High School Students' Perspectives on STEM: Importance and Interest

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Introduction

The STEM (science, technology, engineering, and mathematics) workforce is critical for driving innovation and economic growth in the United States. Driven by rapid technological advancements and evolving industry needs, the STEM workforce has also evolved, consisting of more professionals in emerging fields like artificial intelligence (National Science Foundation, 2024). The rapid advancement in STEM is reshaping the future of almost every industry, leading to a steadily increasing demand for graduates in STEM fields (National Science Board, 2021). However, the United States has been facing a growing shortage of skilled STEM workers (Corin et al., 2020). Thus, preparing high school and college students to enter STEM professions is increasingly vital.

Students' interest in pursuing STEM majors is not fixed; rather, it can evolve significantly over time, particularly during adolescence—a critical period for identity formation and academic decision-making (Lichtenberger & George-Jackson, 2013). A growing body of research has identified multiple factors that influence interest in STEM across individual, family, and school levels. At the individual level, students' academic experiences and performance play a central role. Those who engage in rigorous STEM coursework and demonstrate strong performance in STEM subjects are more likely to express interest in STEM-related college majors (Radunzel et al., 2017). In addition, psychological factors such as motivation and self-efficacy (students' belief in their ability to succeed) are also critical for developing an interest in STEM (Lichtenberger & George-Jackson, 2013).

In addition to individual-level factors, family-level and school-level influences can also shape students' aspirations. Parental expectations, occupational values, and encouragement can significantly influence students' perceptions of STEM careers and their likelihood of pursuing them (Tegelbeckers et al., 2019). At the school level, the quality and rigor of the STEM curriculum, access to hands-on learning opportunities, and exposure to real-world STEM applications through partnerships or extracurricular programs have all been shown to help foster interest in STEM fields (Bicer et al., 2020).

Because today's high school students will make up the future workforce, it is critical to learn about their perspectives on STEM. As such, the current study was designed to address several questions related to students' interests in STEM:

1. Are students familiar with the term STEM?
2. Do students think STEM is important and useful?

3. Do students agree that schools should emphasize STEM?
4. What do students think of the STEM education they have received?
5. Are students interested in pursuing a STEM-related major in college? If so, what factors are related to such an interest, and how do different factors work together to predict interest in STEM?

The answers to these questions can help us better understand students' perspectives on STEM and their interest in STEM-related majors and provide insights into how to better prepare them for the future workforce.

In April 2024, we asked a random sample of college-bound high school students who registered for the April 2024 ACT national test to participate in an online survey. In the survey, we asked students about their perspectives on STEM and STEM education, including its utility and the importance of emphasizing STEM in education. We also investigated students' interest in pursuing a STEM-related major in college, as well as potential factors that could be associated with that interest. In this brief, we share what we learned from 5,978 high school students on these topics (see the technical appendix for more details about the student sample).

Most students knew what STEM stands for, but there were group differences

Before asking students to share their perspectives on STEM, we first assessed whether they understood what STEM stands for (see the technical appendix for all the survey questions). Overall, 79% of the students indicated that they did. Of that 79%, 97% accurately described the four elements (science, technology, engineering, mathematics). However, further analysis revealed notable differences across demographic groups.[1] First, in terms of racial/ethnic groups, Asian students were significantly more likely to indicate that they were familiar with the term STEM compared to their Black and Latinx peers. While over 90% of Asian students responded yes to this question, only two thirds of Black students and 70% of Latinx students responded yes (Figure 1). Second, in terms of family income, students from lower-income families were less familiar with the term than those from higher-income backgrounds. About two thirds (65%) of students from low-income households (annual family income less than $36,000) answered yes, compared to over three quarters (85%) of students from high-income households (annual family income more than $100,000; see Figure 2). Third, in terms of parental education level, students whose caregivers did not hold a postsecondary degree were also less likely to know what STEM stands for. Only 65% of these students responded yes, compared to 86% of students whose caregivers had a college degree or higher (Figure 3). In sum, students from historically underserved groups were less likely to be familiar with the term STEM than their counterparts.

Figure 1. Percentages of Students Knowing What STEM Stands for by Racial/Ethnic Group

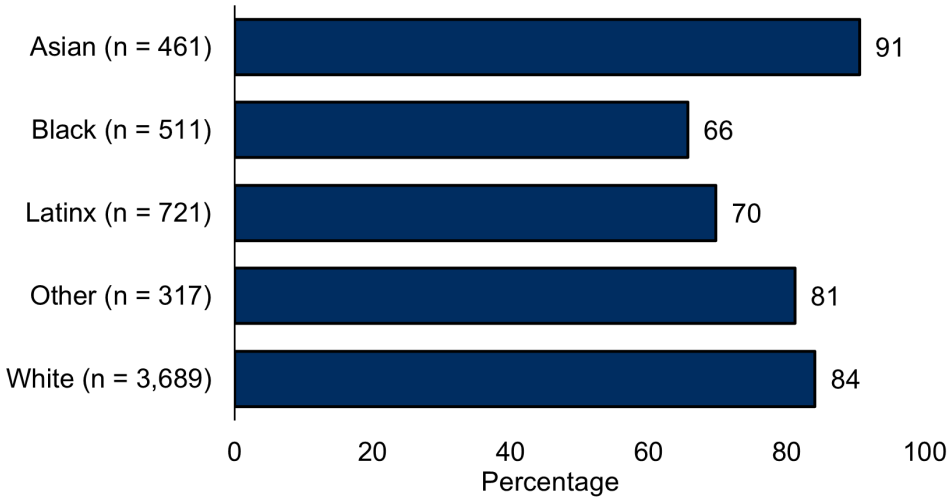


Figure 2. Percentages of Students Knowing What STEM Stands for by Family Income Group

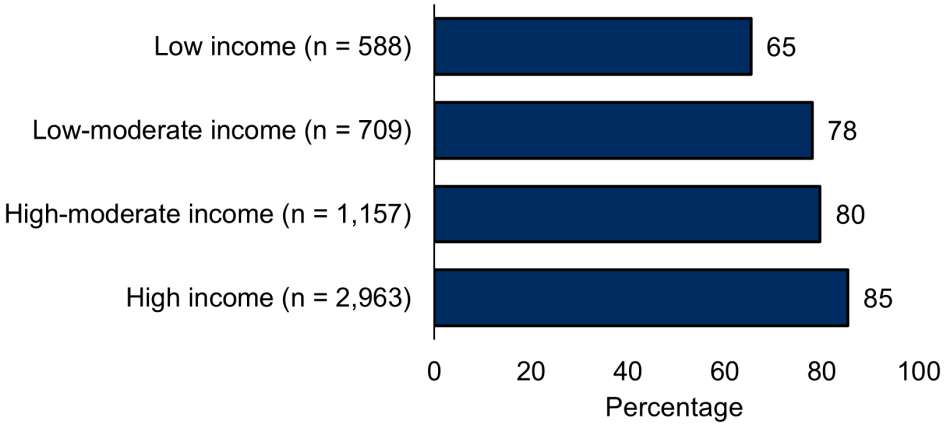
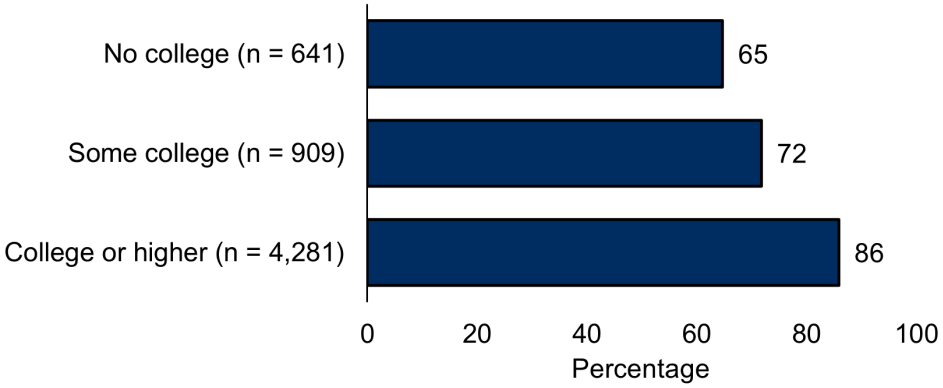


