Expanding Access to STEM-Focused Education: What Are the Effects?*

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Calls for broadening the population of students motivated and prepared to pursue STEM studies, with an aim ultimately to impact the country's competitiveness, have been frequent and widespread, including *Prepare and Inspire: K-12 Education in STEM for America's Future* from the President's Council of Advisors in Science and Technology (PCAST, 2010), *Building a STEM Agenda* (National Governors' Association, 2007), and *Rising Above the Gathering Storm* (National Academies, 2007). While publicly supported selective STEM high schools, such as the well-known Bronx High School of Science, have an extensive history of offering advanced course work and an emphasis on one or more STEM disciplines to a student body chosen through competitive examination or record of past performance (Hanford, 1997; Subotnik, Rayhack, & Edmiston, 2006), they do not meet this new need. These schools offer opportunities to develop deep expertise in STEM subject areas, but they do not expand the pipeline of students motivated and prepared for STEM majors in college or address the issues of economic competitiveness or educational equity.

To address this need, a number of private foundations and education policy groups have promoted the idea of addressing changing demographic trends and differences in subgroup STEM participation rates by creating a new type of specialized secondary school designed to inspire, engage, and educate as broad a population as possible in STEM-related fields (Carnegie Corporation, 2009; Means, Confrey, House, & Bhanot, 2008; Morrison & Bartlett, 2009). These are inclusive STEM high schools. We define an inclusive STEM high school (ISHS) as a school, school-within-a-school, or multi-year school program accepting students primarily on the basis of interest rather than aptitude or prior achievement and giving them the mathematics and science preparation they need to succeed in postsecondary STEM majors and certification programs. ISHSs enroll students from groups underrepresented in STEM professions through an application process that does not require high test scores before high school entry (Means et al., 2008). Such schools are designed to *develop* students' STEM expertise rather than to select those students with prior demonstration of talent.

The inclusive STEM high school concept is being implemented at scale in a number of states, districts, and charter networks, but systematic empirical research is missing on the effectiveness of these schools and on the variations and features of the school models that produce positive outcomes (National Research Council, 2011). As policymakers in states and districts across the country respond to the President's recent call for establishing 1,000 more STEM-focused schools (PCAST, 2010), they need solid information about the feasibility and sustainability of an inclusive STEM school model and about the design choices that will maximize prospects for

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student success. They need to know whether these schools achieve their goal of preparing students from underrepresented groups for postsecondary STEM education and training and to understand the essential elements that make an inclusive STEM high school effective. To that end, we are studying inclusive STEM high schools to shed light on the premise that STEM-focused high schools can be a transformative experience for any student, not just those showing potential through early performance.

We are exploring the outcomes of students attending inclusive STEM schools, compared to students from other kinds of high schools, asking:

- How do the characteristics of students in ISHSs compare with those of students in non-STEM public schools?
- How do academic achievement (tests and grades); STEM interests, engagement, and expectations; and academic progression (e.g., completion of STEM courses, graduation) of students who attended ISHSs compare with those of students with similar backgrounds who attended non-STEM schools?
- Do students of varied ethnicity, poverty status, and gender benefit equally from the ISHS experience?
- What elements of inclusive STEM school design, implementation, and context are associated with superior outcomes in terms of academic achievement, STEM engagement, and academic progression?

Research Basis for Inclusive STEM High Schools

Longitudinal research on the educational outcomes of students attending *selective* STEM high schools has found that they are more likely than students in the general population to attend and graduate from college, complete a STEM major, and enter a STEM-related field (Thomas & Love, 2002). But it is recognized that these schools admit students who have already demonstrated a high level of achievement on an entrance examination. Although selective STEM school graduates often give credit to their high schools for nurturing their STEM interest and preparation (Atkinson et al., 2007), empirical research testing whether these gifted students do better than they would have in conventional comprehensive high schools has been sparse (NRC, 2011; Subotnik, Tai, Rickoff, & Almarode, 2010).

