STEM Magnet High Schools and Student Intent to Declare a STEM Major

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Abstract

This study employed design-based logistic regression to examine the extent to which attending a science, technology, engineering, and mathematics (STEM) magnet high school, school demographics, and student-level factors explain racial/ethnic differences in a student's intent to declare a STEM major in the first semester of college. Data were drawn from the High School Longitudinal Study of 2009 (HSLS:09). The results show only student-level factors (gender, ethnicity/race, highest math course level, and math achievement) are statistically significantly associated with a student's likelihood of intending to declare a STEM major. These findings suggest simply establishing a STEM magnet high school may not increase the likelihood of its graduates pursuing STEM careers.

Keywords: College major choice, HSLS:09, magnet high schools, social cognitive career theory, STEM education.

STEM Magnet High Schools and Student Intent to Declare a STEM Major

Science, technology, engineering, and mathematics (STEM) occupations have had double the growth rate of non-STEM occupations and have accounted for more than half of sustained economic growth in the United States (Fayer et al., 2017; Jobs for the Future, 2007). Despite this demand and the lucrative nature of STEM careers, STEM degree attainment is racially and ethnically inequitable in comparison to the U.S. population distribution (National Science Foundation [NSF], 2019a, 2019b). More specifically, Black and Latinx/o/a citizens and permanent residents are underrepresented in STEM bachelor's degree attainment (NSF, 2019a, 2019b). Additionally, Black and Latinx/o/a students have been more likely to leave a STEM major than their White and Asian peers (Chen, 2012, 2013; Riegle-Crumb et al., 2019). To the extent that students who declare a STEM major after their freshman year in college are more likely to leave a STEM major (Riegle-Crumb et al., 2019), more research is needed about the pre-college factors contributing to Black and Latinx/o/a students' intent to declare a STEM major when entering college. This research is critical to the United States reducing racial/ethnic STEM underrepresentation and sustaining economic growth in an increasingly diverse country.

In this paper, we address a pre-college factor that legislation such as the Every Student Succeeds Act of 2015 (ESSA) and the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (America COMPETES) Act of 2007 promoted as a strategy to decrease STEM underrepresentation—the STEM high school. A STEM high school is a school distinguished by the attention given to one or all four disciplines of STEM, high quality professional development for teachers, STEM-focused curriculum, early college-level coursework, a mission to prepare students for postsecondary STEM majors and careers, and the student population recruited and admitted (Means et al., 2008; National Research Council, 2011). Given that there are multiple types of STEM high schools, we consider a distinct type of STEM high school—the STEM magnet high school—for its longstanding history of educating Black, Latinx/o/a, and lower-income students (Davis, 2014; Frankenberg & Siegel-Hawley, 2009; Gamoran, 1996; Goldring & Smrekar, 2002; Grooms & Williams, 2015; Wang & Herman, 2017) and for its more selective and segregated context in the 21st century (Wang & Herman, 2017). As such, our investigation of the following research questions is salient to school reform discourse about educational equity in STEM:

1. To what extent are student-level demographic factors (i.e., race/ethnicity, gender, socioeconomic status) and student-level academic preparation factors (i.e., highest math course level, algebraic reasoning score) associated with a student's intent to declare a STEM major in the first semester of college?
2. To what extent are school-level specialization factors (**i**.e., STEM-magnet, non-STEM magnet, non-magnet) and school-level demographic factors (i.e., racial composition, socioeconomic composition) associated with a student's intent to declare a STEM major in the first semester of college?

We selected intent to declare a STEM major as the outcome measure because it is an understudied STEM outcome (Hinojosa et al., 2016) that is not only associated with a student's college major choice (Wang, 2013) but also high school academic preparation (Bottia et al., 2015; Wang, 2013). Our answers to these questions, though not causal, suggest that establishing a STEM magnet high school may not increase the likelihood of high school graduates intending to declare a STEM major in college.