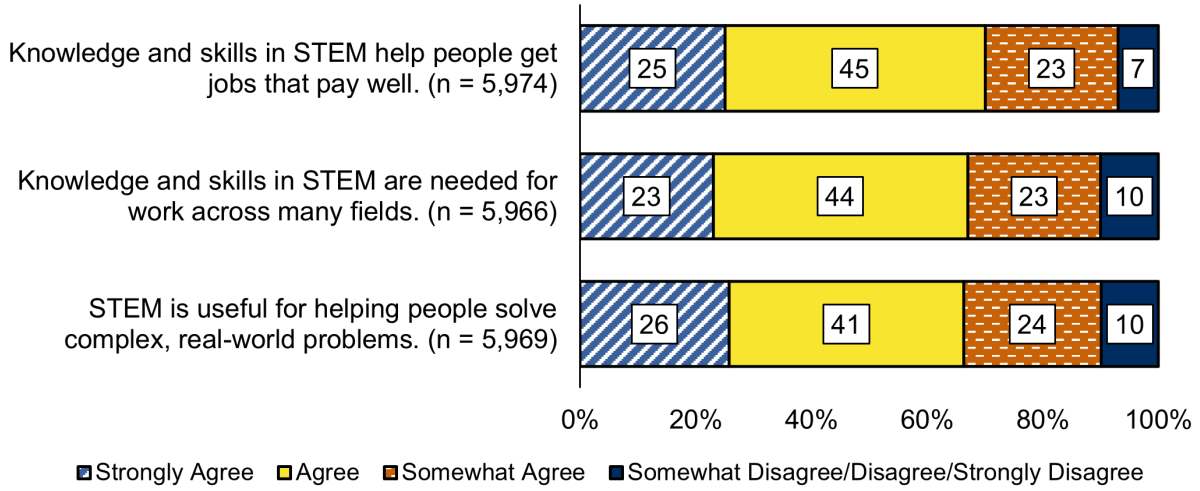
Figure 3. Percentages of Students Knowing What STEM Stands for by Parental Education Level Group



Students agreed that STEM is useful and an important focus in school

We used three items to explore students' views on the usefulness of STEM. A strong majority of students—between 90% and 93%—agreed that STEM is useful (Figure 4). Seven in ten (70%) students strongly agreed or agreed that STEM knowledge and skills help people secure well-paying jobs. An additional 23% somewhat agreed with this statement. Two thirds of students (67%) strongly agreed or agreed that knowledge and skills in STEM are needed across many fields of work, with another 23% somewhat agreeing. When asked whether STEM is useful for helping people solve complex, real-world problems, 26% of students strongly agreed, 41% agreed, and 24% somewhat agreed. Overall, students recognized the value of STEM across multiple contexts—from career advancement to broad applicability and problem-solving.

Figure 4. Percentages of Students Agreeing on STEM Utility



We further investigated students' perspectives on STEM in school by asking how important they think it is for their schools to emphasize STEM in courses and other activities. About three in ten students (28%) considered it very important, 45% considered it moderately important, and an additional 23% considered it slightly important. Only 3% of the surveyed students thought it was not important at all to emphasize STEM in school courses and activities.

Four out of ten students were interested in pursuing a STEM-related major in college

Although most students agreed on the value of STEM and supported its emphasis in school courses and other activities, fewer students expressed interest in pursuing a STEM-related major in college. Overall, 40% of students responded that they were interested, 31% responded maybe, and 28% indicated that they were not interested in pursuing a STEM major.

We further examined differences in college STEM interests across student demographic groups.[2] Racial/ethnic differences revealed that Asian students were more likely to express

interest in pursuing a STEM-related major than were students from other racial/ethnic groups (Figure 5). Over 60% of Asian students reported interest, while the percentages among other racial/ethnic groups were much lower, ranging from 38% to 43%. Moreover, parental education level also showed variation in students' college STEM interests. Students whose caregivers had a college degree or higher were more likely to express interest in STEM-related majors than their peers whose caregivers had no college degree (Figure 6). Specifically, 44% of students in the "college" parental education level group expressed interest, while about one third of students (32%) in the "no college" group showed such an interest.

Figure 5. Percentages of Students Reporting Interest in Pursuing a STEM-Related Major by Racial/Ethnic Group

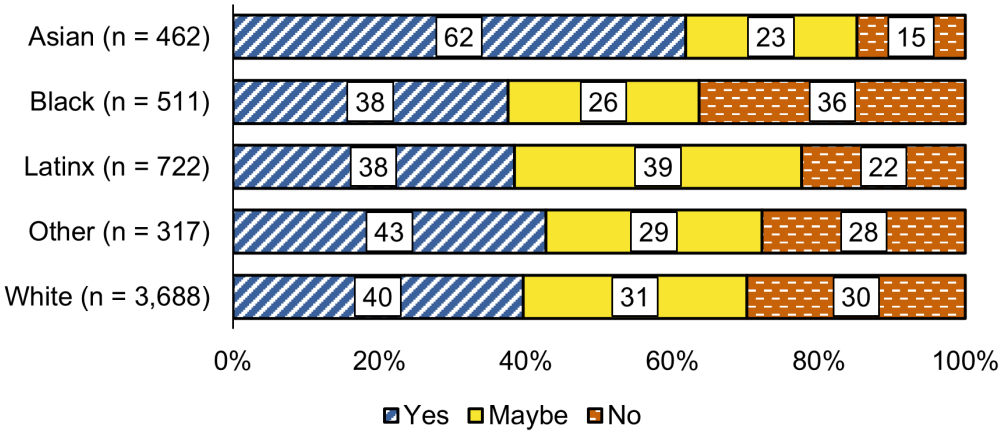
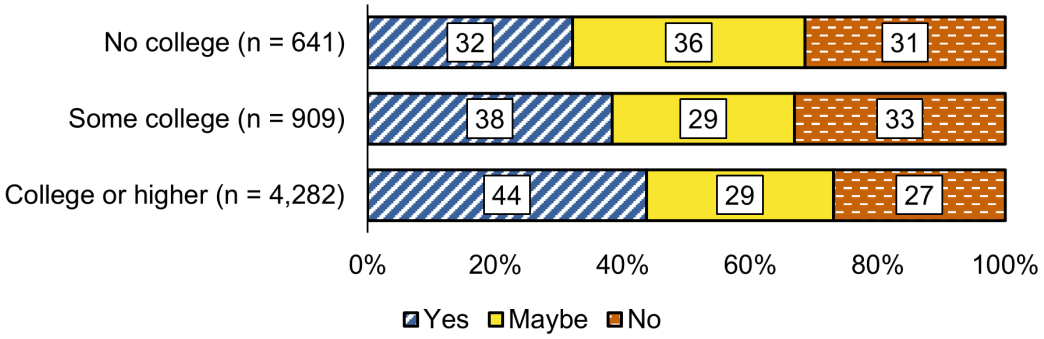


Figure 6. Percentages of Students Reporting Interest in Pursuing a STEM-Related Major by Parental Education Level Group



We asked students an open-ended question to explore their reasons for not being interested in pursuing a STEM-related major in college. Based on responses from 1,419 students, three major reasons emerged.[3]

First, some students (*n* = 718) had already established interest in other areas, and these areas were not related to STEM. They either had developed a career goal that did not require STEM or simply enjoyed studying another area more than STEM, which is reflected in the remarks of three students:[4]

> "I love science and math but I want to pursue a career in sports because I have had a passion for sports ever since I was little and started playing them."

> "I enjoy English more and am interested in careers in the English field."

> "I enjoy other subjects much more than I enjoy math and science- I am much more interested in working with people than with numbers."

