Center for American Progress

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Early High School STEM Perceptions Associated With Postsecondary Outcomes

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Introduction and summary

How can high school students considering an engineering degree prepare for college? For most, the answer is enrolling in advanced math and science courses as they progress through high school—and maybe a computer science course if one is available. For Garett Lopez, a Colorado high school junior, his interest in pursuing engineering was piqued when he became certified in computer-aided drafting through a class at the beginning of his high school career. He is now on a graduation pathway that reflects the district's effort to align course selection with student interest and long-term goals.

Lopez attends Cañon City High School (CCHS), a rural school in a small town two hours south of Denver. The town's primary industries are tourism and corrections—the surrounding area is home to 13 prisons, including the infamous Supermax prison in Florence, Colorado.[1] There has been a general sense among those living in the area that students wishing to pursue careers in science, technology, engineering, and math (STEM) must leave town to do so. But recently, the local school district partnered with local businesses in fields such as technology, environmental science, and emergency services to change that narrative. These partnerships aim to accelerate community development, show students opportunities for other local careers, and prepare them for success in those opportunities.

The recent academic changes that Lopez and his classmates are experiencing at CCHS incorporate insights from research into learning mindsets—beliefs that shape how one interprets educational experiences.[2] The high school's work is predicated on fostering what is known as a "purpose and relevance" mindset, which helps students find value in school by connecting what they learn to their current interests and long-term goals.[3] This is related to but distinct from the more widely known "growth mindset," or the belief that intelligence is malleable and can improve with effort; a "purpose and relevance" mindset is the belief among students that schoolwork is relevant to their life.[4] Finding purpose and relevance in school is associated with a host of positive outcomes for students, including deeper learning,[5] increased engagement in class,[6] and longer persistence through college.[7]

At the beginning of Cañon City School District's partnership efforts, business development and the needs of local industry priorities took precedent. The goal was to build a skilled workforce within the community; redesigning Cañon City's high school experience was not the intended outcome. But it quickly became clear to district and business leaders that a new educational strategy was necessary to help students see the utility of what they were learning and spark interest in a range of newly available careers in the area. That has led to partnerships and internship opportunities for students with area technology companies, emergency service operations, veterinary practices, and river science firms. The school district's leaders—including Superintendent George Welsh, Assistant Superintendent Adam Hartman, and high school Principal Bill Summers—began thinking about the knowledge students needed to acquire, the skills they needed to develop, and the experiences they needed exposure to in order to be ready for those kinds of opportunities after graduation.

Several years into this work, Cañon City School District is taking what Hartman calls a "12-K approach," working backward from the 12th grade down to kindergarten to incorporate career-connected learning throughout elementary and secondary schools.[8] The district uses a "graduate profile"—a listing of knowledge, skills, and experiences that school leaders want students to possess upon graduation from high school—to help create a shared language around those skills and traits and refocus high school completion requirements around core competencies, rather than simply the number of courses completed.[9]

Walking the halls of CCHS today, students, teachers, and visitors are greeted with signs displaying words such as "innovation," "tenacity," and "agency," which signal some of the traits Cañon City's graduate profile values most. CCHS' course of study helps to ensure that students such as Lopez will graduate with these traits having been able to pursue the topics they are most interested in and understand how their education is relevant to their future careers. Four "pathways"—health; science, technology, engineering, agriculture, and math (STEAM); skilled trades, security, and industry; and arts, hospitality, and education—now guide which courses CCHS students take throughout their high school experience.[10] Additionally, beginning with the class of 2021, all CCHS students must participate in an internship and complete a capstone project. And while internships are meant to complement the pathways that students have selected, students have the freedom to design an experience that will be most engaging and useful based on their current interests and future goals.

For Lopez, this meant getting certified in computer-aided drafting and designing his own capstone around his passion for engineering. All this helped him get excited about his math and science courses, strengthened his planned college applications, and made him feel more prepared to start the path toward an engineering degree when he goes to college next year.

In Hartman's view, focusing on skills development is the most equitable approach to graduation requirements since it allows students to learn and demonstrate those skills in the way that works best for them.[11] However, requiring that all students participate is crucial to the success of this approach. CCHS operated an internship program for several years, but it was optional. Allowing students to opt in to the internship program meant that it primarily served students who were already motivated to pursue additional learning experiences. In addition, a GPA requirement for participation in the program limited it to students already near the top of their class.

By giving students freedom to select the pathway they are most interested in, apply for a range of internships, and design their own capstone project while still requiring all students to complete all of these actions, CCHS has made the experience both more equal and more equitable. Still, as Lisa Tedesko, regional internship coordinator, notes, meeting students where they are is a necessity. For example, some students who are responsible to help pay the bills at home are allowed the option of maintaining a paid job in lieu of an internship. In addition, dozens of students with disabilities need access to specific transportation and a paraprofessional who can transport them to work and assist them while on the job.[12]

Certainly, pathways, internships, and capstones are not the only mechanism for activating a purpose and relevance mindset, but they are examples of what has worked for Cañon City and the school district. And as Hartman noted of his small rural district several times: "If it can work here, it can probably work anywhere."[13]

A new CAP analysis of two national datasets explores how much early high school learning mindsets matter for later outcomes. In one longitudinal dataset from the High School Longitudinal Study (HSLS) of 2009, the authors examined how ninth grade students' ratings of their math and science courses predicted future outcomes such as on-time high school graduation, enrollment in a four-year college, and pursuit of a STEM major. In another recent dataset from the National Assessment of Educational Progress (NAEP), the authors explored the relationship between eighth grade math NAEP scores and how those same eighth grade students felt about math in general, as well as how that relationship differed by state.

Key findings include:

- **Mindsets matter:** Students' attitudes toward their ninth grade math courses were correlated with on-time high school graduation. Likewise, students' attitudes toward both ninth grade math and science courses were correlated with four-year college enrollment and pursuit of a STEM major.

- **Mindsets are especially important for students who are traditionally underrepresented in STEM:** The relationship between STEM mindsets and pursuit of a STEM major was strongest for female students and students from families with low incomes.

- **Mindsets differ by state:** There are state-by-state differences in eighth grade student math interest and how students rate the importance of math.

