



INCLUSIVE STEM HIGH SCHOOLS: RACE AND GENDER DIFFERENCES IN STEM ATTITUDES

**Findings Brief from the STEM School
Study**



INTRODUCTION

In response to race and gender gaps in the STEM workforce, educators and policymakers are engaging in huge efforts to increase and broaden participation in STEM education (National Research Council, 2011). **Inclusive STEM schools** have emerged over the past decade as one such strategy for broadening the pipeline to STEM careers. These schools aim to provide high-quality and engaging STEM education for all students, but particularly those groups of students who are currently underrepresented in STEM majors and careers (e.g., females and racial/ethnic minorities; Peters-Burton, Lynch, Behrend, & Means, 2014).

One goal of the S3 project was to understand how inclusive STEM high schools serve students from these groups, and whether the strategies used show promise for increasing equity in STEM education. However, we found that **within a national sample of inclusive STEM high schools, dramatic gaps in race and gender remain.**

In this report, we explore differences in STEM attitudes and interest between Black girls and White boys in inclusive STEM high schools, and between Hispanic students at predominantly Hispanic and predominantly White inclusive STEM high schools.



THE DIFFERENCES BETWEEN BLACK GIRLS' AND WHITE BOYS' STEM ATTITUDES IN INCLUSIVE STEM HIGH SCHOOLS

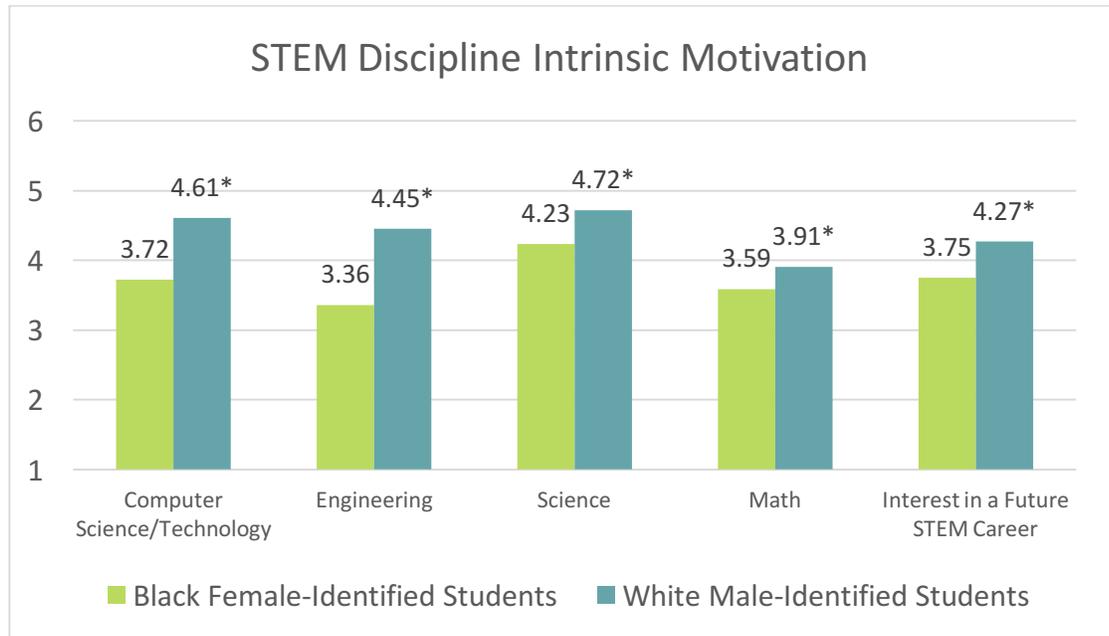
There are many ways to examine race/ethnicity and gender gaps in student outcomes. For this particular analysis, we examined differences in STEM attitudes between Black girls and White boys. Historically, Black women hold fewer STEM degrees than White women, and dramatically fewer degrees in STEM than White men (NSF, 2012). Here we focus on the attitude differences in inclusive STEM high schools, whose goal is reduce race and gender gaps in the STEM pipeline, between students who identify as Black females ($n=230$) and those identifying as White males ($n=838$).

First we examined students' self-reported levels of intrinsic motivation for different STEM disciplines (i.e., computer science/technology, engineering, science, and math).