Conceptual Framework: Social Cognitive Career Theory Choice Model

The Social Cognitive Career Theory (SCCT) choice model (Lent et al., 2002; Lent et al., 1999) describes how students choose their college majors and careers and indicates intent to declare a STEM major is a strong, direct predictor of student choice of STEM majors (Lent et al., 2002; Lent et al., 2018; Wang, 2013). Of the variables within this model, school contexts are the most understudied topic in SCCT literature despite barriers such as racism, sexism, bias, and negative school climates informing student opportunities for STEM entry (Blickenstaff, 2005; Museus et al., 2011). High schools can provide STEM preparation through STEM supports or programs that encourage academic preparation and social cognitive career attributes for postsecondary STEM entry (Fouad & Kantamneni, 2013; Fouad & Santana, 2017; Weis et al., 2015). For example, a school might offer a robotics afterschool program to prepare students for STEM careers (National Research Council, 2011). One type of high school designed to have an environment with plentiful STEM supports is a STEM high school. We posit that STEM magnet high schools, which are racially/ethnically diverse, mitigate barriers to STEM entry with its supports and inclusiveness. In the next section, we review literature that further explains why a STEM magnet high school likely fosters intent to declare a STEM major for students.

Review of the Literature

STEM Underrepresentation and Calls for STEM High Schools

Over the last decade, scholars, federal policy, and policy advisors have popularized STEM high schools as a pre-college mechanism for decreasing STEM underrepresentation (National Research Council, 2011; Peters-Burton et al., 2014; President's Council of Advisors on Science and Technology, 2010). For example, in 2008, President Barack Obama came into office with a legislative mandate from the America COMPETES Act of 2007—enacted at the end of the Bush administration—to pilot a program of grants to start or expand STEM schools. Also, in 2008, the first-ever national study of secondary STEM schools that provided education to grades 9 through 12 was conducted. Means et al. (2008) identified 315 public secondary STEM schools, one-third of which were magnet schools and 140 of which were created after the year 2000, with an increased recruitment of students historically underrepresented in STEM fields. Means et al. (2008) noted that among the 203 secondary STEM schools responding to the study's survey, 89% of the secondary STEM schools identified their mission as preparing students for postsecondary STEM majors and careers. By 2010, the President's Council of Advisors on Science and Technology (2010) determined that only 100 public STEM high schools existed in the United States and proposed the creation of 200 new STEM high schools by 2020. Because magnet schools comprised one-third of all STEM schools in the 2008 survey study (Means et al., 2008) and increased from 1.6% of all public schools in 2001 to 2.5% of all public schools in 2010 (National Center for Education Statistics, 2017), we posit that a STEM magnet high school existing within the last ten years may be an appropriate site for examining the role of STEM high schools in pre-college preparation for the STEM entry of students of color.

STEM Magnet High Schools

STEM schools began in 1904 with selective admission of talented White male students only (Erdogan & Stuessy, 2015b). Then, in the late 1960s and 1970s, magnet schools—public schools of choice—were created with specialized themes in math, science, and foreign language to serve as recruitment magnets to encourage voluntary desegregation of racially segregated schools (Gamoran, 1996; Goldring & Smrekar, 2002; Magnet Schools of America, n.d.). This history suggests that magnet schools with a math or science focus were likely the first type of racially/ethnically inclusive STEM schools in the United States.

Since their inception, magnet schools typically have existed in large urban districts with majority-students of color and majority-low-income enrollment with the goals of maintaining a diverse student body and facilitating higher academic achievement (Wang & Herman, 2017). Although the racial desegregation goal of magnet schools decreased after the U.S. Supreme Court ruling in *Parents Involved in Community Schools v. Seattle School District No. 1* (2007) restricted the use of race and ethnicity in K-12 public school admissions, parents and students likely still turn to magnet schools as alternatives to traditional low-performing schools (Betts et al., 2015; Wang & Herman, 2017). Additionally, with the goal of racial desegregation removed from magnet schools, the primary objective of some magnet schools now is to serve "as incubators for educational innovation" (Wang & Herman, 2017, p. 160) to address issues such as STEM entry or goals to pursue a STEM major.