Second, several students did not have an interest in STEM classes at school (*n* = 594). They responded that they disliked these subjects, were not engaged with them, or found them boring. The lack of interest due to their course experiences led students to be less inclined to pursue a STEM-related major or career. Comments from two students highlight this point:

> "Nothing about any of the classes I have taken so far have interested me enough to make a career out of them."

> "I have never particularly enjoyed math in school. I have a phenomenal teacher now and he has helped me enjoy math, but I definitely don't have a drive or passion for it."

Third, a group of students responded that they were not interested in pursuing a STEM-related major because they thought they were not good at STEM subjects (*n* = 276). They found it difficult learning these subjects, struggled in STEM classes, or believed a STEM-related major did not fit their skills. For example, two students told us the following:

> "I tend to struggle a lot in those areas-I haven't been 'gifted' with a brain that works well with mathematical and scientific concepts, so I feel that I would be better suited to pursue a job in a different field, like language arts or linguistics."

> "I struggle a lot with those subjects in school and feel I would not find fulfillment or happiness in a job related to STEM."

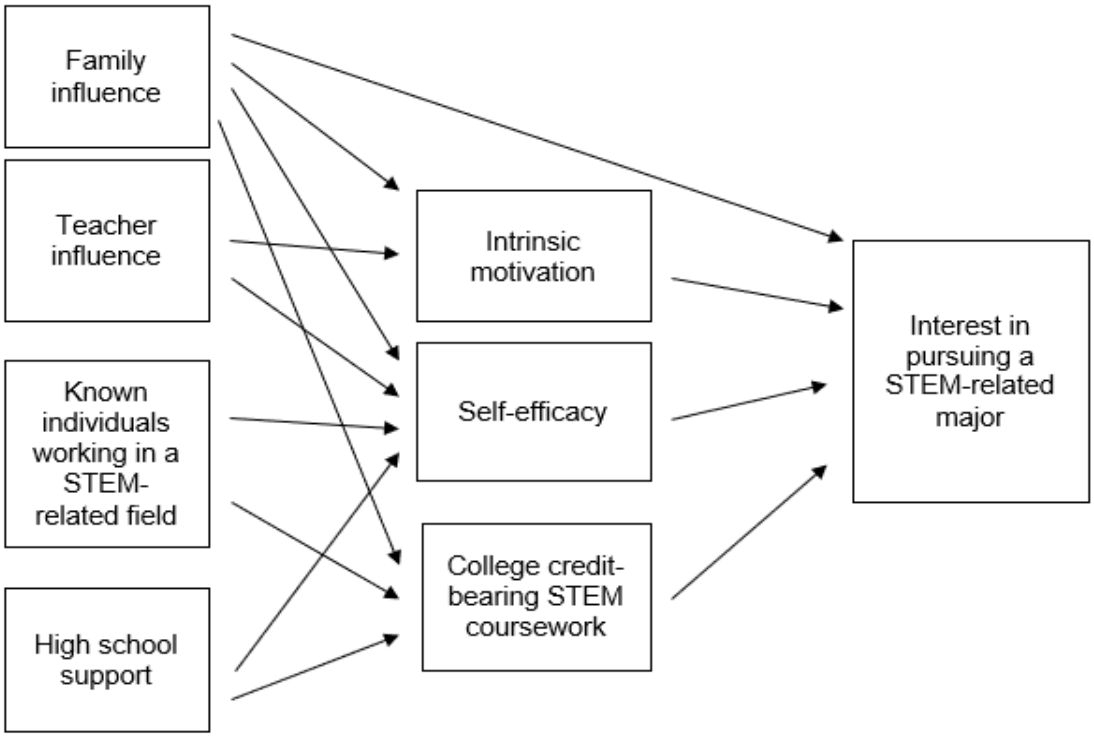
In summary, four out of ten students expressed interest in pursuing a STEM-related major in college. This interest was more common among Asian students and among students whose caregivers held a college degree or higher. Among students who were not interested in STEM majors, the most frequently cited reasons included a preference for non-STEM careers or majors, a dislike of STEM subjects, and difficulties with learning STEM content.

Various factors were directly or indirectly related to students' interest in STEM-related majors

To understand what factors might explain the variation in interest in pursuing a STEM-related major in college, we used a path analysis model to explore the complex relationship between external factors, internal factors, and interest in STEM-related majors.[5] We hypothesized that internal motivation, self-efficacy, and college credit–bearing STEM coursework had a direct positive relationship with interest in pursuing STEM majors, whereas family influence, teacher

influence, known individuals working in a STEM-related field, and high school support had an indirect relationship with the STEM-related interest via the three mediators, as well as a potential direct relationship. Figure 7 shows the relationships of these factors based on the results, which we will examine one by one below.

Figure 7. Relationships Between Various Factors and Interest in STEM Majors



Note. The covariates and the paths that are not significant are not shown in the figure. The technical appendix includes information on the full path analysis model.

Intrinsic Motivation

Numerous studies have shown the importance of motivation in declaring a STEM major (Simon et al., 2015; Wang, 2013). In the survey, we evaluated students' intrinsic motivation—the desire to engage in something purely for the enjoyment—by inquiring whether they enjoyed studying STEM subjects in high school. About 18% of the students strongly agreed that they enjoyed studying a majority of STEM-related subjects, indicating high intrinsic motivation in STEM. An additional 29% of students agreed with this statement, and 26% somewhat agreed. Intrinsic motivation was positively associated with interest in pursuing a STEM-related major and served as a significant predictor of that interest. The higher the intrinsic motivation in studying STEM, the more likely students were to express interest in pursuing a STEM-related major in college.

Self-Efficacy

Students' self-efficacy beliefs (their beliefs that they can accomplish what they desire to accomplish) in STEM have been found to be associated with students' intent to major in STEM

(Wang, 2013). In this study, we assessed students' self-efficacy by asking about their confidence in doing well in STEM-related classes. About 19% of the students strongly agreed that they were confident they could do a good job on assignments in most STEM-related classes, implying high self-efficacy in STEM. An additional 40% agreed and 26% somewhat agreed with this statement. Self-efficacy in STEM was positively related to interest in pursuing a STEM-related major and was a significant predictor of that interest. The higher the self-efficacy in STEM, the higher the probability that a student was interested in pursuing a STEM-related major in college.

College Credit–Bearing STEM Coursework

Taking advanced, rigorous coursework in high school is beneficial for students' intentions to declare a STEM-related major in college (Radunzel et al., 2017). In the survey, we asked students how many STEM-related courses they had taken that awarded college credit, including AP, IB, dual/concurrent enrollment, and dural credit. On average, students had taken two advanced STEM-related courses in high school. The number of STEM college credit–bearing courses taken was positively associated with interest in pursuing a STEM-related major and served as a significant predictor of that interest. The more college credit–bearing STEM courses a student took, the more likely the student was interested in pursuing a STEM-related major.

Family Influence

Family involvement has been found to be a strong predictor of high school students' STEM achievement and STEM career choices (Ing, 2014; Jungert et al., 2020). In the survey, about 18% of students strongly agreed that one or more of their family members would like them to pursue a STEM-related career, with another 26% agreeing and 25% somewhat agreeing with this statement.

Family influence was associated with interest in pursuing a STEM-related major in two ways. First, family influence had a direct positive relationship with interest. The more a student agreed with their family members' expectations for them to pursue a STEM major, the more likely the student was to express interest in pursuing STEM in college. Second, family influence also had an indirect relationship with the interest in STEM majors via the three mediators—intrinsic motivation, self-efficacy, and college credit–bearing STEM coursework. The more students agreed that one or more of their family members would like them to pursue a STEM-related major or career, the higher their levels of intrinsic motivation and self-efficacy, and the more college credit–bearing STEM courses they had taken; these outcomes were in turn associated with a higher probability of them having an interest in pursuing a STEM-related major in college.