Similarly, hard evidence is lacking on the effects of large-scale implementation of *inclusive* STEM schools on STEM-related outcomes, an omission that is easier to understand given that most of these schools are new and only now beginning to graduate their initial classes of seniors. Cases of individual schools suggest that a comprehensive program of academic and social supports can dramatically improve STEM outcomes for underrepresented groups (Gordon & Bridglall, 2004; Lynch & Means, 2012). High Tech High, an ISHS started in San Diego in 2000, for example, selects among applicants through a lottery and serves a diverse set of students, 51% of whom come from ethnic groups underrepresented in STEM, and 35% of whom will be the first in their families to attend college. Its African American and Latino students perform dramatically better than their district and state peers on state tests. In addition, 100% of these students take chemistry, physics, and advanced math and enter college after graduation.

Examples of individual schools with such outstanding student results, however, do not prove that the same effect will be achieved when the concept is implemented at scale.

SRI's evaluation of the T-STEM component of the Texas High School Project (THSP) offers some evidence regarding the impacts of ISHSs implemented at scale (National Research Council, 2011). T-STEM academies have had significant positive effects on achievement and academic progression, including on 10th-grade state math test scores, Algebra I completion by 9th grade, and likelihood of meeting or exceeding standards on state tests in all four core areas for 10th-grade students (Young et al., 2011). The THSP evaluation, however, ended data collection in 2010 when only two T-STEMs had had graduating seniors, and was not designed to examine postsecondary outcomes at all.

Conceptual Framework for Inclusive STEM High Schools

Many different kinds of inclusive STEM schools are being established (Means et al., 2008). Some focus on specific occupations and provide extensive mentoring and internship opportunities. Some stress integration of STEM subjects and project-based learning, and others structure their courses more traditionally and emphasize opportunities to take college-level courses.

Means et al. (2008) developed a conceptual framework for describing STEM schools in terms of their design, implementation, and outcomes. This framework has been refined and elaborated by Lynch et al. (2011) in the form of hypothesized "critical components" that researchers are using in the NSF-funded OSPrI cross-case analysis study of 12 ISHSs deemed successful by STEM policymakers. Although space restrictions prohibit recounting all of the pertinent research literature behind the components, each was selected through a review of the literature as being important in successful STEM-focused schools. The present study incorporates these components as "high school experiences" in a conceptual framework predicting postsecondary STEM outcomes (Figure 1). The OSPrI case studies will provide rich descriptions of selected ISHSs, elaborating on how these critical components are implemented, while this study tests the relationships assumed in the framework.

The framework illustrates the need for a longitudinal design. Working from right to left through the figure starting with desired *Postsecondary Outcomes* (e.g., STEM major declaration/intent) and *Postsecondary Experiences* (e.g., STEM course taking, testing out of remedial math), we know that persistence and success can be predicted on the basis of *High School STEM Outcomes*, such as SAT math scores, high school grade point average, and the level of math and science courses taken in high school (Adelman, 2006; Astin & Astin 1993; Chen & Weko, 2009; Crisp, Nora, & Taggart, 2009; Smyth & McArdle, 2004; Tyson, Lee, Borman, & Hanson, 2007). We also know that adding students' level of STEM interest and commitment to entering a STEM field to their achievement data will improve predictions of persistence in the STEM pipeline (Astin & Astin, 1993; Chen & Weko, 2009; Leslie et al., 1998). Moreover, some researchers have shown that disparities between different student subgroups in terms of STEM persistence can be largely accounted for by the combination of a student's high school achievement and interest levels (Elliot, Strenta, Adair, Matier, & Scott, 1996; Smyth & McArdle, 2004).