As present-day STEM magnet high schools can be designed to fit any STEM high school model (Magnet Schools of American, n.d.), we assume a STEM magnet high school may or may not increase a student’s college preparation for a STEM major. For example, STEM high schools with a career and technical focus are not designed to advance students to bachelor’s degree attainment or even traditional associate’s degrees, and the racial and socioeconomic composition of students enrolled at selective and inclusive STEM high schools likely determines who is adequately prepared for entry into a college STEM degree program. Further, there are mixed results about the usefulness of STEM high schools in promoting student outcomes in STEM. For instance, some positive findings in recent research using state data from New York, North Carolina, and Texas suggest STEM magnet high schools could be useful interventions for decreasing STEM underrepresentation (Erdogan & Stuessy, 2015a; Means et al., 2016; Wiswall et al., 2014). In contrast, Bottia et al.’s (2018) study of a statewide sample of students and schools in North Carolina revealed that attending a STEM high school was not statistically significant in predicting student intent to declare a STEM major nor actual choice of a STEM major. These results collectively suggest a need for more research, especially using national data.

Methods

Data Source

For this study, we accessed a national sample from restricted-data of the High School Longitudinal Study of 2009 (HSLS:09) conducted by the National Center for Education Statistics (2018) within the Institute of Education Sciences. The HSLS:09 collected data regarding the postsecondary plans and trajectories of 25,210 students nested within 940 high schools (an average of 25 ninth graders per school) in the base year of 2009 and follow-ups in 2012, 2013, and 2016 (Ingels et al., 2013). We analyzed student data from the base year questionnaire (e.g., gender, race/ethnicity, SES), the 2012 student first follow-up questionnaire administered in 11th grade (e.g., gender, race/ethnicity, academic preparation), and the 2013 updated parent and student questionnaire (e.g., academic preparation, intent to declare a STEM major). We also utilized the 2012 first follow-up school administrator data (e.g., STEM-focused or not, racial composition, SES composition). We did not use the 2016 follow-up data, collected three years postsecondary, because of our interest specifically in student intent to declare a STEM major, an outcome more proximal to high school.

Sample

As stated earlier, the HSLS:09 restricted-data file accessed for this study includes 25,210 student participants nested within 940 public and private schools in the United States. The final analytic sample size for our study became 6,040 students within 660 public schools based on a few rules. First, because this study aimed to investigate the links between high school-level and student-level covariates to an outcome of student intent to declare a STEM major in college, we limited our analytic sample to students with enrollment either in bachelor degree programs (34.50%) or associate degree programs (10.68%) in the 2013 update questionnaire. Second, among students who enrolled in bachelor or associate degree programs, 11.13% did not indicate whether they would be considering a STEM major and thus were eliminated from our sample. Finally, all private high schools could legitimately skip the questions related to the STEM-focused specialization in the interview; therefore, participants in private schools were not included in our analytic samples. These delimitations render our findings applicable only to public school students who enrolled in college.

Only 40 of the 660 schools we examined were STEM high schools. Each of those STEM high schools were magnet schools. Among the 40 STEM magnet high schools, only 10 of the schools were STEM-focused magnet schools during the entire period between the base year and first follow-up of the HSLS:09. Our descriptive analysis further showed that 30 non-magnet schools in our sample became STEM magnet high schools during this period. Additionally, there were 30 non-magnet schools in the base year that became magnet schools without a STEM focus by the first follow-up in 2012. Between the base year and the first follow-up, magnet schools also had increased in number from 2.8% to 3.2% of public elementary and secondary schools in the United States (National Center for Education Statistics [NCES], 2012, 2017). These observations about STEM magnet schools likely reflect a renewed interest in magnet schools in the United States during the promotion of STEM high schools by the Obama administration (President's Council of Advisors on Science and Technology, 2010).