Based on these findings, the Center for American Progress believes that state and local policymakers should invest in measuring student learning mindsets, expand equitable access to career and technical education (CTE) programs that make learning relevant to student interests, and advocate for scalable school redesign efforts that can increase student engagement and promote the availability of successful STEM opportunities, especially to students who are traditionally underrepresented in those fields.

Learning mindsets

An abundance of recent research in education and psychology has shown how student learning mindsets are related to future outcomes such as academic achievement, behavioral outcomes, and educational attainment.[14] Put simply, a "mindset" is a belief that shapes how one interprets daily experiences.[15] While a "growth mindset"—or belief that intelligence is malleable and can improve with effort—continues to dominate media attention when it comes to education, other learning mindsets such as a "purpose and relevance mindset" are less about how students learn and more about their perception of what they are learning.

Learning mindsets help students organize their goals into a single meaning system.[16] By reframing academic challenges within a new meaning system, effective learning mindsets help students navigate these experiences with the resources available to them.[17] Carol Dweck, a pioneer of mindset research, says that by changing these beliefs, educators "can influence whether they [students] see that world as overwhelming and threatening or whether they greet it with the confident words 'I love a challenge.'"[18]

A purpose and relevance mindset helps students find value in school by connecting what they learn to their current interests and long-term goals.[19] When students who find purpose and relevance in their schoolwork encounter challenges, they are more motivated to maintain effort and push through the challenge in service of a bigger purpose. Alternatively, when students do not care about what they are learning or do not see how it relates to their life experience, they are less likely to persist through those same challenges. Educators can promote purpose and relevance in their students by making instruction culturally relevant, connecting coursework to student hobbies, and explaining why school is important for self-transcendent goals that will help people, such as securing a job. All of these strategies routinely bolster academic and behavioral outcomes for students, both in primary and secondary school and through college.

Mindsets are not a panacea,[20] and Dweck herself has acknowledged the problems with implementing mindset work at scale.[21] Not only do educators lack the training to effectively cultivate a growth mindset in their students, a 2016 survey found that only 20 percent of teachers strongly believed that they were good at incorporating

such a mindset into their instruction.[22] Furthermore, equity is also a concern. One major criticism of learning mindsets is that they create a "deficit lens" that could give teachers permission to simply say, "that student doesn't think they can learn so I don't have to teach them.[23] Parents of Black students specifically have voiced concern that a singular focus on mindset in the classroom fails to consider the many ways students must develop and demonstrate these strengths in nonacademic settings.[24]

While many of these critiques are valid, there is also important evidence—in both research and implementation—that learning mindsets, when done well and with equity front and center, can be especially powerful tools for students who are traditionally underserved.[25] It is becoming clearer that the opportunity gap may also manifest itself as a gap in learning mindsets, as students from families with low incomes typically self-report less of a growth mindset than their peers.[26] And the most robust effects of learning mindsets are consistently found for low-performing students,[27] students of color,[28] and students from families with low incomes.[29]

Direct-to-student interventions demonstrate positive effects on their own, but the largest gains come from changing the wider culture. STEM professors' mindsets influence their students' motivation, and having a teacher who believes intelligence is malleable can help close the achievement gap between white students and students of color.[30] For example, one study found that schools in Chicago that do more to enhance student social and emotional well-being see larger positive effects with regard to academic persistence.[31] In 2015, the National Study of Learning Mindsets began research involving more than 12,000 students in an effort to better understand the qualities of the students, classrooms, and schools that were most likely to benefit from a growth mindset intervention during the transition from middle school to high school.[32] Preliminary findings published by the lead researchers in the prestigious journal *Nature* show that schools fostering climates of curiosity increased student achievement by half a grade point—on a GPA scale from 0.0 to 4.0.[33]

The benefits of making education interesting and relevant

> *"Getting an education in what you enjoy is important because you learn more."*
>
> *Kodee Summers, CCHS senior*

It is unsurprising that the National Study of Learning Mindsets found that schools fostering curiosity had some of the most positive outcomes given that intellectual curiosity is considered the third pillar of academic performance—alongside intelligence and effort.[34]

Unfortunately, schools are not effectively fostering intellectual curiosity throughout students' K-12 experiences. In a recent survey that asked more than 21,000 high school students how they felt at school, nearly 75 percent of the reported emotions were negative.[35] More concerning, the few positive emotions students offered were passive ones such as "happy" and "calm," which do not reflect deep learning in the same way that "excited" and "engaged" might. Indeed, the share of students excited about school peaks at around 74 percent in fifth grade but drops steeply to 32 percent by 11th grade.[36] More intentional efforts to foster a purpose and relevance mindset can help to change this narrative.

Interest is linked to motivation

Such a drop-off in student excitement is especially concerning given evidence that interest fuels motivation.[37] Students who are not interested in what they are taught are not motivated to learn.[38] But changing mindsets can help. Subject matter interest is moderately correlated with academic achievement across all subjects.[39] Math interest specifically can predict the amount of time students spend on homework[40] as well as their enrollment in more advanced math courses.[41] Likewise, science interest predicts a host of positive outcomes, both in science classes and more broadly.[42]

Teachers shape interest and motivation.[43] In an international study of Programme for International Student Assessment (PISA) scores, family background was found to have no effect on interest formation, but in all countries, there was a strong impact based on which schools student attended.[44] Another study found that kindergarten teachers' beliefs about their students' math abilities predict how interested their students are in math up through sixth grade.[45] But teacher preparation programs typically do not include social-emotional skill development, and teachers do not feel equipped with best practices to cultivate passions with fidelity.[46]

Unfortunately, without this training, many teachers fall into outdated and potentially harmful practices when attempting to boost student interest. Despite increasing evidence that there is no such thing as a "math person," 37 percent of teachers believe that advanced math courses are only important if a student already shows ability or interest in math.[47] What is more, new research suggests that one common strategy to boost student interest—simply telling them that math is important—can actually decrease interest in the subject, especially for students who already lack confidence in their math abilities.[48]

Purpose, relevance, and utility

> *"I take history because I like it, and I take science because it's relevant to what I want to do. Pre-calc isn't fun, but it's important for life."*
>
> *Garett Lopez, CCHS junior*