Across all STEM disciplines, Black females reported significantly lower intrinsic motivation than White males. The narrowest gap was observed in math, which was also the lowest rated of all STEM disciplines by White males. **Black females reported the highest levels of intrinsic motivation for science, and the lowest levels of intrinsic motivation for engineering.**

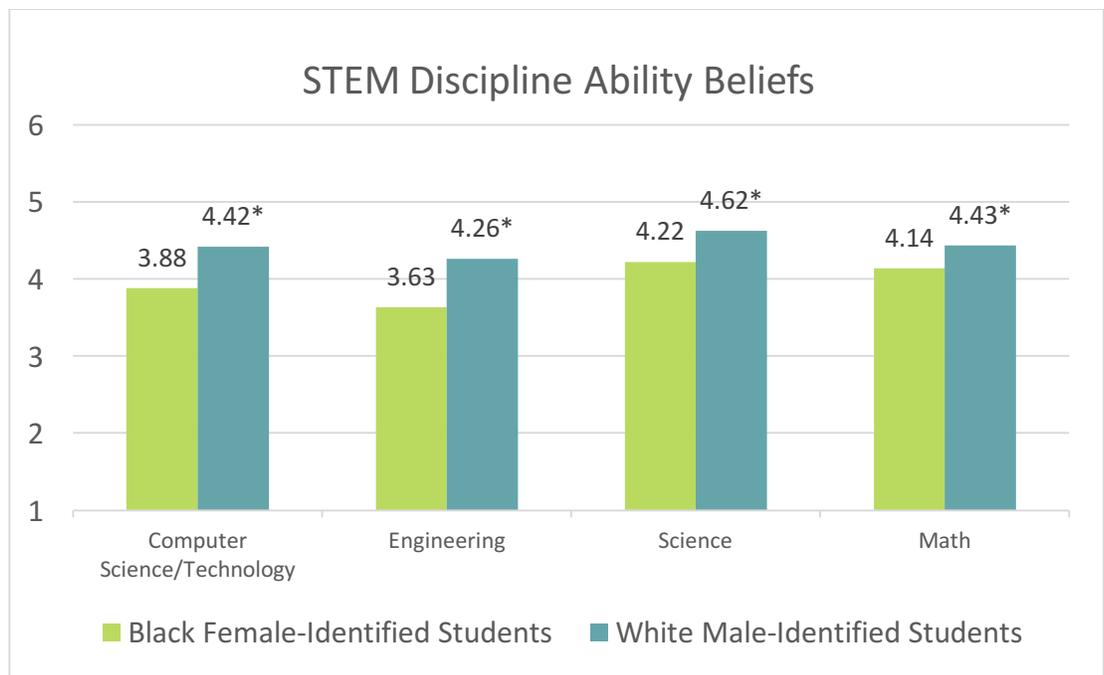
Intrinsic motivation: I find [science] very interesting; I enjoy solving [science] problems; I want to learn more [science]; Learning about [science] is fun.

Ability beliefs: I have the skills and ability to learn [computer science/technology]; I am better at working with [computers/technology] than most of the kids in my school; I can figure out how to solve the most difficult [computing and/or technology] tasks if I try.



*Significant difference at $p < .05$ or lower.

Next we examined students' STEM ability beliefs. **Again, Black females reported consistently (and significantly) lower ability beliefs across STEM disciplines than White male students.** The narrowest gap in STEM discipline ability belief ratings was again found in math.



*Significant difference at $p < .05$ or lower.