Measures

Outcome variable. Using the SCCT framework and related literature, we identified the outcome variable as 'intent to declare a STEM major in college' as reported by students who enrolled in bachelor or associate degree programs by November 1, 2013. At this point in the data collection, only one college major intention could be specified. This measure was captured with a binary dependent variable comprised of two categories: intent to declare a STEM major (28.22%) and intent to declare a non-STEM major (71.78%). Table 1 presents the breakdown of students in each of these categories. In the HSLS:09, STEM major referred to the following majors denoted by the NCES designation of two-digit Classification of Instructional Programs (CIP) codes embedded within the questionnaire: agriculture, agricultural operations, and related sciences; natural resources and conservation; engineering; engineering technologies/technicians; biological and biomedical sciences; mathematics and statistics; and physical sciences (NCES, n.d.).

School-related variables. We created the primary school-related predictor—STEM magnet specialization—by combining two variables derived from the school administrator questionnaire to measure whether the school had a magnet program with a special focus on STEM (yes/no). If a school reported a special focus on STEM and a magnet program, we classified the school as a STEM magnet high school or school with a STEM magnet specialization. Table 2 shows that in our analytic sample, 6.72% of schools were STEM magnet high schools; 8.40% were non-STEM magnet high schools; and the remaining 84.89% of schools were non-magnet high schools without a STEM focus.

Racial composition and school socioeconomic composition are the school-level variables we included as covariates given that approximately 44% of Black students and 45% of Latinx/o/a students in the United States attend high poverty schools (NCES, 2019) and because magnet schools tend to exist in urban contexts in which 40% of urban schools have a high poverty enrollment (NCES, 2019). Racial composition was measured by the percentage of White students. Specifically, a school was designated majority students of color (SOC) for our study if 75% or more of the students were non-White (Orfield et al., 2014). Table 2 shows that in our analytic sample, 13.44% of schools had a racial composition that was at least 75% non-White (i.e., majority SOC schools). Similarly, school poverty was measured by the percentage of the student body receiving free- or reduced-price lunch. Schools were designated high-poverty in our study if 75% or more of the enrolled students received free- or reduced-price lunch (NCES, 2019; Synder & Musu-Gillette, 2015). In our analytic sample, 8.24% of schools were high-poverty schools. Table 3 shows that among the STEM magnet schools, 27.27% had a majority SOC enrollment and 13.64% were high poverty schools. In all, the summary statistics in Table 3 suggest magnet schools in the HSLS:09 national sample were more likely than the non-magnet schools in the HSLS:09 national sample to reflect the public education context that many students of color and low-income students experience.

Student-related variables. The student-related variables in this study included demographic factors (i.e., race/ethnicity, gender, SES) and academic preparation (i.e., course-taking and achievement). We used the highest math course level taken, with ordinal categories from 0 (no math course) to 13 (AP/IB calculus), as one indicator of academic preparation in high school. For the analysis, we reduced the thirteen categories for highest math course level to three categories representing three levels of mathematics courses taken: basic (categories 0 to 3; 0.71%), moderate (categories 4 to 6; 19.47%), and advanced (categories 7 to 13; 79.82%). Then, because the size of the basic level category was too small, we combined the categories of basic and moderate levels for the data analysis: *basic-moderate level* coded as 0 (0 = no math, 1 = basic math, 2 = other math, 3 = pre-algebra; reference group, 4 = algebra I, 5 = geometry, 6 = algebra II) and *advanced level* coded as 1 (7 = trigonometry, 8 = other advanced math, 9 = probability and statistics, 10 = other AP/IB math, 11 = pre-calculus, 12 = calculus, 13 = AP/IB calculus).

The second indicator of academic preparation we used was standardized algebraic reasoning score (M = 55.51; SD = 9.68) on an algebraic reasoning test developed by the

HSLS:09 survey administrators to assess key algebraic knowledge and skills for preparation for postsecondary study and use (Ingels et al., 2011, p. 23). As the math standardized score offered a norm-referenced measurement of achievement, the estimate of achievement was relative to the population of fall 2009 9th grade students (Ingels et al., 2013).