Making school more relevant to students is one way teachers can effectively increase student interest.[49] That is why Alex Carter, who works with the Colorado Education Initiative (CEI) in implementing career-connected learning for districts across Colorado, says: "Every student should see the relevance of their course of study."[50] In a 2017 survey, only half of students said that they thought what they learned in school was relevant to the real world.[51] Schools across the country are now learning from experts such as Carter about connecting classes, especially STEM classes, to students' interests.[52]

Helping students find purpose and relevance in their schoolwork helps them view school as more valuable, which can promote deeper learning.[53] One way to do this is through short-term interventions that help students to build connections between specific concepts they learn—such as measuring an angle of a triangle—and their interests outside of school, such as skateboarding on a triangular ramp.[54] In a series of studies, college students who wrote several short essays throughout the semester about the relevance of science material to their lives enjoyed their classes more and earned higher grades.[55] In one of these studies, the GPA gap between Black and white students was 0.42 points in the group that wrote about the relevance of what they were studying, whereas Black and white students who only wrote a summary of the course content had a GPA difference of 1.22 at the end of the semester.[56]

These short-term strategies are a fast and simple way to help make school relevant in the moment. However, teachers can also help students connect school to their future selves in order to promote long-term learning and achievement—also known as "academic tenacity."[57] In one 10-session elective workshop, Black and Latinx eighth grade students wrote essays about the obstacles preventing them from becoming who they wanted to be and how they could overcome those obstacles. This writing assignment improved both their academic and behavioral outcomes, compared with students taking a typical elective class.[58] The approach used in the elective writing workshop targets students' sense of purpose,[59] a critical piece of adolescent development correlated with other character traits such as gratitude, compassion, and grit.[60] Helping students find purpose in school can increase academic self-regulation,[61] improve time spent learning a topic,[62] raise GPA, and reduce the risk of a student dropping out of high school.[63]

Of course, many students do not automatically know exactly what they want to do when they grow up. Many researchers therefore encourage teachers to forgo telling students to "find their passion," as if it is a predetermined thing inside of them, and instead help students to grow a passion.[64]

Tedesko, the Canon City internship coordinator, is trying to help other students understand that their internships do not need to be the exact job they want after high school.[65] In a phone interview, senior Kodee Summers raved about her internship at a local history museum specifically because it opened her eyes to a college major she had not previously considered.[66] She began the internship interested in archaeology but learned over time that she was actually more interested in anthropology. "I had no way to know what the reality of those two jobs would actually look like from my regular high school classes," she shared.[67] Similarly, Adam Hartman noticed some students paralyzed by what they saw as making a potentially life-altering choice when they selected a pathway in ninth grade. Hartman is now working to make it clear to students that it does not matter what specific path they ultimately pursue, just that they learn something from the experience.[68]

Historically underserved students can benefit most from connecting school to their interests and goals

> *"Getting people to talk about equity is one thing; really getting people to design with equity in mind continues to be a struggle"*
>
> *Alex Carter, vice president of implementation at the Colorado Education Initiative*

Interventions to increase interest, purpose, and relevance typically work best for students who were previously underperforming. Studies also routinely find different effects based on individual characteristics such as race, socioeconomic status, and gender. This may be because the interventions target a student's identity.[69] It can be hard for those who are traditionally underrepresented, including female students and students of color, to build a STEM identity when their classroom experience does not speak to their lived experiences. These unconscious biases, whether manifested in classroom decorations featuring exclusively male scientists[70] or in a teacher's grading practices or other behavior,[71] can make students more likely to conform to stereotypes and steer clear of fields that they do not think they "should" pursue.[72]

Female students are both less likely to pursue a STEM major[73] and more likely to leave the STEM pipeline during college,[74] but these decisions are not explained by prior achievement. In high school, girls enroll in advanced courses and receive roughly the same grades and standardized test scores as boys.[75] Instead, confidence in math ability

predicts this gender divide. Math efficacy beliefs[76] similarly bolster math-based career interest for first-generation college students[77] and students of color,[78] who report many of the same barriers as girls in interviews about their STEM aspirations.[79] For Latinx students, attending a Hispanic-serving institution is an important point of access to a STEM degree,[80] as Latinx students more frequently drop out of STEM pathways in other institutions of higher education.[81] Meanwhile, parent support and other mentors are especially important for Black girls in math pipelines.[82] These social and emotional supports are useful precisely because they help students see themselves represented in STEM.[83] Schools must also do their part to implement social and emotional development, remove unconscious bias, and provide additional opportunities so that students can see every career as a viable possibility.

Unfortunately, students of color and students from families with low incomes face access barriers to schools with the resources to provide the key supports and additional opportunities needed to expand career possibilities.[84] Moreover, there is evidence that schools with more resources serve predominantly white students and are less likely to design innovative new practices with equity in mind.[85] As a result, students who may benefit the most from these opportunities are least likely to have access to them, no matter what school they attend. Even with access, there are risks that even well-intentioned opportunities will continue to exacerbate opportunity gaps for those students already underrepresented in STEM fields. For example, a CTE program in Connecticut produced significant positive outcomes for male students but no effect for female students, contributing to an increase in the CTE gender gap.[86]

It is critical that any effort to make school more purposeful does so with cultural relevance in mind and expands beyond limited ideas of what postsecondary success should look like. CCHS is working with the Homegrown Talent Initiative (HTI), a CEI project that strives to bring career-connected learning to rural districts through local partnerships. Another HTI district is working with a nearby tribal nation to offer hospitality pathways at a local casino. This approach not only engages members of the community, it offers students an opportunity to meet mentors who share their cultural background—which has demonstrated success for Native American students in at least one study.[87]

Redesigning the high school experience

A great deal is already known about how to get students through high school and to college. High school graduation rates have been rising since 2006 to a current high of almost 85 percent.[88] But despite spending $3 billion per year on STEM instruction, the nation is still not seeing more STEM professionals later in life.[89] Simply taking additional STEM classes in high school does not translate into additional likelihood of pursuing a STEM major in college.[90] Moreover, the traditional approach to math instruction in high school fails to sufficiently prepare students for college math expectations and career demands.[91]

High school redesign is a concept that can—and should—look different across schools and districts.[92] Broadly, it captures efforts to change the educational experience in order to better engage students and open up additional learning opportunities. This could mean apprenticeships, opportunities to earn college credit, or classes outside of traditional school hours for students with jobs, internships, or caregiving responsibilities. As Alex Carter explained, "Our philosophy was if we came in with a program we wanted them to implement, it wouldn't sustain and there wouldn't be local buy-in."[93]

While design thinking is an important starting point to bringing innovative new experiences into schools, it must be accompanied by structural change and student, staff, and community input in order to have lasting, equitable impact.[94] Social class continues to be a primary predictor of educational success, and while small or "light-touch" interventions can address some of these disparities, they are no match for outdated textbooks and run-down school buildings.[95] Existing CTE opportunities show promise,[96] but they still face critical barriers to widespread implementation that is both equitable and scalable.[97]

Supporting structural redesign requires both clarifying flexibilities in existing policies and creating new policies to ensure that high school credits and graduation requirements reflect the skills, knowledge, and experiences students need for postsecondary success. Previous research has found that schools and districts already have more flexibility to change high school standards than they realize. The vast majority of states currently allow high schools to grant credit through methods other than traditional seat time.