Teacher Influence

Previous research has found that teachers also play a role in students' interest in STEM (Jungert et al., 2020). In the survey, we asked students about their perceptions of their STEM teacher(s) in high school. About 21% of the students strongly agreed that they liked their STEM teachers, with an additional 38% agreeing and 25% somewhat agreeing with this perception. Teacher influence had an indirect relationship with interest in pursuing STEM-related majors. It

was positively related to intrinsic motivation and self-efficacy, which in turn were associated with the interest. The more students agreed that they liked their STEM teachers, the higher their levels of intrinsic motivation and self-efficacy, which were directly related to interest in pursuing a STEM-related major. The direct relationship between teacher influence and interest in STEM major was not significant in this study.

Known Individuals in STEM Fields

Vicarious learning is one main source of self-efficacy in STEM (Van Tuijl & van der Molen, 2016). Thus, we wondered whether knowing individuals in STEM fields would provide students with more opportunities to learn about STEM-related majors and careers, which might influence their self-efficacy and intrinsic motivation. We asked students how many people they knew who worked in a STEM-related field. On average, students reported that they knew five people working in STEM-related fields. The number of individuals a student knew in STEM fields had an indirect relationship with interest in pursuing a STEM-related major, via the mediators (self-efficacy and college credit–bearing STEM coursework). The number of known individuals in STEM fields was positively associated with self-efficacy and college credit–bearing STEM coursework. The more people in STEM fields that a student knew, the higher their level of self-efficacy and the more college credit–bearing STEM courses they had taken, after other variables (e.g., race/ethnicity, family income, parental education level) were held constant. As discussed before, higher levels of self-efficacy and more college credit–bearing STEM coursework were linked to the higher probability of interest in pursuing a STEM-related major in college. The direct relationship between known individuals in STEM fields and interest in a STEM major was not significant in this study.

We further investigated whether students from certain subgroups knew more individuals in STEM fields than others.[6] Results indicated that Asian and White students knew significantly more people who worked in a STEM-related field than Black and Latinx students (Figure 8). On average, Asian and White students reported that they knew six people in STEM fields, whereas Black and Latinx students knew only three. Subgroup differences were also found among students from diverse family income backgrounds (Figure 9). As family income increased, the number of known individuals in STEM fields increased as well. On average, students from low-income family backgrounds knew only three people working in STEM fields, while the number doubled among students from high-income family backgrounds. A similar pattern was found based on students' parental education levels, with students whose caregivers had a college degree or higher knowing significantly more people working in STEM fields than students whose caregivers did not have any college experience (Figure 10).

Figure 8. Average Known Individuals in STEM Fields by Racial/Ethnic Group

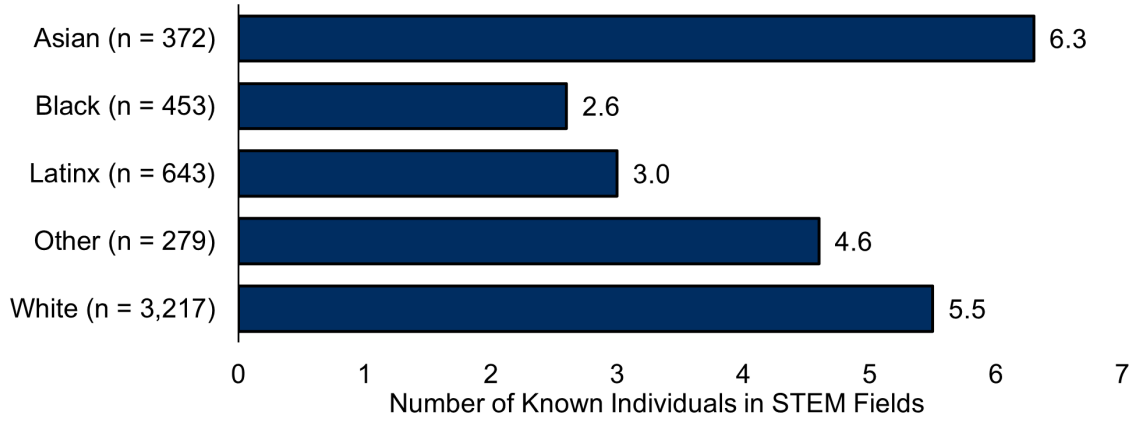


Figure 9. Average Known Individuals in STEM Fields by Family Income Group

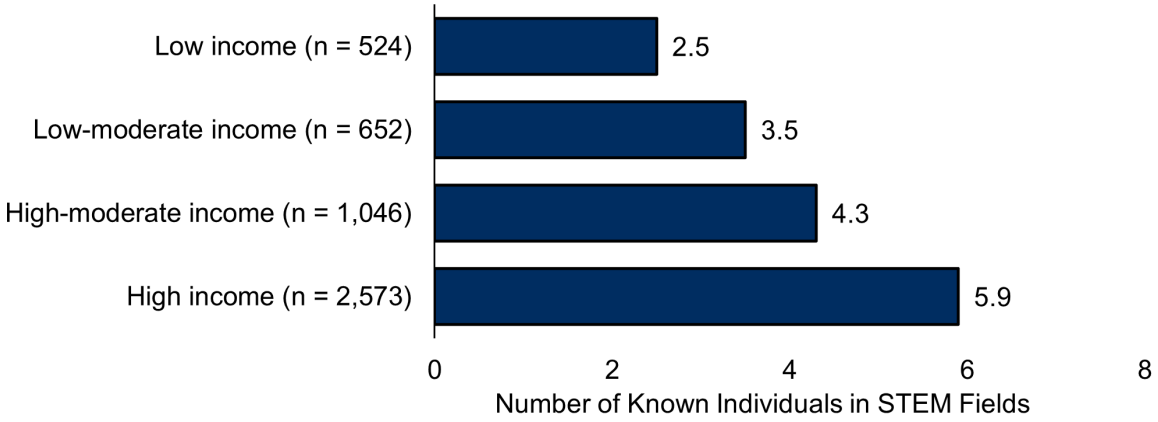
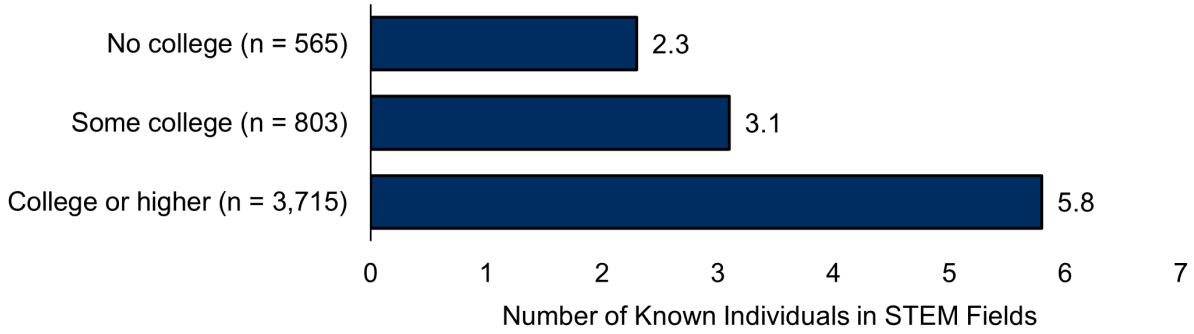


Figure 10. Average Known Individuals in STEM Fields by Parental Education Level Group