Demographic student-related variables of socioeconomic status (SES), race/ethnicity, and gender also were considered in the analysis as Table 2 displays. Student SES was a continuous variable (M = 0.25; SD = 0.72) calculated using parent/guardians' education, occupation, and family income (Ingels et al., 2013), whereas race/ethnicity (White = 59.69%; Black = 7.69%; Latinx/o/a = 11.76%; Asian = 11.71%; Others = 9.14%) and gender (male = 48.68%; female = 53.32%) were categorical variables. For students who identified as Indian/Alaska Native, Native Hawaiian/Pacific Islander, or more than one race, we classified the race/ethnicity of those students into one category, Other, due to a small number of cells for these groups.

Data Analysis

Following Ingels et al.'s (2014) suggestion, we applied a design-based approach to investigate the influence of student- and school-related factors on student intent to declare a STEM major at the beginning of postsecondary education. We carefully incorporated sampling weights. In addition, we also applied 200 balanced repeated replicate weights to adjust standard error estimates, resulting in valid statistical significance testing results (Duprey et al., 2018; Heeringa et al., 2010; Stapleton, 2008). Given our binary outcome of interest (intent to declare a STEM major versus intent to declare a non-STEM major), we conducted design-based logistic regression analyses to address the research questions through the following model:

$$\eta_i = \beta_0 + \beta_1 X1_i + \beta_2 X2_i + \beta_3 X3_i + \ldots + \beta_n Xn_i,$$

$$where\ \eta_i = ln\left(\frac{P\ (Y_{ij}="declare\ a\ STEM\ major")}{P\ (Y_{ij}="declare\ a\ non{-}STEM\ major")}\right).$$

Stata 14 was used for all data analyses. Following Kreuter and Valliant's (2007) recommendation, we conducted data analysis in three steps using *svy* commands in Stata. Then, we converted the regression coefficients to odds ratios to facilitate the interpretations of the results. For interested readers, the detailed analytical procedures including the *svy* commands in Stata are available from the authors upon request.

We specified seven logistic regression models to address our research questions. Model 1 examined the predictive power of student-related factors alone, and Model 2 assessed the predictive power of school-related factors alone. Model 3, a more comprehensive model, included student- and school-related predictors simultaneously. By comparing the results of Models 1 and 2 to Model 3, we reached a conclusion about the extent to which student-level demographic factors and academic preparation factors correlate with student intent to declare a STEM major (Research Question 1). By comparing the results of Models 1 and 2 to Model 3, we also reached a conclusion about the extent to which school specialization and school demographic composition, respectively, correlate with student intent to declare a STEM major (Research Question 2).

Results

Student Demographics, Academic Preparation, and Intent to Declare a STEM Major

Our first research question examined the extent to which student-level demographic factors and academic preparation factors are associated with student intent to declare a STEM major. According to the outputs of Model 1 in Table 4, student-related variables including gender, race/ethnicity, highest math course level, and algebraic reasoning score were statistically significantly associated with student intent to declare a STEM major in the first semester of college. More specifically, male students were more likely to intend to declare a STEM major. Statistically speaking, the estimated ratio of odds of declaring a STEM major for males relative to females was 2.71. Regarding race/ethnicity, Asian students were more likely than White students to intend to declare a STEM major, and our analyses did not reveal statistically significant differences between White students and Black or Latinx/o/a students' intent to declare a STEM major, respectively. Based on these results, we conducted a supplementary analysis with Asian students as a reference group and found Asian students had statistically higher intent to declare a STEM major than all other ethnic groups. Additionally, our analyses indicate a statistically significant association between academic preparation and student intent to declare a STEM major. Namely, students who took advanced math courses were more likely to express intent to declare a STEM major than those who did not take advanced math courses. Lastly, students who had high math academic achievement, indicated by the algebraic reasoning scores, also were more inclined to express an intent to declare a STEM major.