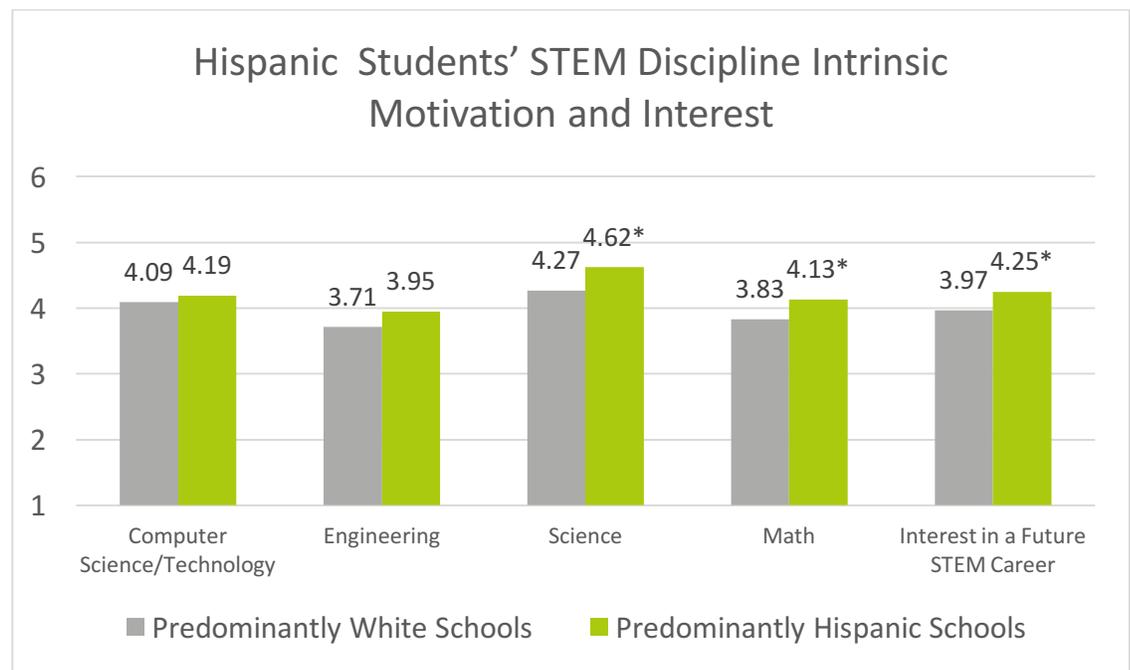
Many factors could contribute to the discrepancies found between Black girls and White boys in this study. Sample sizes for each group are different, and while several of our sample schools were comprised of predominantly White students, none were comprised of predominantly Black students. This analysis does not control for any additional variables. Still, even considering several caveats, these findings may suggest that we are far from STEM attitude equity—even within inclusive STEM high schools.



DIFFERENCES IN HISPANIC STUDENTS' ATTITUDES ACROSS PREDOMINANTLY HISPANIC AND PREDOMINANTLY WHITE INCLUSIVE STEM HIGH SCHOOLS

The S3 sample includes students from 17 inclusive STEM schools. Of these high schools, five are predominantly Hispanic (meaning that the majority of students self-identified as Hispanic). The remaining 12 schools are predominantly White. In these analyses, we wanted to investigate whether there were differences between Hispanic students' attitudes at these two types of schools.

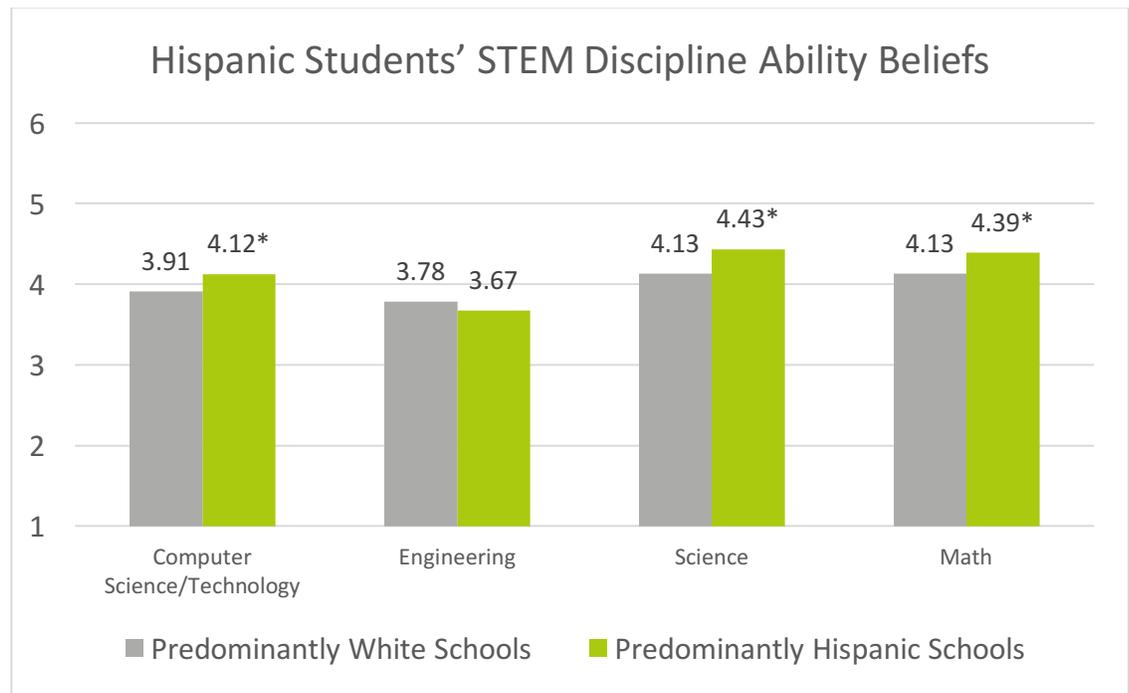
Hispanic students ($n=858$) who attended predominantly Hispanic inclusive STEM high schools had significantly higher intrinsic motivation for both science and math than Hispanic students who attended predominantly white inclusive STEM high schools ($n=201$). There was no significant difference in intrinsic motivation for computer science/technology or engineering between Hispanic students who attended these two types of inclusive STEM high schools.