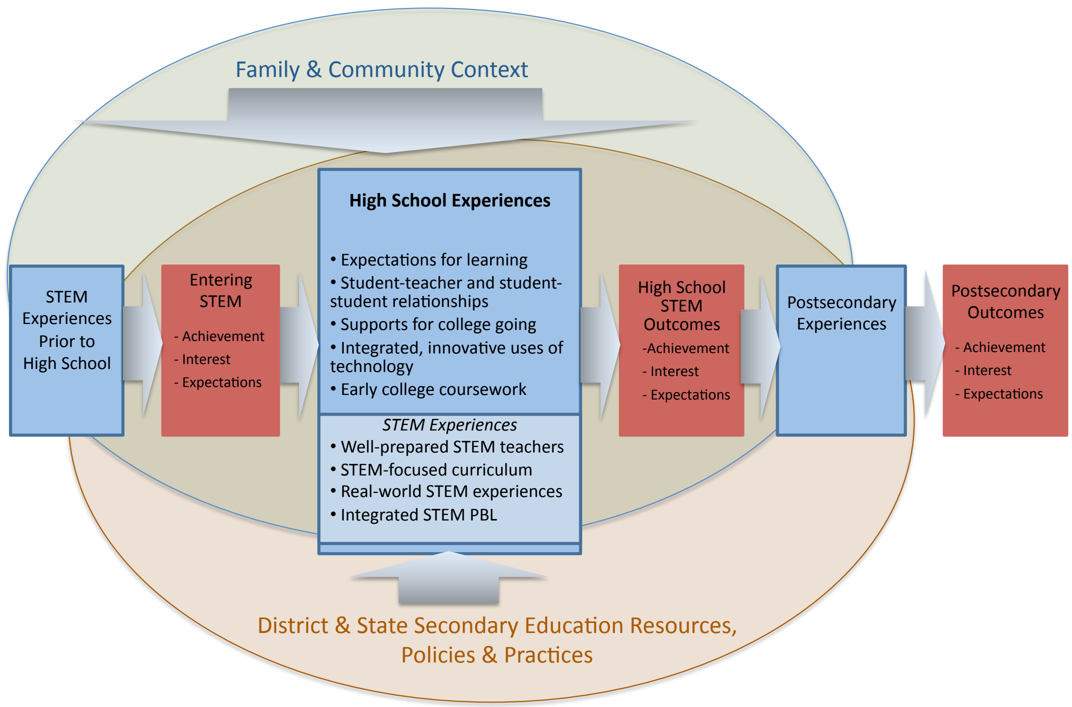

Figure 1. iSTEM Conceptual Framework

High School Experiences influence students' STEM achievement, interests, and expectations in a variety of ways. In many ways, the kinds of experiences STEM schools say they provide to students are similar to those emphasized by student-centered schools in general (Century, 2012). High expectations for learning and close relationships with teachers, for example, are associated with school effectiveness generally (NRC, 2011). In addition, there is research linking these school qualities to underrepresented minority students' persistence in STEM (Crosnoe, Lopez-Gonzalez, & Muller, 2004; Muller, Riegle-Crumb, Schiller, Wilkinson, & Frank, 2010). Aspects specific to high school STEM courses are important also. Taking advanced STEM coursework results in higher STEM achievement. Provision of STEM research opportunities and project-based instructional approaches appear to increase students' STEM interest, with the latter being particularly important for girls (Boaler, 1998; Mergendoller, Maxwell, & Bellisimo, 2006; Ross & Hoagaboam-Gray, 1998).

STEM persistence is predicted also by nonacademic student qualities both generally (such as school behaviors and motivation) and specifically in STEM (Burtner, 2005; Leslie, McClure, & Oaxaca, 1998). High school experiences influence these attributes, but their formation begins before high school (Eccles, Lord, & Midgley, 1991; Tai, Liu, Maltese, & Fan, 2006), necessitating the measurement of *Entering STEM* interests and expectations as well as achievement if one wishes to attribute differences in high school outcomes to the contribution of the high school itself.

Parental and peer influences appear to be important across the developmental span (Astin & Astin, 1993; Leslie et al., 1998; Riegle-Crumb, Farkas, & Muller, 2006) and are represented as a framing context in Figure 1. Similarly, the nature of the opportunities available to students varies in different locales and reflects the influence of state and district resources and policies (Eisenhart et al., 2012).

General Approach and Feasibility Study

Our objective is to conduct rigorous quasi-experiments examining student outcomes over the long term and disentangling the effects of student self-selection and school experiences, as urged by the National Research Council (p. 28, 2011). Our research strategy involves using a combination of data available in state-level databases and new information obtained through student surveys to identify students in different kinds of high schools who are matched not only on demographic variables and academic achievement before high school entry, but also on indicators of preexisting STEM interest and expectations such as career plans and prior participation in informal STEM-related activities. Our design calls for collecting survey and administrative data on students at multiple points in time, either in 9th grade and again when they are 12th graders or in 12th grade and again when they are in college.