School-related Factors and Intent to Declare a STEM Major

Our second research question addressed the extent to which school-level specialization factors and school demographic factors are associated with student intent to declare a STEM major. The outputs of Model 2 in Table 4 suggest that none of the school-related predictors we studied were statistically significantly associated with student intent to declare a STEM major. In other words, students who attended STEM magnet high schools were not statistically significantly more likely to express intent to declare a STEM major than students who attended non-STEM magnet high schools. Similarly, there was no statistically significant difference between non-magnet high school students and STEM magnet high school students in terms of their intent to declare a STEM major. Additionally, there was no significant difference in student intent to declare a STEM major between students who studied in majority SOC schools and students attending schools not classified as majority SOC. Finally, there was no significant difference in student intent to declare a STEM major between high poverty schools and schools not classified as high poverty.

Combined Influence of School-related and Student-level on Intent to Declare a STEM Major

We confirmed the results of Model 1 and Model 2 by including both student- and school-level variables in Model 3. The student-related variables including gender, race/ethnicity, highest math course level, and algebraic reasoning score, remained statistically significantly associated with student intent to declare a STEM major. No school-level factor emerged as significant.

Discussion and Limitations

The primary purpose of this paper was to understand the influence of attending a STEM magnet school on student intent to declare a STEM major. We discuss those findings first.

STEM Magnet Specialization

Our study found no statistically significant relationship between a high school's STEM magnet specialization and a high school graduate's intent to declare a STEM major in the first semester of college for any racial/ethnic group. This null finding with national data may not be good news for students and parents who have no other access to an education experience rich in STEM supports apart from a magnet school. Additionally, this lack of statistically significant association also may produce some skepticism about the value of a STEM magnet high school. However, we suggest these preliminary findings about STEM magnet high schools be interpreted with caution, as our analysis was descriptive and not causal.

Until more is known about the impact of STEM magnet high schools on intentions for and choice of college majors, we have recommendations for education stakeholders. For policymakers and local education agencies, perhaps a more feasible approach to diversifying STEM entry is to innovate and pilot STEM high school features (LaForce et al., 2016; Means et al., 2008; National Research Council, 2011; Peters-Burton et al., 2014; Weis et al., 2015) in traditional comprehensive high schools before converting to a STEM magnet model (Betts et al., 2015). For parents, we recommend they ask about the postsecondary outcomes of STEM high school graduates before enrolling their children in a STEM magnet high school. When comparing STEM magnet high schools with other neighborhood schools, parents should explore claims of what makes the respective STEM magnet high school unique. Finally, colleges and universities should not assume students graduating from a STEM magnet high school are any more likely to intend to declare a major in STEM disciplines than their peers from other public high schools when admitting students.

We suggest scholars consider the previously noted limitations as they design future research studies. It would be useful to examine the impact of a student attending and completing four years at a STEM magnet high school, designated as such for all four years. We also recommend collecting and analyzing data about students' academic and career interests prior to, while, and after attending a STEM magnet high school. Additionally, we recommend research to identify the structural elements of a STEM magnet high school that may have the greatest impact on STEM entry.

Student Demographics

Regarding what factors are statistically significant, our analysis confirmed previous findings that student demographic characteristics of race/ethnicity and gender are significantly related to student intent to declare a STEM major (NSF, 2017; Riegle-Crumb & King, 2010; Wang, 2013). Consistent with prior reports (NSF, 2017; Wang, 2013), our results also suggest that Asian students are more likely to intend to major in STEM than White students, Black students, and Latinx/o/a students. However, education stakeholders must recognize that, irrespective of STEM outcomes in the aggregate, Asian students can also face racial/ethnic-related barriers in high school (Rosenbloom & Way, 2004) and every ethnic group of Asian students may not be overrepresented in STEM fields. The dataset used in this study did not disaggregate Asian students by different ethnic categories. Future research could compare Asian students of different ethnicities to non-Asian students to better understand STEM participation disparities within and between racial/ethnic groups.

Also consistent with existing research (NSF, 2017; Riegle-Crumb & King, 2010), we did not find Black and Latinx/o/a first-year students less likely than White students to intend to declare a STEM major. These results suggest that the previous gap in STEM entry between White students and Black/Latinx/o/a students may be closing. Future researchers may focus on confirming this finding and illuminating specific factors contributing to the shrinking of the STEM entry gap. Also, consistent with past research, our results suggest the gender gap persists (Engberg & Wolniak, 2013; Wang, 2013) as male students are still more likely than female students to express intent to declare a STEM college major.