*Significant difference at $p < .05$ or lower.



Hispanic students who attended predominantly Hispanic inclusive STEM high schools also had significantly more interest in a future STEM careers than Hispanic students who attended predominantly white inclusive STEM high schools. They also reported significantly higher ability beliefs in computer science, science, and math. There was no significant difference in engineering ability beliefs between Hispanic students who attended these two types of inclusive STEM high schools.



*Significant difference at $p < .05$ or lower.

One potential reason for fewer differences across engineering and computer science disciplines may be that these disciplines are not as widely taught, even at inclusive STEM schools, compared to traditional subjects like math and science. Of the STEM disciplines, Hispanic students in both types of inclusive STEM high schools had the lowest intrinsic motivation and ability beliefs for engineering.

The finding that across most STEM discipline attitudes, as well as in their interest in a future STEM career, **Hispanic students who attended predominantly Hispanic inclusive STEM high schools were more positive than Hispanic students who attended predominantly white inclusive STEM high schools** requires more exploration to fully understand potential explanations and implications. One reason for the difference in attitudes may be that the



predominantly Hispanic schools in the sample experienced stronger implementation of instructional strategies (for example, more problem-based learning or interdisciplinary science and math classes) than did the predominantly White schools. Another reason might be that the predominantly Hispanic schools are better at serving Hispanic students than predominantly White schools, or that Hispanic students at predominantly Hispanic schools may benefit from seeing fellow Hispanic students and teachers modeling STEM behaviors.

While some research has found that predominantly Black higher education institutes provide better outcomes for Black college students, the same pattern has not necessarily been shown with Hispanic higher education institutions (Nelson Laird et al., 2007). In addition, to our knowledge, no research has looked at the implications of predominantly Hispanic and predominantly White inclusive STEM high schools on Hispanic students' STEM attitudes. Further research should examine Hispanic students' STEM, general academic, and social experiences at various types of schools to better understand how school population may relate to students' STEM attitudes, and how to best serve these students in all high school settings.



REFERENCES

LaForce, M., Noble, E., King, H., Century, J., Blackwell, C., Holt, S., Ibrahim, A., & Loo, S. (2016). The eight essential elements of inclusive STEM high schools. *International Journal of STEM Education*, 3(21).

National Research Council. (2011). *Successful K-12 STEM education: Identifying effective approaches in science, technology, engineering, and mathematics*. National Academies Press.

National Science Foundation, National Center for Science and Engineering Statistics. 2017. *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017*. Special Report NSF 17-310. Arlington, VA. Available at www.nsf.gov/statistics/wmpd/

Nelson Laird, T. F., Bridges, B. K., Morelon-Quainoo, C. L., Williams, J. M., & Holmes, M. S. (2007). African American and Hispanic student engagement at minority serving and predominantly White institutions. *Journal of College Student Development*, 48(1), 39-56.

Peters-Burton, E. E., Lynch, S. J., Behrend, T. S., & Means, B. B. (2014). Inclusive STEM high school design: 10 critical components. *Theory Into Practice*, 53(1), 64-71.

Questions? Contact Melanie LaForce at laforce@uchicago.edu.

Suggested citation:

LaForce, M., Noble, E., Zuo, H., & Ferris, K. (2018). *Race & gender differences in STEM attitudes and interest in STEM careers*. Chicago, IL: Outlier Research Evaluation, UChicago STEM Education | The University of Chicago.

This work is supported by the National Science Foundation, Study #1238552.