We have been able to begin this work with funding from the National Science Foundation for a feasibility study in North Carolina. By the end of the feasibility study, we will have 9th- and 12th-grade survey data from 36 schools, postsecondary survey data from a pilot conducted a year after graduation with students from the three ISHSs surveyed in the spring of their senior year, and pre-high school and high school state test performance data for all these students. We will also have developed all of the necessary survey instruments, established the reliability of our survey item scales, and demonstrated the feasibility of recruiting comparison schools as well as STEM schools for study participation and our ability to obtain a satisfactory survey response rate from students a year or more after high school.

We chose North Carolina for the feasibility study because it has both a good student data system with student identifiers that support longitudinal analyses and a strong set of policies promoting STEM education. North Carolina has implemented a major push around STEM-focused schools with an inclusion mission. They have developed a STEM education strategic plan and defined a set of attributes for North Carolina STEM schools. The North Carolina New Schools Project has a network of 14 innovative schools focused on STEM and is developing a network of 50 such schools, 20 of which are part of the state's Race to the Top initiative. In addition, nine of the states "transformational schools" have chosen a STEM focus as their improvement strategy.

At the time of this writing, we have completed pilot data collections in 3 ISHSs and 3 comparison schools as well as the main North Carolina survey data collection from 5,078 ninth-graders in 18 ISHSs and 18 comparison schools. The 12th-grade student survey and a principal survey are being conducted in the same schools this spring, and we are also running the follow-up survey with graduates of 3 pilot ISHSs who took our grade 12 survey last spring.

To identify ISHSs for our feasibility study we obtained a full list of all North Carolina high schools to identify schools with names suggesting a STEM focus and solicited nominations of inclusive STEM high schools from state STEM education associations and researchers. All potential participating ISHSs were screened by phone to confirm that they are inclusive (i.e., do not have student selection criteria based on academic achievement), have the target grades for data collection, and require STEM coursework and experiences beyond the state's graduation requirements.

The comparison schools for ISHSs in our North Carolina study were identified by selecting high schools with incoming 8th-grade math and science test scores and demographic and district profiles similar to those of the ISHSs that were being matched. To the extent possible, we recruited comparison schools in districts that did not have a STEM-themed school in order to avoid biasing the comparison school sample toward inclusion of students who had had the option to attend an inclusive STEM school but chose to go elsewhere. Table 1 shows the characteristics of schools in the ISHS and comparison school samples. As shown in that table, the two sets of schools are very closely matched in terms of the prior year's (grade 8) state test scores in math and science. In order to obtain that close match on prior achievement, the closeness of match on some other school variables had to be sacrificed. The ISHSs serve a higher proportion of African American and Hispanic students than do the comparison schools. They are also smaller in size and have a larger proportion of their students taking the SAT, but these latter two features can be considered part of the ISHS design. The only other significant difference between the two sets of schools is in the proportion of urban schools. The criterion that comparison schools be chosen from districts that did not have an ISHS option meant that schools in large urban districts, all of which had ISHS options, were ruled out as comparison school candidates. Thus, the ISHS school sample contains a larger proportion of urban schools than the comparison school sample does.

The survey of 9th graders in the two types of schools was used to gather information related to student demographic variables, educational aspirations, grade 9 course taking, and STEM interests and activities prior to high school. The survey of 12th-grade students will gather information related to STEM experiences during high school, attitudes toward STEM subjects, and post-graduation plans.

During the study's pilot phase, surveys were collected from 90 ninth graders and 137 twelfth graders in ISHS schools, and 85 ninth graders and 143 twelfth graders in comparison schools. The pilot survey data were used to establish the reliability of item scales related to the theoretical constructs in the project's conceptual framework. Each of these scales had an alpha of .59 or better.

The 9th-grade survey data collection involved 1,719 students in ISHSs and 3,359 from comparison schools.

Differences between ISHS and Comparison School Students at High School Entry

Although we know that the average prior achievement of 9th graders at our ISHS and comparison schools was equivalent, we are still awaiting receipt of the individual students' prior test scores from the North Carolina Department of Public Instruction. We do, however, have considerable student-level information about 9th graders from both ISHS and comparison schools from the fall 2012 ninth-grade student survey.

Entering 9th Graders' Backgrounds. As shown in Table 2, 9th graders in ISHS schools were more likely than those in comparison schools to be African American or Hispanic and to speak a language other than English in their home. They were also more likely to be female (53% female compared to 49% of comparison school survey respondents). The proportion of 9th graders with a parent working in a STEM field or profession did not appear to be different between the two types of schools, but ISHS 9th graders appear to come from homes where parents have completed somewhat more formal education. They reported that 29% of their mothers and 22% of their fathers hold bachelor's degrees or higher. In contrast, students from comparison schools reported 25% of their mothers and 17% of their fathers hold bachelor's degrees or higher.