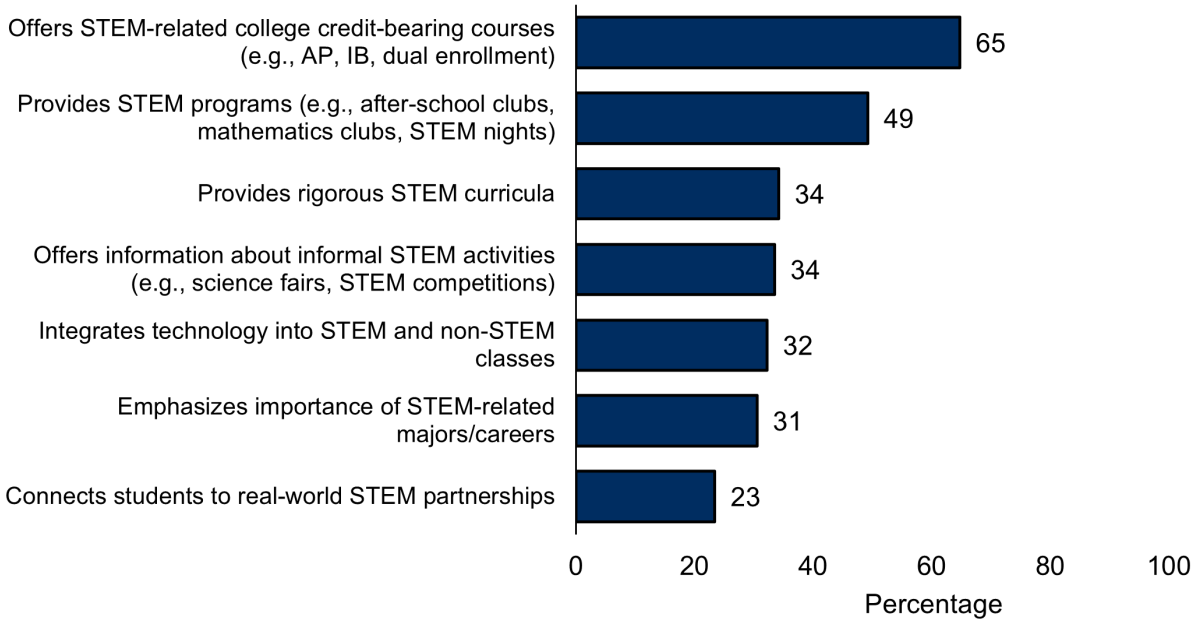
High School Support

Students' STEM experiences in high school were found to be critical in their pursuit of STEM majors in college (Eam et al., 2021). In the survey, we investigated what STEM-related supports students received from their high schools. We provided a list of seven common STEM-related supports and asked students whether their high schools offered each support (see Figure 11).

The most widespread support was offering STEM-related college credit–bearing courses, with almost two thirds of the students (65%) indicating that these courses were available at their high schools. This was followed by providing STEM programs (e.g., after-school clubs, mathematics clubs, STEM nights), with about half of students (49%) reporting that such programs were available. The least common support was connecting students to real-world STEM partnerships (e.g., internship opportunities). Overall, about 14% of the students reported that their high schools did not provide any of these supports, while 7% reported that their high schools provided all of them.

The total number of high school supports had an indirect relationship with students' interest in pursuing a STEM-related major. This number was positively associated with self-efficacy and college credit–bearing STEM coursework. The more STEM-related supports a high school provided, the higher a student's level of self-efficacy and the more college credit–bearing STEM courses they had taken; these outcomes were in turn related to a higher probability of students pursuing a STEM-related major in college. The direct relationship between total number of high school supports and interest in a STEM major was not significant in this study.

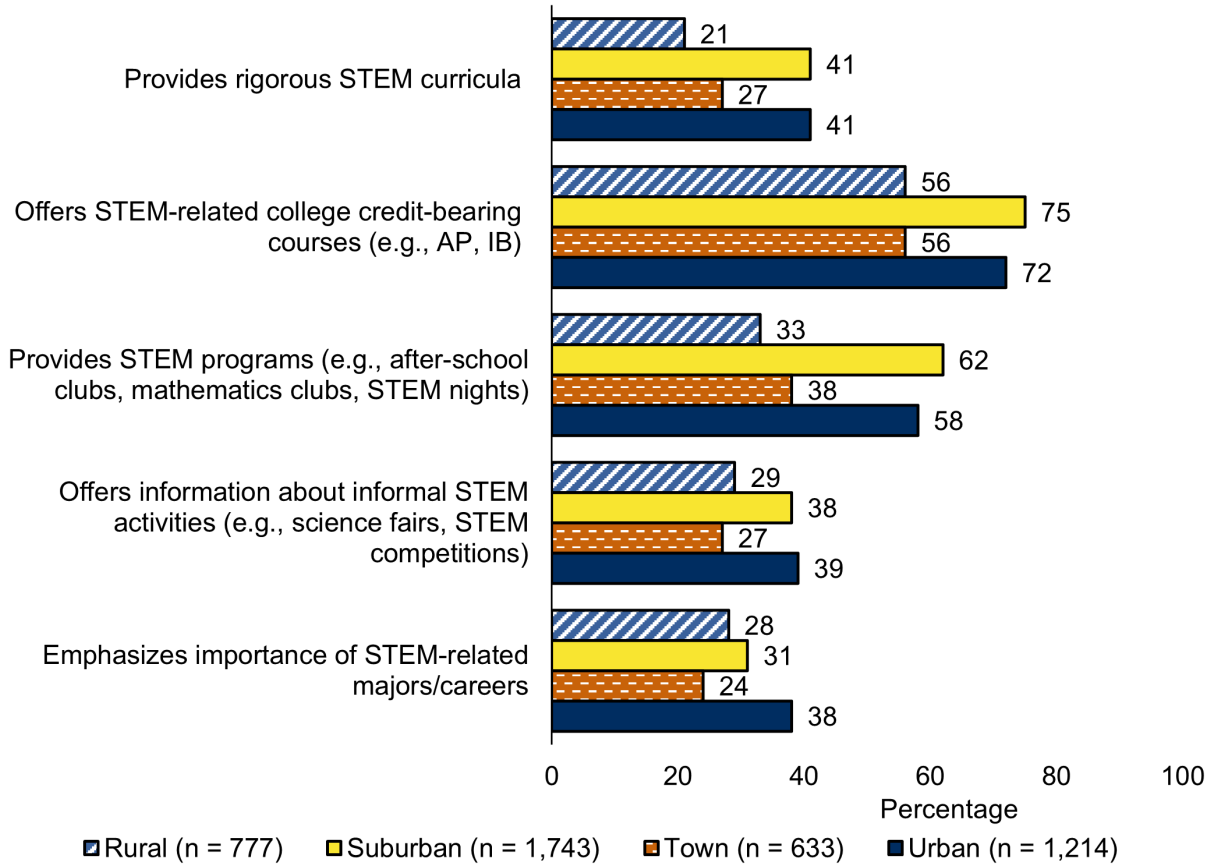
Figure 11. Percentages of Students Reporting Whether Their High Schools Provided Each of Seven STEM-Related Supports (*n* = 5,262)



We further investigated whether the availability of high school supports was associated with high school types.[7] We categorized the high schools into four groups: rural, suburban, urban, and town. High schools in suburban and urban areas were significantly more likely to provide five of the seven STEM-related supports than high schools in rural and town areas (Figure 12). For example, about three quarters of high schools in suburban and urban areas offered STEM-related college credit–bearing courses, while this percentage was much lower (56%) for rural and town high schools. Also, six out of ten high schools in suburban and urban areas (62% and 58% respectively) provided STEM programs such as after-school clubs and STEM nights,

whereas only about one third of high schools in rural and town areas (33% and 38% respectively) provided such programs.

Figure 12. Percentages of Students Reporting Whether Their High Schools Provided STEM-Related Supports by School Type



Students weighed in on high school STEM education

We included an open-ended survey question asking students to share their opinions about STEM education at their high schools, including what they liked or disliked. By analyzing 3,525 responses,[3] we identified the top five categories for positive feedback (i.e., what they liked) and the top five categories for negative feedback (i.e., what they disliked). When comparing these categories, we found that each "like" category had a corresponding "dislike" category, revealing five major themes that reflect students' perspectives on high school STEM education (Table 1). These themes are described in more detail below.