In states that still do not have this flexibility or that want additional guidance, there are plenty of examples that can be used as guides to craft new policies—from Colorado, where CCHS has benefited from the state's "menu of options" for demonstrating college and career readiness,[98] to Maine, where all students must demonstrate proficiency but can do so through assessments, portfolios, projects, or community service.[99] It is important that these redesign efforts are done in partnership with the community, including local industry, but also with the state higher education system in order to ensure that high school graduates' coursework is aligned with college entrance requirements. Currently, only four states' high school diploma course expectations match their state university entrance requirements. Redesign efforts would only improve this alignment.[100]

Analysis of national data on learning mindsets and postsecondary outcomes

To better understand the relationship between interest and utility and student success, the authors analyzed two federal datasets to determine if there was a relationship between measures of these learning mindsets and key postsecondary outcomes.

The High School Longitudinal Study (HSLS) dataset includes more than 20,000 student surveys from a nationally representative sample of students entering high school in 2009, as well as follow-up surveys in 2012 and 2016 and data from high school transcripts and postsecondary, job, and education enrollment records.[101] Recent studies of HSLS data have explored similar topics, including the relationship between student engagement and teacher support;[102] the extent to which peer support predicts postsecondary readiness;[103] support and barriers for students of color;[104] and the change in STEM pursuit over time.[105] A related 2014 study found that science attainment value, intrinsic value, and utility value all predicted STEM persistence, and that the effects differed by student race.[106] To date, however, no other study of which the authors are aware has analyzed the specific relationship between the self-reported 2009 learning mindsets and all of the 2016 postsecondary outcomes measured in this report; nor have any explored the specific interacting factors of both individual- and school-level characteristics.

The other dataset used in this CAP analysis is from the National Assessment of Educational Progress, also known as the "Nation's Report Card," a standardized test distributed to a nationally representative group of students in all 50 states and the District of Columbia. In 2019, nearly every state showed a decade of stagnant or declining progress in math and reading.[107] A prior analysis of the 2015 NAEP results suggested that students performed worse if they had teachers who failed to provide them with advanced coursework or engage in higher-order thinking.[108] Plenty of other research has attempted to explain these disappointing results, but none have explored the relationship between NAEP scores and students' self-reported effort, enjoyment, and interest in math.

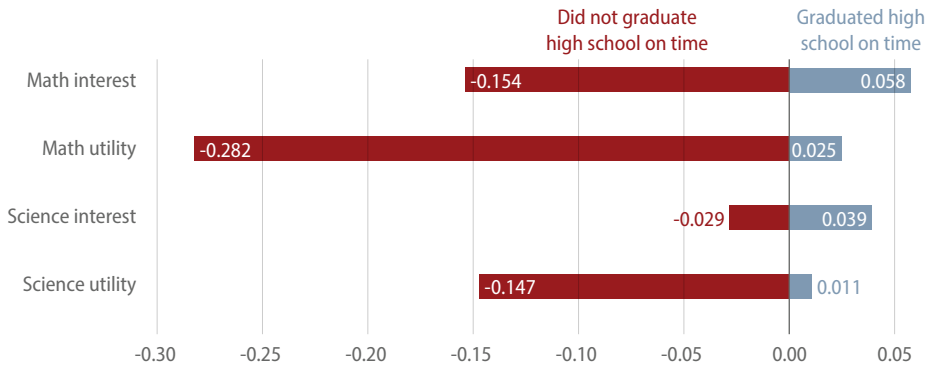
How students feel about their ninth grade courses is associated with decisions they make after high school

Controlling for basic student-level demographics and school characteristics, high school learning mindsets predict a range of academic outcomes. This study showed that a one standard deviation increase in both how interesting and how useful students rated their ninth grade math course statistically significantly increased their predicted probability of graduating high school on time by about half a percentage point, or 0.5 percent. Although this is a small effect size, in comparison, a 2012 meta-analysis of college access programs found that the average college access program evaluated by a rigorous randomized controlled study did not statistically significantly affect high school graduation at all.[109]

FIGURE 1

Ninth-grade math mindsets correlate with on-time high school graduation

Math and science utility and interest ratings among students who graduated high school on time and those who did not



Note: Math and science interest and utility scores were created as a composite of items related to how interesting the students found the class and how useful they thought it would be later in life and then standardized so the average was 0 and the standard deviation was 1. The effect of math interest and math utility were statistically significant when controlling for standard student and school level demographics. For additional information, see report appendix.

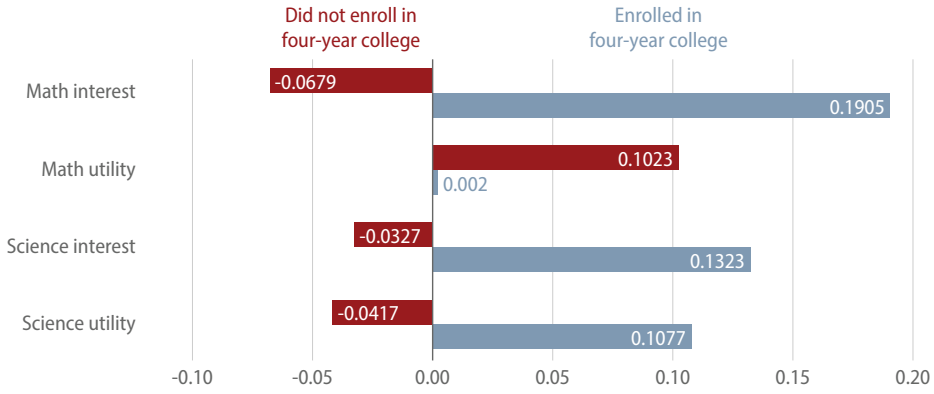
Source: National Center for Education Statistics, "High School Longitudinal Study, 2009-2013," on file with the authors.