Similar percentages of ISHS and comparison school 9th graders report that science was their favorite subject in middle school (11.2% and 11.6%, respectively). There was a small difference, on the other hand, with respect to feelings about math courses, with ISHS 9th graders being somewhat more likely to report that mathematics was their favorite middle school subject (23.3% compared to 18.8% of comparison school 9th graders).

STEM Achievement at High School Entry. An important difference between ISHS entrants and incoming 9th graders at the comparison schools is that the former are more likely to have completed Algebra I before getting to high school (42% of them reported having done so compared to 29% of comparison school 9th graders). They also were somewhat (and statistically) more likely to have participated in more extracurricular and out-of-school science activities while in middle school as shown in Table 3. In responding to a variety of survey items, ISHS 9th graders expressed a stronger sense of identity as someone who "does" math and science. On the other hand, comparison school students had somewhat more experience working with technology prior to high school.

STEM Interests and Expectations at High School Entry. North Carolina students entering ISHSs do so with a higher level of interest in science, technology, and engineering careers (but are no more interested in a mathematics career) than students entering other kinds of high schools, as shown in Table 4. They also express more confidence that they will graduate from high school and go on to complete a bachelor's degree or more education. There was no difference between the two sets of students, however, in their expressed level of general academic motivation (3.07 and 3.05 on a 4-point scale for ISHS and comparison school students, respectively).

The 9th-grade student survey also asked whether the student had chosen to attend the school they were going to: 65% of ISHS 9th graders said they or their families had chosen their school compared to 34% of 9th graders in the comparison school sample. All students were asked to indicate the top three factors they would consider if they had the opportunity to go to any high school they wanted. As shown in Table 5, ISHS 9th graders were significantly more likely to cite a high school's STEM offerings, academic reputation, and courses related to their career interests as grounds for school selection. Comparison school 9th graders, on the other hand, were significantly more likely to say that where their friends would be going to school and closeness to home were top considerations.

Early High School Experiences. Because it will be used to develop student propensity scores that include STEM interests and exposure prior to high school, the grade 9 student survey was administered in the first semester of freshman year. Students taking the survey had only a few months of high school experience to reflect on, but we did ask them about current course taking and extracurricular activities. As shown in Table 6, students at ISHSs were more likely than those at comparison schools to be taking an engineering or technology course. They were also somewhat more likely to be involved in STEM extracurricular activities. Other significant differences in first-semester activities were that ISHS students had talked to more people about college and about careers than their comparison school counterparts, with discussions with teachers (rather than parents, school counselors, or others) being the main source of this difference. ISHS 9th graders also demonstrated better knowledge of the course requirements for high school graduation. The two groups of 9th graders did not differ in their sense of belonging at their schools or in the extent to which they felt safe in that environment.

While the feasibility study is ongoing, the data from incoming 9th graders allow us to address at least the first of pur four research questions: How do the characteristics of students in ISHSs compare with those of students in non-STEM public schools? The 9th-grade survey reveals a picture of inclusiveness, with higher proportions of African American, Hispanic, and female students in North Carolina ISHSs. These schools, however, do seem to attract students who have personal identities aligned with math and science, and began engaging in STEM-related activities prior to high school. ISHS 9th graders also seem to be more intentional than their peers at comparison schools about their future careers related to STEM fields and their interest in a high school that will provides them the opportunity to prepare for these fields.

Pilot Data on High School Experiences and Expectations Reported by 12th Graders

Because the main data collection for 12th graders will not be done until later this spring, we have only the small amount of 12th-grade data collected in the spring 2012 pilot schools at present. The data from the three ISHSs and three comparison schools participating in the piloting of the 12th-grade survey indicate that there are some important differences between students in pilot ISHSs and comparison schools in terms of their high school experiences and future plans.

