2022*. (NSB-2021-2). National Science Foundation. https://ncses.nsf.gov/pubs/nsb20212

National Science Board. (2024a). *The state of U.S. science and engineering. Science and Engineering Indicators 2024.* (NSB-2024-3). National Science Foundation. https://ncses.nsf.gov/pubs/nsb20243

National Science Board. (2024b). *The STEM labor force: Scientists, engineers, and technical workers*. *Science and Engineering Indicators 2024.* (NSB-2024-5). National Science Foundation. https://ncses.nsf.gov/pubs/nsb20245/

Nguyen, T. K., Williams, A., & Ludwikowski, W. M. (2017). Predicting student success and retention at an HBCU via interest-major congruence and academic achievement. *Journal of Career Assessment, 25,* 552-566. https://doi.org/10.1177/1069072716651870

Park, J. J., Kim, Y. K., Salazar, C., & Eagan, K. (2018, November 15-November 17). *Discrimination and student-faculty interaction in STEM: Exploring the impact for students of different races*. [Paper presentation]. Association for the Study of Higher Education 49th Annual Meeting, Minneapolis, MN, United States.

Ramsay-Jordan, N. N. (2020). Hidden figures: How pecuniary influences help shape STEM experiences for Black students in grades K-12. *Journal of Economics, Race, and Policy, 3*, 180-194. https://doi.org/10.1007/s41996-019-00049-7

Taggart, A. (2022). Postsecondary co-enrollment patterns among Latinx/a/o students. *Journal of Hispanic Higher Education, 21*(4). https://doi.org/10.1177/15381927221085671

Tran, T. C., Williams, J., Middleton, K. V., Clark-Taylor, A., Priddie, C. (2023, Spring). Examining factors that influence BIPOC students' enrollment in STEM postsecondary majors. *The AIR Professional File,* Article 160. https://doi.org/10.34315/apf1602023

U.S. Bureau of Labor Statistics. (2024). *Employment projections: Employment in STEM occupations.* Office of Occupational Statistics and Employment Projections. https://www.bls.gov/emp/tables/stem-employment.htm

Wang, X. (2013). Why students choose STEM majors: Motivation, high school learning, and postsecondary context of support. *American Educational Research Journal, 50*(5), 1081-1121. https://doi.org/10.3102/0002831213488622

Warne, R. T., Sonnert, G., & Sadler, P. M. (2019). The relationship between advanced placement mathematics courses and students' STEM career interest. *Educational Researcher, 48*(2), 101-111. https://doi.org/10.3102/0013189X19825811

West, D. M. (2023, July 26). Improving workforce development and STEM education to preserve America's innovation edge. Brookings Institution. https://www.brookings.edu/articles/improving-workforce-development-and-stem-education-to-preserve-americas-innovation-edge/

Zhang, J., Bohrnstedt, G., Zheng, X., Bai, Y., Yee, D., Broer, M. (2021). *Choosing a college STEM major: The roles of motivation, high school STEM coursetaking, NAEP mathematics achievement, and social networks*. [AIR-NAEP Working paper #2021-02.] Washington, DC: American Institutes for Research. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.air.org/sites/default/files/2021-07/Choosing-a-College-STEM-Major-June-2021.pdf

Contact email: amanda.taggart@usu.edu