Student Academic Preparation

Our results also indicate a statistically significant association between academic preparation and student intent to declare a STEM major. Namely, students who took advanced math courses in high school were more likely to express intent to declare a STEM major than those who did not take advanced math courses. Given that school environment factors interact with person inputs to influence academic preparation experiences and career development, future analysis of the relationship between student intent to declare a major and other school-level factors and student-level factors such as social-cognitive person attributes (e.g., self-efficacy, interest, outcome expectations) could produce more knowledge about STEM diversity within the transition from high school to college. Such insights may guide educational strategy and school design.

Limitations

This study had several limitations that may influence the interpretation of the results. Regarding the school sample, there are three major limitations. First, we were unable to investigate any elements (e.g., academic structure/program, resources, quality, and admission criteria) of a STEM high school, so the findings and implications of our study cannot be used as approval or disapproval of the features of STEM magnet high schools nor STEM high schools broadly. Second, only 10 of the 40 STEM magnet high schools in our study maintained the STEM magnet identifier during the entire period of the HSLS:09 administration. Students who attended a STEM magnet school during a school's transition to a STEM magnet high school compared to those attending a STEM magnet high school all years before college may have different outcomes (Betts et al., 2015). Our inability to delineate the impact of the amount of time a student attended a magnet school before college or how long a school was a magnet school may have affected our findings regarding the impact of attending a STEM magnet high school. We also could not determine whether a magnet school was inclusive or selective in admissions, which would have greater implications in discussions of equity.

We also acknowledge some factors limiting the student sample. For example, although the HSLS:09 data collected in fall 2009 is representative of all ninth grade students and high schools in the United States at that time, the other data collection waves did not exhibit the same representativeness (Duprey et al., 2018). This limitation means that as our analytic samples were drawn from HSLS:09 participants who enrolled either in a bachelor's degree program or in an associate's degree program in the 2013 update wave, the results of our study are considered ungeneralizable to 9th graders who might have initiated a bachelor's or associate's degree after fall 2013. Moreover, the results of this study cannot be generalized beyond college-going high school graduates and requires an assumption that college-going participants were willing to express their intention for a major in November of their first semester of college without any hesitation (e.g., social expectation). Lastly, our analysis included no information about students' pre-college STEM interest, self-efficacy, outcome expectations, career actions, performance domains and attainments, nor proximal contextual influences. Thus, from our analysis, we cannot understand whether students chose to attend STEM magnet schools because of other pre-existing SCCT factors or if STEM magnet schools can influence those other SCCT factors.

Conclusion

From our study, we can descriptively but not causally say that, within the high school-to-college continuum, STEM magnet schools do not increase the likelihood of a student intending to declare a STEM major in the first semester of college—an SCCT career development factor most predictive of the choice of a STEM major, but student-level factors do increase the likelihood of intent. These findings suggest simply establishing a STEM magnet high school may not increase the likelihood of its graduates pursuing STEM careers, but in many urban communities of color, STEM magnet schools are the best option some families can find. This reality points to a need for further discourse on STEM school reform and proposes more research on other student-level characteristics in the SCCT choice model (e.g., student's self-efficacy, interest, and outcome expectations) to better understand ways that students of all backgrounds and the STEM specialization of a high school shape those factors.

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Table 1

Characteristics of Students by College Major Intentions

	STEM major		non-STEM major	
	Mean (*SD*)	Percentage	Mean (*SD*)	Percentage
Gender				
Male		66.69		41.03
Female		33.31		58.97
Race/Ethnicity				
White		58.50		60.51
Black		4.53		8.70
Latinx/o/a		11.23		13.31
Asian		17.43		7.81
Other		8.31		9.67
Socio-economic status (SES)	0.36 (0.72)		0.12 (0.71)	
Highest math course level				
Basic-Moderate		13.37		30.43
Advanced		86.63		69.57
Algebraic reasoning score	59.47 (9.90)		52.59 (9.07)	

Note. SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS:09), “Base-Year through 2013 Update, Student File and School File.”