Postsecondary Expectations. As 12th-grade students prepare to leave high school, a larger proportion of students from pilot ISHSs reported ambitions to earn a master's degree or higher (44% compared to 33% for students from comparison schools). While there was little difference in the number of pilot study 12th graders reporting an interest in careers related to mathematics, science or technology, there was a larger proportion of pilot ISHS 12th graders interested in careers related to engineering (26% compared to 18% of 12th graders in comparison pilot schools).

If these differences hold up in the much larger 12th-grade samples that will be surveyed later this spring, they have important policy implications. For example, while the proportion of comparison school students choosing science as their favorite middle school subject was about the same as among ISHS 9th graders (11.6% for comparison school 9th graders and 11.2% for ISHS 9th graders), the proportion of comparison school 12th graders liking science the best is much smaller than that of ISHS 12th graders (6% compared to 13%). Students who enter comparison schools with an interest in science may stand a good chance of getting disillusioned with the subject through their high school courses.

These apparent differences should be treated with caution, both because they come from small pilot testing samples, and because they are cross-sectional rather than longitudinal and not corrected for any differences between comparison and ISHS 12th graders in terms of their prior achievement or level of STEM interest prior to entering high school. (We are currently seeking additional funding to follow up the students we surveyed in fall 2012 as 9th graders three years from now when they will be high school seniors.)

High School Experiences. When asked about their favorite school subject, science was the favorite (out of 11 choices) for 13% of 12th graders in ISHS pilot schools and 6% of seniors in comparison schools, a statistically significant difference. The two pilot groups did not differ in the proportion choosing math as their favorite subject.

One reason students interested in science who enter comparison schools might become disenchanted with the subject is the nature of instruction in their high school science classes. Twelfth graders in pilot comparison schools were more likely than those in pilot ISHSs to report that their science classes involved frequent memorization of facts and watching the teacher provide a demonstration or lecture. In contrast, 12th graders in pilot ISHSs more frequently described their science classes as involving more reform-oriented instructional practices, such as frequent laboratory activities, investigations, or experiments; writing up or presenting results from such investigations; using evidence to support their ideas or hypotheses; and multi-day projects or investigations.

The 12th-grade pilot data also suggested that the ISHSs provide more engaging instruction in mathematics and different learning experiences than comparison schools do. A greater proportion of 12th-graders in ISHS pilot schools reported that their math classes frequently applied math to real-world problems, asked them to work on problems with more than one solution, called on them to explain how they solved a math problem, and incorporated science, engineering and the use of technology.

Another indicator of different STEM learning experiences is that ISHS students reported feeling more challenged in their math and/or science classes. While in high school, 53% of 12th-grade students in the pilot ISHS schools reported having experienced "a difficult time understanding the content or earning the kind of grade you wanted in a science or math class," in contrast to just 34% of comparison school students who agreed with this statement. And when students faced this type of challenge, 12th graders from ISHS pilot schools were more likely to seek out a tutor than were seniors from pilot comparison schools. Finally, 12th graders in the pilot ISHSs were more likely than those in comparison schools to report that they had completed Calculus or Pre-Calculus, an important indicator of preparation for a STEM college major.

Conclusion

On the whole, the 9th-grade survey data on students' prior STEM experiences and entering achievement and interests suggest that ISHS 9th graders and their families are actively thinking about and aligning high school educational choices with long-term education and career expectations.

Because we do not yet have survey data from the larger sample of 12th graders or the state administrative records data needed to model student outcomes, it is too soon to try to answer the question about ISHS effectiveness posed by this paper's title. But the data we have so far do provide insights relative to the project's conceptual framework and methodology.

It is clear from the 9th-grade data that North Carolina's ISHSs are serving groups under-represented in STEM occupations. In fact the ISHS 9th graders are more likely to be African American, Hispanic, and female than 9th graders in North Carolina public high schools as a whole. What's more, ISHSs are not "creaming" the most talented students under a guise of inclusiveness: average grade 8 scores in mathematics and science are right at the state average.

One sense in which the ISHSs do appear to be serving a more select population in North Carolina is that a larger portion of their students report having taken Algebra I or a more advanced math course prior to entering high school. As these schools either take all applicants or use non-achievement criteria such as lotteries to select their students when applications exceed openings, and their students do not have higher grade 8 math scores than North Carolina students as a whole, the early Algebra I completion probably has an indirect effect on students' propensity to enroll in an ISHS, perhaps by increasing students' liking of math (23% say math was their favorite middle school subject) and their sense that they can do well in math.