With the exception of math utility, both math and science mindsets in ninth grade predicted four-year college enrollment. For those students who graduated high school on time, one standard deviation increase in math and science interest was associated with increases of 6.5 percent and 3.8 percent, respectively, in students' likelihood of enrolling in a four-year college. The same increase in science utility was associated with a 4.5 percent increase in the likelihood of enrolling in a four-year college.

FIGURE 2

Ninth-grade math and science mindsets correlate with enrollment in a four-year college

Math and science utility and interest ratings among high school students who enrolled in a four-year college and those who did not



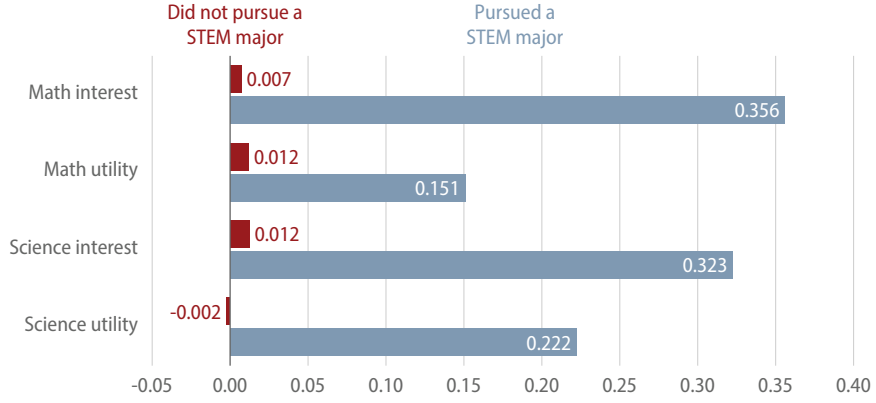
Note: Math and science interest and utility scores were created as a composite of items related to how interesting the students found the class and how useful they thought it would be later in life and then standardized so the average was 0 and the standard deviation was 1. The effect of math interest, science interest, and science utility on enrollment in a four-year college was statistically significant when controlling for standard student and school level demographics. For additional information, see report appendix.

Source: National Center for Education Statistics, "High School Longitudinal Study, 2009-2013," on file with the authors.

FIGURE 3

Ninth-grade math and science mindsets correlate with pursuit of STEM majors in college

Math and science utility and interest ratings among students who pursued STEM majors and those who did not



Note: Math and science interest and utility scores were created as a composite of items related to how interesting the students found the class and how useful they thought it would be later in life and then standardized so the average was 0 and the standard deviation was 1. The effects of all scores were statistically significant when controlling for standard student and school level demographics. For additional information, see report appendix.

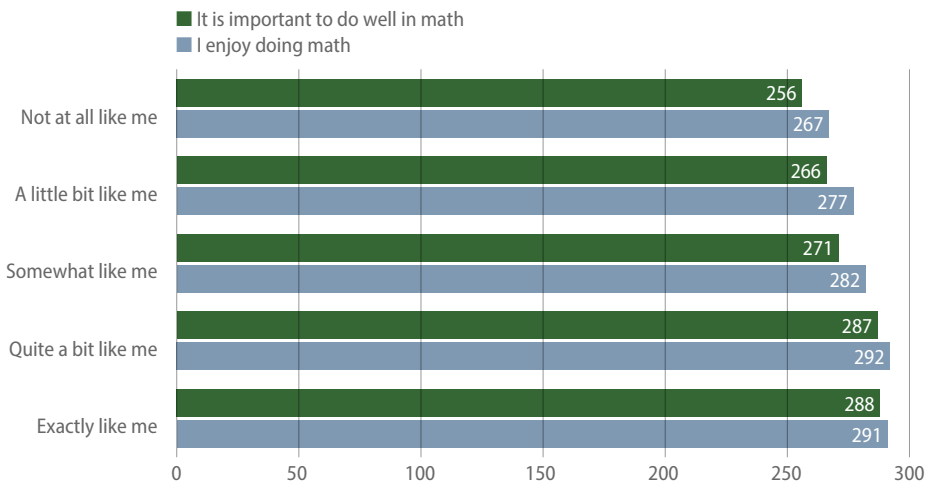
Source: National Center for Education Statistics, "High School Longitudinal Study, 2009-2013," on file with the authors.

All learning mindsets were associated with eventual pursuit of a STEM major. For students who were enrolled in a four-year college, a one standard deviation increase in math and science interest was associated with 6.1 percent and 5.4 percent increases, respectively, in the likelihood of majoring in STEM. The predicted probability changes of utility scores were smaller in magnitude but still statistically significant. A one standard deviation increase in math and science utility corresponded with 2.5 percent and 4.4 percent increases, respectively, in the chance of students pursuing a STEM major in college; the same increase in math and science utility saw enrollment in a four-year college increase by 12 percent. These numbers are similar to the college access program meta-analysis, which found an overall increase of 12 percent as well as a 4 percentage point increase in two-year or four-year college enrollment for only those programs that were rigorously evaluated.[110]

In the 2019 NAEP dataset, student perceptions of math were correlated with NAEP performance. Eighth grade students who indicated that statements such as "I enjoy doing math" and "it is important to do well in math" were more like them typically received higher NAEP math scores.

FIGURE 4

Eighth graders' average math scores by perceptions of the importance of doing well in math and math enjoyment



Note: For additional information, see report appendix.

Source: National Assessment of Educational Progress, "2019 Mathematics Assessment," available at https://www.nationsreportcard.gov/ndecore/landing (last accessed September 2020).