Table 2

Descriptive Statistics

	Mean (*SD*)	Percentage
Outcome variable		
STEM major		
Intent to declare a STEM major		28.22
Intent to declare a non-STEM major		71.78
Student-related variables (n=6,040[a])		
Gender		
Male		48.68
Female		53.32
Race/Ethnicity		
White		59.69
Black		7.69
Latinx/o/a		11.76
Asian		11.71
Other		9.15
Socio-economic status (SES)	0.25 (0.72)	
Highest math course level		
Basic-Moderate		20.18
Advanced		79.82
Algebraic reasoning score	55.51 (9.68)	
School-related variables (n=660[a])		
STEM magnet specialization		
STEM magnet		6.72
Non-STEM magnet		8.40
Non-magnet		84.89
Majority SOC		13.44
High poverty		8.24

Note. SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS:09), "Base-Year through 2013 Update, Student File and School File." [a]We rounded all unweighted sample size numbers to the nearest ten in accordance with the Institute of Education Sciences research publication requirement when using the restricted-use data (https://nces.ed.gov/statprog/rudman/chapter2.asp#srp)

Table 3

School Racial and Socioeconomic Composition by School Type

School Type	Majority SOC	High poverty
Magnet specialization		
Magnet (n = 100[a])	28.28%	10.10%
Non-magnet (n = 560[a])	10.79%	7.91%
STEM magnet specialization		
STEM magnet (n = 40[a])	27.27%	13.64%
Non-STEM magnet (n = 60[a])	29.09%	7.27%
Non-magnet (n = 560[a])	10.79%	7.91%

Note. SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS:09), "Base-Year through 2013 Update, Student File and School File." SOC refers to students of color. [a]We rounded all unweighted sample size numbers to the nearest ten in accordance with the Institute of Education Sciences research publication requirement when using the restricted-use data (https://nces.ed.gov/statprog/rudman/chapter2.asp#srp)

Table 4

Results of Design-based Logistic Regression Models 1 to 3

	Model 1			Model 2			Model 3		
Predictor	Coefficient	*SE*	*OR*	Coefficient	*SE*	*OR*	Coefficient	*SE*	*OR*
Student-related variables									
Male	1.00*	0.11	2.71				1.01*	0.12	2.74
Race/Ethnicity [1]									
Black	0.00	0.22	1.00				-0.13	0.26	0.88
Latinx/o/a	0.17	0.16	1.18				0.12	0.17	1.13
Asian	0.51*	0.19	1.66				0.54*	0.24	1.71
Others	0.14	0.19	1.14				0.10	0.19	1.11
SES	0.09	0.09	1.09				0.11	0.09	1.11
Course_adv [2]	0.50*	0.14	1.65				0.45*	0.14	1.57
Math score	0.06*	0.01	1.07				0.07*	0.01	1.07
School-related variables									
STEM magnet specialization [3]									
Non-STEM magnet				0.27	0.33	1.31	0.12	0.23	1.13
Non-magnet				0.14	0.27	1.15	0.12	0.23	1.13
Majority SOC [4]				0.14	0.21	1.15	0.12	0.23	1.13
High poverty[5]				-0.80	0.41	0.45	-0.24	0.38	0.79
Intercept	-5.66	0.43		-1.14	0.26		0.12	0.23	

Note: [1]Reference group = White. [2]Reference group = basic-moderate level math courses (0 = no math, 1 = basic math, 2 = other math, 3 = pre-algebra; reference group, 4 = algebra I, 5 = geometry, 6 = algebra II). [3]Reference group = STEM magnet. [4]Reference group = Not majority SOC (schools with less than 75% non-White students). [5]Reference group = Not high poverty (schools with less than 75% of student receive free- or reduced-priced lunch). OR = Odds ratio. *$p < .05$.