The data presented here also illustrate the importance of measuring and accounting for differences between students entering ISHSs and those entering other kinds of high schools in any analyses comparing the outcomes for the two types of schools. Our pilot 12th-grade data found that ISHS students are more likely to have completed Calculus or pre-Calculus prior to high school graduation. On the surface, this difference (presuming it holds up in the larger sample) suggests a positive impact of ISHSs, but our 9th-grade survey data reveal that ISHS students are more likely to come to high school with Algebra I already completed, thus giving them a head start on the secondary math sequence that culminates in Calculus. Similarly, the stronger identification with math and science that ISHS 9th graders bring to high school may dispose them to be more interested in postsecondary education and future STEM courses. A longitudinal data set is needed to investigate the extent to which inclusive STEM high schools really do develop STEM competency and engagement as opposed to merely attracting students who already have it.

Within the next six months we will have data from the 12th-grade survey, which will provide information on the extent to which students graduating from North Carolina ISHSs differ from their counterparts at other types of schools in terms of high school experiences and post-graduation plans. We are actively seeking support for following up with these 12th graders two years into college, at which point many of them will have declared their major field of study. Only by measuring long-term outcomes such as college persistence and choice of a STEM major can we determine whether inclusive STEM high schools are an effective tool for increasing participation of under-represented groups in STEM fields.

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Table 1. Characteristics of ISHS and Comparison Schools

Variable	ISHSs	Comparison Schools	All North Carolina High Schools
Program Improvement status	.39	.39	.39
Urban	.71*	.28	.34
% low-income students	46.6	56.4	49.4
% minority students	61.5*	45.5	38.9
Avg. incoming 8th-grade math score	360.1	360.5	360.8
Avg. incoming 8th-grade science score	147.6	148.1	148.7
Enrollment	745.2	944.8*	744.0
Title I status	.94	.94	.75
Attendance (% days)	95.3	94.3	93.2
% taking SAT	73.2*	56.6	57.6
SAT general score	1362.8	1387.5	1419.7

* $p < .05$.

Table 2. ISHS and Comparison School Grade 9 Survey Respondents

Variable	ISHS 9th-grade sample	Comparison school 9th-grade sample	All North Carolina 9th graders
African American	47.8%*	27.1%	28.8%
Hispanic	17.3%*	11.5%	11.8%
Female	53.3%*	48.8%	47.6%

* $p < .05$.

Table 3. Middle School Experiences of ISHS and Comparison School Ninth Graders

Variable	ISHS 9th-grade sample	Comparison school 9th-grade sample
Favorite middle school course was math	.23*	.19
Favorite middles school course was science	.12	.11
Least favorite middle school course was STEM	.41	.43
Participation in science activities (scale)	.11*	.07
Participation in math activities (scale)	.13	.11
Prior use of technology (scale)	1.53	1.57*
Completed algebra, geometry, or other advanced math courses in grade 8	.42*	.29
General academic orientation (scale)	3.07	3.05

* $p < .05$.

Table 4. Educational Interests and Plans for ISHS and Comparison School Ninth Graders

Variable	ISHS 9th-grade sample	Comparison school 9th-grade sample
Confidence will graduate high school	.86*	.82
Plan to go to college after high school graduation	.63*	.57
Highest level of education expected–bachelor's or higher	.83*	.67
Science career interest	.66*	.55
Technology career interest	.66*	.62
Engineering career interest	.53*	.48
Mathematics career interest	.53	.53

* $p < .05$.

Table 5. ISHS and Comparison School Ninth Graders Reasons for School Choice

Chose/wanted high school	ISHS 9th-grade sample	Comparison school 9th-grade sample
For its academic reputation	.45*	.37
That friends would be attending	.34	.43*
With STEM	.56*	.46
Close to home	.16	.19*
With courses related to a career interest	.44*	.30

* $p < .05$.

Table 6. Early High School Experiences of ISHS and Comparison School Students

Variable	ISHS 9th-grade sample	Comparison school 9th-grade sample
Taking engineering	.19*	.06
Taking a technology course	.19*	.15
Number STEM extracurriculars (scale)	.9*	.7
Knowledge of h.s. graduation requirements (scale)	.6*	.5
Number people talked to about college (scale)	2.5*	2.3

* $p < .05$.