Measuring change in learning mindsets

The Cañon City School District knows that its efforts to make school more relevant and interesting are changing student mindsets for the better. For several years now, the district has administered a recurring survey of student attitudes and school climate, and it is already seeing the effects of new pathways in survey responses even before one would expect to be able to detect academic outcomes.[111]

Student surveys are a useful tool throughout the redesign process and can serve three primary purposes:

1. Determine what students want and need and incorporate their voice into redesign efforts.

2. Track change in student beliefs over time and see the effects of new interventions.

3. Ensure that changes are not having disparate effects on any group of students.

Notably, CCHS does not use these student surveys as an accountability measure or a measure of teacher performance. This is important, as many of the most prominent mindset researchers have cautioned against using mindset as such a measure,[112] given the difficulty of measuring mindsets with reliability, validity, and cultural competence.[113] While student surveys are an effective formative tool to use before and throughout a redesign process, they should not be a measure of success or failure in and of themselves.

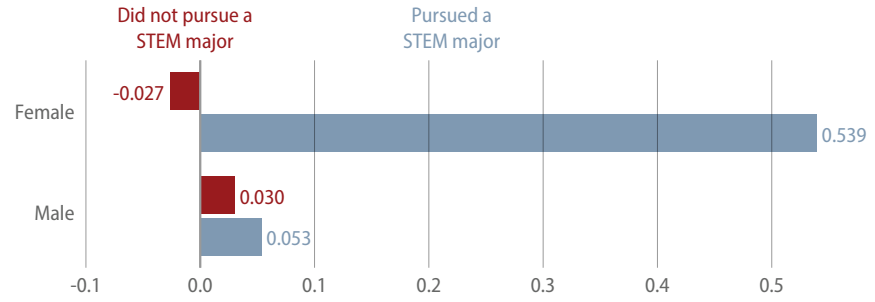
Courses that are interesting and relevant are especially helpful for students traditionally underrepresented in STEM

The nation's STEM fields have a gender diversity problem. However, CAP research shows that learning mindsets could make an important difference in addressing this imbalance. Specifically, the research finds that science mindsets are more associated with whether women major in a STEM field than they are for men. The impact is significant, with a one standard deviation increase in science interest and science utility related to 9 percent and 11 percent increases, respectively, in the likelihood of women pursuing a STEM major, compared with only 4 percent and 1 percent increases for men.

FIGURE 5

Perceived utility of science may contribute to the gender gap in students pursuing STEM majors

The perceived utility of science class among ninth-grade students, by gender and whether they went on to pursue a STEM major



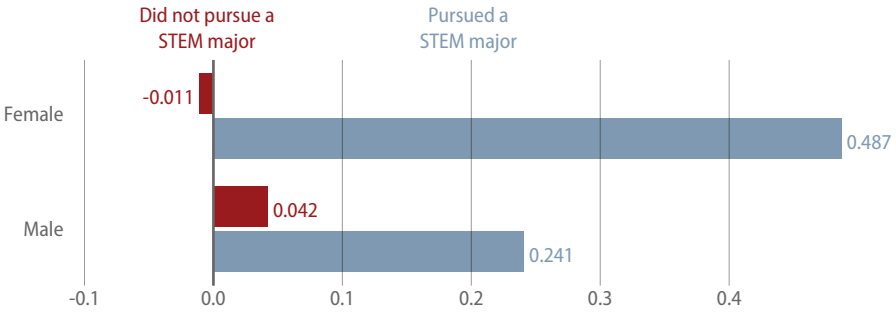
Note: Science utility scores were created as a composite of items related to how useful they thought the class would be later in life and then standardized so the average was 0 and the standard deviation was 1. STEM majors are those undergraduate degree/certificate first major fields of study in a science, technology, engineering, or math field. The interaction between gender and science utility was statistically significant at p= .003. For additional information, see report appendix.

Source: National Center for Education Statistics, "High School Longitudinal Study, 2009-2013," on file with the authors.

FIGURE 6

Interest in science may contribute to the gender gap in students pursuing STEM majors

The perceived interest in science class among ninth-grade students, by gender and whether they went on to pursue a STEM major



Note: Science interest scores were created as a composite of items related to how interesting they found the class and then standardized so the average was 0 and the standard deviation was 1. STEM majors are those undergraduate degree/certificate first-major fields of study in a science, technology, engineering, or math field. The interaction between gender and science utility was statistically significant at p= .019. For additional information, see report appendix.

Source: National Center for Education Statistics, "High School Longitudinal Study, 2009-2013," on file with the authors.

Notably, while these effects matter for individual student characteristics, school-level factors—such as school locale and the racial or socioeconomic demographics of the student body as a whole—were less important. Moreover, the effect of science mindsets on all three postsecondary outcomes was slightly more important in high-poverty schools than in other schools. Otherwise, the effects that both math and science learning mindsets in ninth grade have on graduation, college enrollment, and pursuit of a STEM major tend to look the same across schools serving different populations or located in different types of areas.

Student reports of math relevance correlated with improvements in math scores

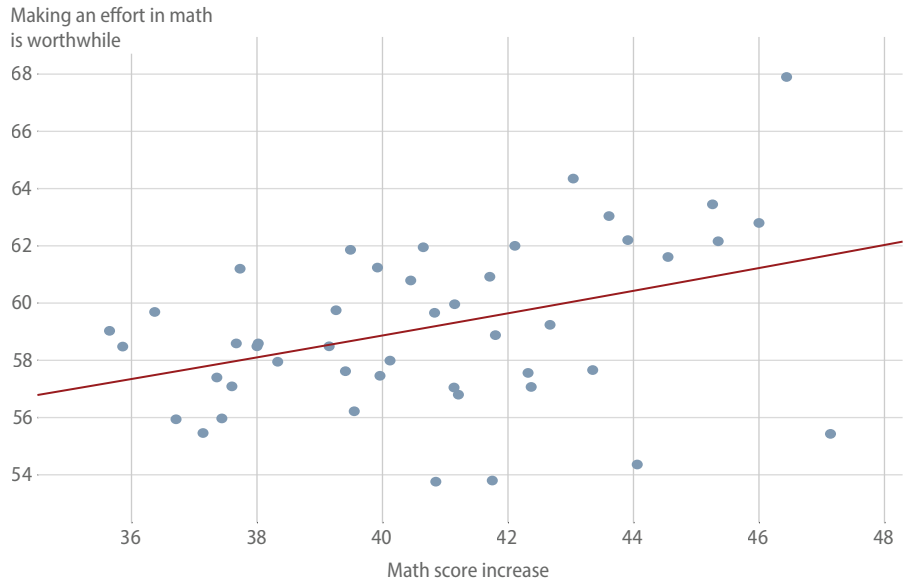
Stagnant or decreasing math scores on NAEP assessments over the past decade have states, and the nation as a whole, concerned. While national NAEP results in eighth grade math scores have not improved substantially since 2003, the standardization of NAEP scoring allows for comparison between state-level fourth and eighth grade scores over time.[114] The authors analyzed data to determine if student mindsets predicted the extent to which scores improved between fourth and eighth grade. It should be noted that the same students do not take the test both years; however, comparing 2015 school year fourth grade scores to 2019 school year eighth grade scores does represent the same age cohort.