Table 1. Themes and Categories Describing Students' Likes and Dislikes About Their STEM Education

Theme	Like (*n* count)	Dislike (*n* count)
Teaching	Good teaching, good teachers (*n* = 384)	Bad teaching, bad teachers (*n* = 294)
Course variety	Varied courses to choose from (*n* = 334)	Courses lack variety (*n* = 365)
Course rigor	Rigorous, advanced, challenging courses (*n* = 247)	Courses too difficult, too rushed (*n* = 119)
Course utility	Useful/applicable courses (*n* = 250)	Courses too basic, not applicable in real world (*n* = 110)
Opportunities outside of class	Opportunities available outside of class (*n* = 144)	Not enough opportunities outside of class (*n* = 135)

Teaching

Many students viewed the quality of teaching as a key component of their high school STEM education. When describing what they liked, students often mentioned their STEM teachers, highlighting their enthusiasm and expertise. These teachers were credited with helping students understand the materials effectively. Some students also described STEM teaching at their schools as interactive, interesting, or engaging. Two student reflections illustrate this theme:

> "The teachers at my school have made my STEM classes much more understandable to everyone who takes their classes."

> "I enjoy the teaching immensely, I like how passionate my current Adv Biology teacher is about various subjects."

On the other hand, some students expressed dissatisfaction with the quality of STEM instruction. Several felt their teachers lacked experience or qualifications, while others struggled with getting their questions answered. Some described the teaching style in STEM classes as boring and wished it were more engaging. For example, two students shared the following comments:

> "I don't always feel like I have been taught in a way that leads to me to master the content."

> "Some of the teachers who teach STEM classes are not teaching the subject as throughly as expected. The subject is not taught correctly or the teacher doesn't seem enthusiastic about what they teach."

Course Variety

Another aspect some students appreciated about their schools' STEM education was the variety of courses offered. They valued having multiple STEM course options that allowed them to choose based on their interests and needs. In some cases, schools provided multilevel courses within each subject area—including advanced levels—which students found especially enjoyable. This is highlighted by two students who shared this sentiment:

> "I enjoy the amount of courses available and how they build on each other."

> "I like how they have a variety of different STEM classes so that people can have the freedom to chose what path they want to go down."

However, for other students, course variety was a major concern—and the most frequently mentioned dislike regarding their schools' STEM education. These students felt that the limited selection of STEM courses was a drawback and wished for more options. Additionally, a few students noted challenges in accessing the courses they were interested in due to factors such as small class sizes and extensive prerequisites. Their comments illustrate these concerns:

> "I don't really like it because we don't have many classes for it. if you want to do something stem you have to do it after school and that's not always possible for some people.'

> "It is very limited. There aren't a large variety of classes to chose from."

Course Rigor

In addition to mentioning course variety, students also emphasized the rigor of STEM courses when sharing their perspectives on STEM education. Those who appreciated their STEM courses described them as challenging and advanced, noting that a strong curriculum helped them better understand the content. Some students enjoyed the academic challenge and felt a sense of accomplishment when they performed well, as shown by the remarks of two students:

> "I appreciate the rigorous curriculum that doesn't necessarily involve college credit but still rewards excellence in STEM."

> "I like how rigorous it is, and often times it challenges students to think outside the box."

While some students appreciated the challenge of rigorous STEM courses, others felt these classes were too difficult. Some reported that the content was hard to understand, while others felt the pace was too fast, leaving little time to absorb the material. A number of students also described the workload as overwhelming. Comments from two students illustrate these concerns:

> "At times, it is rigorous and harder to digest, especially for someone who's not as strong at STEM-related subjects."

> "The STEM education at my high school is incredibly rigorous and challenging. I like the content we learn, however the pace and workload can be difficult to manage."

Course Utility

Some students highlighted the usefulness of their STEM coursework, which they greatly appreciated. They described these courses as helpful, informative, and applicable to real-world contexts. These students believed that the content was valuable for their futures—whether in college or a career—and felt that STEM classes helped prepare them for what lay ahead. The following student comments reflect these views:

> "I like how the STEM courses offered at my school focus on the fundamentals. Normal lessons aim to teach us how or why something works the way it does, and thus help us problem-solve / use the techniques in the real-world."

> "I believe that my high school's STEM education will adequately support anyone interested in a STEM-related career."

Nevertheless, other students identified course utility as a limitation in their schools' STEM education. They felt the courses were too basic, were too easy, or lacked sufficient depth. Others noted that the content was not applicable to real-world situations. A few students also criticized the curriculum, describing it as overly focused on test preparation rather than meaningful learning. Two students shared these views:

> "I think the STEM education at my high school is a little underwhelming as there is a lot of work but yet little is actually properly understood. The teachers do not go into much depth about the material and explain it moderately."

> "I strongly dislike how they go about teaching it for Biology and it doesn't tie to real world issues."

Opportunities Outside of Class

In addition to discussing STEM coursework, several students emphasized the importance of having opportunities outside the classroom. They appreciated STEM-related activities and events such as extracurricular programs, clubs, and internships, believing these experiences helped prepare them for future careers. Some schools even provided opportunities for students to connect with professionals in STEM fields, which students found especially valuable. Two students shared the following reflections:

> "I like that my school provides students opportunity to have STEM involved outside the classroom as well as inside. It very helpful for students that are looking to make connections to sign up for STEM relates clubs and activities which can help them in the long run."

> "I really enjoy how they prepare us for the real world and potential careers, especially in terms of researching and learning how to make connections with College Professors or other experts in the field."

In contrast, some students shared negative feedback about the availability of opportunities outside the classroom. They felt that STEM coursework alone was not sufficient and wished their schools offered more STEM-related experiences, such as career development programs and extracurricular activities. The following comments from two students highlight these thoughts:

> "I dislike that my school lacks opportunity outside of class regarding STEM. I would like to have opportunities such as competitions and science fairs."

> "I think STEM is very well emphasized, but I would like to be connected to possible internships/research opportunities, which my school does not do a good job of offering."

Discussion

In this study, we investigated high school students' perspectives on STEM and their interest in pursuing a STEM-related major in college. We examined students' views about STEM utility and the importance of emphasizing STEM in courses and activities in schools. We learned about their interest in STEM-related majors and explored factors that could potentially be associated with this interest. More importantly, we unpacked the complex relationships between these factors from various levels (i.e., individual, family, school). We also gathered students' opinions on STEM education at their high schools.

A majority of students agreed on the usefulness of STEM across multiple contexts, from career advancement to broad applicability and problem-solving. About three quarters of students (73%) considered it very or moderately important for schools to emphasize STEM in courses and other activities. These findings indicate that the surveyed high school students understood the importance of STEM. This is promising, given that technology advances affect almost every industry (National Science Foundation, 2024). Therefore, it is beneficial for students to have some knowledge and skills in STEM even if they are pursuing a career that is not traditionally STEM-related.

Four out of ten students expressed interest in pursuing a STEM-related major in college, with another 31% saying they might be interested in pursuing STEM. We found subgroup differences in interest in pursuing STEM-related majors, with Asian students and students whose caregivers had a college degree or higher more likely to have such an interest. Another relevant finding was that subgroup differences existed when we asked students whether they knew what STEM stood for. Students from historically underserved groups, such as Black students, Latinx students, and students whose caregivers did not have any college experience, were less likely to be familiar with the term STEM than students from other groups, such as Asians and students whose caregivers had a college degree or higher. Meanwhile, these students from underserved groups knew significantly fewer people in STEM fields than their counterparts (e.g., Asian

students, students from high-income families, and students whose caregivers hold a college degree). These differences highlight the disparities in exposure to STEM among various subgroups. The lack of interest in STEM in traditionally underserved groups may partially stem from their lack of familiarity with STEM-related majors, careers, and industries.

We further examined individual, family, and school-level factors associated with students' interest in pursuing STEM-related majors. More importantly, we sought to unpack the complex relationships among these multiple factors. The results indicated that family influence, teacher influence, known individuals in STEM fields, and high school support were positively associated with at least one of three mediators—intrinsic motivation, self-efficacy, and college credit–bearing STEM coursework. These mediators, in turn, showed a direct positive relationship with students' interest in STEM-related majors. While causal relationships cannot be assumed due to the limitation of the research methods, the significant predictors identified in this study are consistent with those in existing literature. For example, prior research has shown that parental and teacher enthusiasm are linked to adolescents' intrinsic motivation in STEM (Jungert et al., 2020) and that intrinsic motivation is positively associated with STEM major selection (Wang, 2013). Additionally, advanced STEM course-taking and teacher experience have been found to positively relate to students' interest in majoring in STEM fields (Lichtenberger & George-Jackson, 2013). The current study contributes to understanding the complex relationships among these factors and the ways they relate to interest in STEM-related majors both directly and indirectly.

To better understand why some students chose not to pursue STEM majors, we asked those who did not express interest to explain their reasons. The three most commonly cited reasons were (1) a stronger interest in non-STEM subjects or careers, (2) a dislike of STEM subjects in school, and (3) a belief that they were not good at STEM. These reasons implied the potential role of intrinsic motivation and self-efficacy in pursuing STEM majors, which are aligned with the findings in the path analysis discussed above. While it is entirely appropriate for students to pursue paths that align with their interests and strengths, it is increasingly important for all students to develop foundational STEM-related knowledge and skills, especially as emerging technologies like AI are poised to affect many occupations. Moreover, expanding the future STEM workforce is critical given the current labor shortages in STEM fields (Corin et al., 2020). Therefore, high schools should not only support students who already show a clear interest in STEM but also engage those who are disinterested or lack confidence in STEM subjects, helping them explore and potentially develop new interests in these areas.

Students also shared their perspectives on their schools' STEM education. Their views on good STEM education centered on good teaching, the variety of STEM coursework, rigorous and useful STEM coursework, and STEM-related opportunities outside of class. Based on the findings showing relevant factors that relate to interest in STEM-related majors, high schools could play a key role by focusing on factors at multiple levels. For example, schools could better engage students in STEM subjects and help them master the content knowledge, which may increase students' intrinsic motivation and self-efficacy in STEM fields and potentially spark their interest in STEM-related majors and careers.

Based on the findings of this study, there are several actions high schools could take to better help students develop interest in STEM and better support those who are already interested in pursuing STEM-related majors:

- **Help students learn more about STEM subjects, STEM majors, and STEM careers.** Educators and counselors can play a key role in clarifying what STEM consists of, what fields are considered STEM-related, and what types of careers are available within STEM. It is valuable for students to recognize how STEM knowledge and skills can be relevant—even in careers not traditionally considered STEM-related. This support is especially important for students from underserved groups, such as Black and Latinx students and those from low-income families.
- **Encourage students to assess their STEM knowledge and skills using reliable and valid assessments** (e.g., the ACT math and science tests). These assessments can provide students with a clearer understanding of their current achievement levels and help identify areas for improvement. For students who lack confidence in their ability to succeed in STEM, objective feedback from assessments may offer a more accurate perspective on their strengths. Notably, improvements in STEM-related scores could contribute to increased self-efficacy, potentially motivating further engagement in STEM learning.
- **Offer rigorous STEM courses that incorporate innovative teaching approaches**. Educators can enhance engagement by making STEM instruction more interactive and dynamic through methods such as project-based learning and game-based learning with the use of augmented and virtual reality technologies. Providing hands-on learning experiences and emphasizing the real-world applications of STEM knowledge and skills can help students connect classroom content to practical, everyday contexts—making STEM more relevant and accessible.
- **Support students in enrolling in STEM-related college credit–bearing courses**. Educators and counselors should provide guidance on course selection based on each student's academic needs, intended college major, and career goals. If the desired courses are not available at the school, staff can assist students in exploring alternative options, such as online offerings. Ensuring access to these opportunities can help students build confidence and readiness for postsecondary STEM pathways.
- **Connect students with individuals in STEM-related fields.** High schools can invite professionals working in STEM careers and college students majoring in STEM disciplines to speak with students. These interactions can help students gain a deeper understanding of STEM majors and career paths while also providing opportunities for students to ask questions and explore potential interests.
- **Promote collaboration among families, schools, and communities to expand STEM opportunities.** Educators and counselors can engage parents in supporting students' STEM interests and aspirations. Schools can also facilitate access to job shadowing and internship opportunities within the community. Additionally, students may benefit from participating in local STEM-related activities such as science competitions, robotics clubs, and STEM-focused summer camps.

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Notes

[1] A series of chi-square tests of independence was conducted to explore whether knowing what STEM stands for was associated with race/ethnicity, family income, and parental education level. For race/ethnicity, five groups (Asian, Black, Hispanic/Latinx, White, and Other) were compared. Due to low *n* counts, the Other group included Native American, Native Hawaiian/Other Pacific Islander, and two or more races/ethnicities. For family income, four groups were compared: low income (annual family income less than $36,000), low-moderate income (annual family income between $36,001 and $60,000), high-moderate income (annual family income between $60,001 and $100,000), and high income (annual family income more than $100,000). Students who did not report their family income were excluded from this analysis. For parental education, three groups were compared: students whose caregivers did not have any college experience, students whose caregivers had some college experience but did not have a bachelor's degree from a 4-year institution, and students whose caregivers had a bachelor's degree or higher. Students who did not report their parental education level were excluded from this analysis. If a test was significant at a .05 alpha level, follow-up chi-square tests were then conducted to further explore which two levels were significantly different. The reported results were significant at the adjusted alpha level of .005 for race/ethnicity, .0083 for family income, and .0167 for parental education level.

[2] A series of chi-square tests of independence was conducted to examine whether interest in STEM-related majors was associated with race/ethnicity, family income, and parental education level. See note 1 for details about each group. The reported results were significant at the adjusted alpha level of .005 for race/ethnicity, .0083 for family income, and .0167 for parental education level.

[3] Thematic qualitative analysis procedures were conducted to analyze students' responses to open-ended questions. All responses were read, segmented by relevance (irrelevant comments were excluded), and coded by a qualitative research expert to construct tentative categories. These categories were then reviewed and verified by a second qualitative research expert. Categories were examined and grouped into broader themes.

[4] All student responses are reproduced as written and without editing.

[5] A path analysis was conducted to examine the relationships between external and internal factors and interest in pursuing a STEM-related major (coded as a dichotomous variable, with the selection of "Yes" being 1). The reported factors were significant predictors at a .05 alpha level. See the technical appendix for detailed results of the path analysis. The fit indices of the SEM model were CFI = .996, RMSEA = .024, and SRMS = .006, indicating a good model fit.

[6] One-way ANOVA with Tukey HSD tests were conducted to explore subgroup differences (i.e., race/ethnicity, family income, parental education level) in the number of known individuals in STEM fields. The reported group differences were significant at a .05 alpha level.

[7] A series of chi-square tests of independence was conducted to examine whether providing each of the seven STEM-related high school supports was associated with school types. There were four school types—rural, suburban, urban, and town. If a test was significant at a .05 alpha level, follow-up chi-square tests were then conducted to further explore which two levels were significantly different. The results showed that suburban and urban schools were significantly more likely to provide five of the seven supports than rural and town schools at the adjusted alpha level of .0083.

Technical Appendix

Sample

This survey study focused on students' perspectives on STEM, including whether they knew the elements of STEM, whether they think it necessary to emphasize STEM in teaching and learning, and how important they think STEM is for their future success. We also investigated whether students were interested in pursuing a STEM-related major and examined the factors that could potentially relate to their interest. This report summarized the findings from the quantitative and qualitative data analyses.

The target population was high school students who registered for the April 2024 ACT national test and reported that they were residing in the U.S. The sampled population was N = 73,920 and did not include students who opted out of ACT communications or who were included in recent student survey samples. A stratified random sample of 44,400 Grade 10, Grade 11, and Grade 12 high school students nationwide was drawn from the sampled population for this study. These students were presumed to be college-bound, although it is possible that some of them will not attend college. The sample was stratified on race/ethnicity.