The authors' analysis found that student responses to survey items about whether "making an effort in math was worthwhile" were moderately correlated ($r = .38$) with the extent to which states saw improvement between fourth and eighth grade scores in 2015 and 2019. In other words, states where more eighth grade students in 2019 said that those "making an effort in math is worthwhile" were "quite a bit like me" or "exactly like me" also saw larger gains between fourth and eighth grade math scores. The percentage of students reporting high math interest and enjoyment, meanwhile, was not statistically significantly related to change over time. While there is no way to infer causation from these numbers, simply making math enjoyable may be less beneficial than redesign efforts that demonstrate its importance or relevance to students' lives.

FIGURE 7

The percentage of students reporting that making an effort in math is worthwhile is moderately correlated with math gains between fourth and eighth grade across states

Change in math ability between fourth grade and eighth grade compared with the percentage of eighth-grade students who said making an effort in math was worthwile, by state



Note: Alaska, Colorado, New Hampshire, and South Dakota were excluded because they did not meet reporting standards for the survey items. The percentage of students who said making an effort in math was worthwile was determined by combining the percentage who responded that making an effort in math was "quite a bit like me" or "exactly like me." For additional information, see report appendix.

Source: National Assessment of Educational Progress, "2015 Mathematics Assessment and 2019 Mathematics Assessment," available at https://www.nationsreportcard.gov/ndecore/landing (last accessed September 2020).

Many students may not believe making an effort is worthwhile because they simply do not understand why math is important. In five states—Florida, Minnesota, North Dakota, Oklahoma, and Oregon—only half of students indicated that the statement "math will help me even when I'm not in school" was "quite a bit like me" or "exactly like me." The national average is not much higher: Only 54 percent of students across all states indicated that those statements were "quite a bit like me" or "exactly like me." And interest in math is even lower than perceived utility: 39 percent of national eighth grade public school students reported that the statement "I am interested in what I learn in math" was "quite a bit like me" or "exactly like me." In four states—Idaho, North Dakota, Utah, and Wyoming—less than 1 in 3 students gave either response.

TABLE 1

Average math scores and perceptions of math among fourth graders and eighth graders, 2015 and 2019

State	2015 fourth-grade math scores	2019 eighth-grade math scores	Math score increase	Math importance	Math effort	Math relevance	Math enjoyment	Math interest	Math interest/ enjoyment index
Alabama	231	269	38	74%	61%	59%	41%	42%	38%
Alaska	236	274	38	‡	‡	‡	‡	‡	‡
Arizona	238	280	42	72%	58%	52%	39%	39%	33%
Arkansas	235	274	39	70%	58%	54%	38%	39%	35%
California	232	276	44	69%	54%	54%	37%	39%	32%
Colorado	242	285	43	‡	‡	‡	‡	‡	‡
Connecticut	240	286	46	75%	63%	56%	41%	40%	36%
Delaware	239	277	38	72%	59%	52%	39%	41%	34%
Florida	243	279	36	71%	58%	50%	37%	38%	31%
Georgia	236	279	43	76%	64%	58%	44%	44%	42%
Hawaii	238	275	37	70%	56%	55%	42%	43%	36%
Idaho	239	286	47	68%	55%	51%	34%	33%	28%
Illinois	237	283	45	74%	63%	56%	43%	42%	38%
Indiana	248	286	38	70%	58%	53%	38%	35%	32%
Iowa	243	282	38	69%	58%	54%	38%	35%	32%
Kansas	241	282	41	69%	57%	53%	37%	35%	31%
Kentucky	242	278	36	70%	60%	54%	39%	39%	36%
Louisiana	234	272	37	71%	57%	52%	38%	42%	35%
Maine	242	282	40	69%	58%	54%	40%	38%	33%
Maryland	239	280	41	72%	62%	53%	38%	39%	35%
Massachusetts	251	294	44	73%	62%	53%	37%	36%	33%
Michigan	236	280	45	72%	62%	53%	38%	37%	34%
Minnesota	250	291	41	69%	57%	51%	37%	36%	31%
Mississippi	234	274	39	76%	62%	59%	45%	44%	40%
Missouri	239	281	42	71%	59%	53%	37%	36%	33%
Montana	241	284	43	73%	59%	58%	34%	33%	30%
Nebraska	244	285	41	71%	60%	57%	38%	37%	33%
Nevada	234	274	40	69%	57%	52%	36%	39%	33%
New Hampshire	249	287	38	‡	‡	‡	‡	‡	‡
New Jersey	245	292	46	80%	68%	57%	45%	45%	41%
New Mexico	231	269	38	70%	57%	57%	38%	40%	34%
New York	237	280	44	73%	63%	54%	45%	45%	39%

continues

State	2015 fourth-grade math scores	2019 eighth-grade math scores	Math score increase	Math importance	Math effort	Math relevance	Math enjoyment	Math interest	Math interest/ enjoyment index
North Carolina	244	284	40	72%	61%	53%	40%	39%	34%
North Dakota	245	286	41	66%	54%	50%	34%	30%	28%
Ohio	244	286	42	73%	62%	56%	41%	39%	35%
Oklahoma	240	276	37	69%	56%	50%	35%	34%	30%
Oregon	238	280	42	66%	54%	50%	33%	34%	27%
Pennsylvania	243	285	42	73%	61%	56%	41%	40%	36%
Rhode Island	238	276	38	70%	59%	51%	38%	36%	31%
South Carolina	237	276	39	73%	60%	56%	40%	39%	36%
South Dakota	240	287	47	‡	‡	‡	‡	‡	‡
Tennessee	241	280	39	70%	58%	52%	39%	37%	34%
Texas	244	280	36	72%	59%	54%	41%	42%	36%
Utah	243	285	42	72%	57%	54%	32%	32%	29%
Vermont	243	287	43	67%	58%	52%	36%	34%	29%
Virginia	247	287	40	73%	61%	54%	42%	39%	38%
Washington	245	286	41	71%	60%	53%	40%	39%	34%
West Virginia	235	272	37	69%	55%	53%	35%	35%	31%
Wisconsin	243	289	45	74%	62%	59%	43%	39%	35%
Wyoming	247	286	40	69%	56%	51%	32%	31%	27%
National	**240**	**281**	**41**	**72%**	**60%**	**54%**	**40%**	**39%**	**35%**