Students were invited via email to participate in the online survey. The survey opened on April 13th, 2024, and closed on April 30th, 2024. A total of 5,978 students answered at least half of the required questions (i.e., the selected-response questions). This group was used as the analytical sample of the survey (a response rate of 13%). This response rate is not unusual for online surveys, and we do not know whether nonrespondents' opinions would have been similar to those of the respondents, which is a limitation of this study.

We used propensity weighting to weight the responses to match the sampled population, compensating for the differences in sample size and the overrepresentation of respondents from subgroups. We also conducted a multiple imputation to address the issue of missing data in calculating weights. The imputed data were used only for the purpose of weighting and reporting demographics and were not used in survey question analyses.

Student characteristics (gender, race/ethnicity, family income, parental education) are reported in Table A1 for the survey's sampled population, the analytical sample, and the weighted analytical sample. All the characteristics in the table were reported by students and were collected when the students registered for the ACT test. Also, students who chose to participate in the survey were asked to provide additional information about family income and parental education at the end of the survey.

Table A1. Characteristics of the Sampled Population, Analytical Sample, and Weighted Analytical Sample (Percentage[a])

Characteristic	Group	Sampled population (*N* = 73,920)	Analytical sample (*n* = 5,978)	Weighted analytical sample (*n* = 5,978)
Gender	Female	55	63	55
	Male	44	35	44
	Other/unknown	1	2	1
Race/ethnicity	Asian	5	8	5
	Black / African American	12	8	12
	Hispanic/Latinx	16	12	17
	Other[b]	5	5	5
	White	57	62	56
	Race/ethnicity missing	5	5	4
Family income	Less than $36,000	9	10	8
	$36,000 to $60,000	8	12	8
	$60,000 to $100,000	13	19	13
	More than $100,000	39	50	38
	Family income missing	32	9	32
Parental education[c]	No college	14	11	15
	Some college	16	16	16
	College or higher	70	73	69

[a] Some percentages in the table do not add up to 100% due to rounding.

[b] Other races/ethnicities include Native American, Native Hawaiian/Other Pacific Islander, and two or more races/ethnicities.

[c] Parental education levels: No college = less than high school or high school graduate / GED; Some college = business/technical school, certificate program, some college with no degree or certificate, or associate's degree (2 year); College or higher = bachelor's degree (4 year) or higher. The percentages of the parental education levels were calculated using the data from multiple imputation.

Path Analysis Results

Table A2. Path Analysis (SEM) for Interest in STEM Major

Variable		Estimate	Standard error	z-value	*p*
Intrinsic motivation	High school support	0.01	0.01	1.18	0.24
	Family influence	0.37	0.02	21.77	0.00
	Known individuals in STEM	0.01	0.00	1.80	0.07
	Teacher influence	0.41	0.02	19.29	0.00
	Black	−0.25	0.10	−2.54	0.01
	Latinx	−0.18	0.09	−2.08	0.04
	Other race/ethnicity	−0.22	0.11	−2.04	0.04
	White	−0.16	0.07	−2.34	0.02
	Male	0.14	0.04	3.37	0.00
	Low income	−0.01	0.08	−0.11	0.91
	Income middle group 1	−0.01	0.07	−0.06	0.95
	Income middle group 2	−0.03	0.06	−0.60	0.55
	Parent education: no college	0.00	0.08	−0.01	0.99
	Parent education: some college	0.12	0.06	2.00	0.05
Self-efficacy	High school support	0.02	0.01	2.47	0.01
	Family influence	0.23	0.01	16.19	0.00
	Known individuals in STEM	0.01	0.00	3.33	0.00
	Teacher influence	0.32	0.02	15.90	0.00
	Black	0.20	0.10	2.03	0.04
	Latinx	0.02	0.10	0.22	0.83
	Other race/ethnicity	0.04	0.11	0.34	0.73
	White	0.20	0.08	2.50	0.01
	Male	0.20	0.04	5.63	0.00
	Low income	−0.17	0.07	−2.31	0.02
	Income middle group 1	−0.10	0.06	−1.56	0.12
	Income middle group 2	−0.02	0.05	−0.36	0.72
	Parent education: no college	−0.02	0.07	−0.29	0.77
	Parent education: some college	0.03	0.05	0.54	0.59
College credit–bearing STEM coursework	High school support	0.09	0.02	4.74	0.00
	Family influence	0.07	0.02	2.88	0.00
	Known individuals in STEM	0.03	0.01	4.24	0.00
	Teacher influence	0.03	0.03	0.91	0.37
	Black	−0.49	0.18	−2.69	0.01
	Latinx	−0.41	0.17	−2.43	0.02
	Other race/ethnicity	−0.73	0.20	−3.70	0.00
	White	−0.72	0.15	−4.99	0.00
	Male	−0.04	0.07	−0.57	0.57
	Low income	−0.02	0.13	−0.19	0.85

	Income middle group 1	0.07	0.12	0.63	0.53
	Income middle group 2	0.05	0.09	0.57	0.57
	Parent education: no college	−0.26	0.12	−2.28	0.02
	Parent education: some college	−0.08	0.10	−0.83	0.41
Interest in STEM major	College credit–bearing STEM coursework	0.03	0.00	5.81	0.00
	Intrinsic motivation	0.10	0.01	13.64	0.00
	Self-efficacy	0.03	0.01	3.04	0.00
	Family influence	0.09	0.01	15.62	0.00
	Known individuals in STEM	0.00	0.00	2.70	0.01
	Teacher influence	−0.01	0.01	−1.82	0.07
	High school support	0.01	0.00	1.67	0.10

Survey Instrument

The following are the survey items explored for this issue brief:

1. Do you know what “STEM” stands for? (Scale: yes, no)

2. (If “yes” selected in Q1) What does “STEM” stand for? (Open-ended)

3. Are you interested in pursuing a STEM-related (science, technology, engineering, or mathematics) major in college? (Scale: yes, maybe, no)

4. (If “yes” or “maybe” selected in Q3) What STEM-related major(s) are you interested in pursuing? (Open-ended)

5. (If “no” selected in Q3) Could you tell us why you are not interested in pursuing a STEM-related major? (Open-ended)

6. To what extent do you agree or disagree with each of the following statements? (Scale: strongly disagree, disagree, somewhat disagree, somewhat agree, agree, strongly agree)

    - Knowledge and skills in STEM help people get jobs that pay well.
    - Knowledge and skills in STEM are needed for work across many fields.
    - STEM is useful for helping people solve complex, real-world problems.
    - I enjoy studying a majority of STEM-related subjects (e.g., math, science) in high school.
    - I am confident that I can do a good job on assignments in most STEM-related classes.
    - One or more of my family members (e.g., parent, guardian) would like me to pursue a STEM-related career.
    - I like my STEM teacher(s) in high school.

7. How many people do you know who work in a STEM-related field? (Please enter a number)

8. During high school, how many STEM-related course(s) have you taken that award college credit (i.e., AP, IB, dual/concurrent enrollment, dual credit)? (Please enter a number)

9. Which of the following would describe your high school? (Select all that apply.)

   - ☐ Provides rigorous STEM curricula
   - ☐ Offers STEM-related college credit-bearing courses (e.g., AP, IB)
   - ☐ Provides STEM programs (e.g., after-school clubs, mathematics clubs, STEM nights)
   - ☐ Offers information about informal STEM activities (e.g., science fairs, STEM competitions)
   - ☐ Emphasizes importance of STEM-related majors/careers
   - ☐ Integrates technology into STEM and non-STEM classes
   - ☐ Connects students to real-world STEM partnerships (e.g., STEM-related internship opportunities)
   - ☐ None of the above

10. How important do you think it is for your school to emphasize STEM in courses and other activities? (Scale: not important at all, slightly important, moderately important, very important)

11. What do you think of the STEM education at your high school? Anything you like or dislike? (Open-ended)

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