Note: The survey item data are from eighth-grade students in 2019. Students responding to the survey were asked to rate five items--"It is important to do well in math" (math importance), "Making an effort in math is worthwhile" (math effort), "Math will help me even when I'm not in school" (math relevance), "I enjoy doing math" (math enjoyment), and "I am interested in what I learn in math" (math interest) by selecting one of the following answers: "not at all like me," "a little bit like me," somewhat like me," "quite a bit like me," and "exactly like me." For the five survey items above, the data represent the percentage of respondents who answered "quite a bit like me" or "exactly like me" for each item. For the math interest/enjoyment index, the data represent the percentage of students scoring "high," as opposed to "medium" or "low." For additional information, see report appendix.

Source: National Assessment of Educational Progress, "2015 Mathematics Assessment and 2019 Mathematics Assessment," available at https://www.nationsreportcard.gov/ndecore/landing (last accessed September 2020).

Policy recommendations

"I don't think any district should launch into this type of thing [redesigning schools] with whimsy … You'd better be ready to stay the course."
Adam Hartman, assistant superintendent of Cañon City School District

Redesigning schools to make learning more relevant to students' current and future lives is difficult work. Hartman acknowledged that doing so is a big ask for teachers, as it requires shifting staff expectations, changing course structures, and maintaining rigorous curricula in CCHS' new system—and doing it all at the same time has been a significant challenge.[115] Garett Lopez, a CCHS junior and a member of the inaugural class for whom a capstone project was mandatory, said the rollout of the capstone initiative was a bit confusing and that some students still remain unsure of what exactly is expected of them.[116]

But despite these stumbles, the work is already showing short-term benefits. According to recent student surveys, internships help students connect school to their career aspirations and capstones let them pursue the topics they are most interested in. Moreover, the longitudinal data analyzed in this report suggest that similar approaches could bolster college enrollment and STEM pursuit elsewhere, especially for students who have traditionally shied away or been deterred from these paths.

Efforts to leverage learning mindsets and make education more relevant to students must begin at the local level through intentional curricula and CTE opportunities. Student voice should be front and center in these decisions in order to ensure that opportunities are available to—and expected of—everyone. States can help in these efforts by increasing flexibility in graduation expectations, making existing flexibilities clearer, and better aligning high school requirements with college standards. For its part, the federal government should invest in these opportunities and commit to measuring their success with validity and equity in mind.

This report identifies specific recommendations to help scale successful programs based on existing research and CAP's new analysis of national datasets.

Recommendations for school districts and local communities

- **School districts should lead efforts within their communities to develop graduate profiles outlining the knowledge, skills, and experiences that students should have by the time they complete high school.** Successful efforts to develop these profiles must be culturally relevant and incorporate perspectives that represent the racial, ethnic, and socioeconomic diversity of the community. These profiles should include contributions from students, teachers, parents, administrators, community leaders, employers and the business community, and representatives from local institutions of higher education.

- **Communities should ensure that they are expanding and providing equitable access to high-quality CTE, internships, and apprenticeships, as well as offering advanced courses.** This means enabling flexible high school schedules to support participation in these activities, removing potential barriers such as transportation and required work attire, promoting paid internships and apprenticeships, equitably locating programs throughout communities, and disaggregating data on participation and success in these programs across high schools as well as racial and ethnic subgroups, disability status, and socioeconomic status.

- **School districts should use well-designed student surveys to understand students' learning mindsets.** These surveys should cover students' interest in and perceptions of the relevance of high school to their future and be used as a formative measure of success of high school redesign and improvement efforts. They should not be used for accountability for schools or staff, but rather to help administrators, school counselors, and teachers understand how pathways, course offerings and curricular changes, internships, and other efforts are affecting students' engagement.

Recommendations for states

- **States should provide resources, guidance, and technical assistance to school systems and communities to support equitable efforts to redesign the high school experience.** This could begin with efforts similar to the philanthropically supported graduate profile and redesign work that the Colorado Education Initiative is leading with rural districts throughout the state. It should continue through efforts to scale up high-quality career pathways, internships, and other experiences to make learning more interesting and relevant for students. Attention and funding should prioritize empowering high-poverty communities with lower financial and staffing capacities to pursue redesign efforts on their own.

- **States should redesign the K-8 experience to ensure that students and families enter high school prepared for quality programs.** This effort should include frequent and regular communication with families, starting in elementary school, about college and career pathways and preparation.[117] In middle grades, states should develop rigorous college and career preparation standards that emphasize making math and science more engaging, interesting, and relevant to students, as well as providing more opportunities to connect them with industry or postsecondary programs.[118]

- **States should invest in developing frameworks for graduate profiles that are aligned with entry standards for four-year public institutions of higher education in the state.** These graduate profiles could then be used as a starting point for schools and communities to customize the knowledge, skills, abilities, and career pathways that will prepare their students for success after high school.

- **States should support the development and deployment of high-quality student surveys for use by districts—without accountability stakes attached.** This can help them to identify strategies to improve engagement and make learning experiences more interesting and relevant to students.

Recommendations for the federal government

- **Congress should increase investments in CTE funding and the Student Support and Academic Enrichment block grant.** Additional funding in these areas would help to provide equitable access to high-quality career pathways, improve access to advanced coursework, and provide flexible funding that could be used to administer student surveys. These surveys should not be a part of school accountability systems, but rather provide students, teachers, counselors, and administrators with information on how to improve learning mindsets such as interest and relevance.

- **Congress should provide funding to close gaps in access to technology.** The coronavirus pandemic has laid bare that too many students lack the technology devices and broadband internet access needed to learn outside of the school day and building. Additional funding is required to ensure that access to flexible schedules and learning opportunities is not limited to wealthy students and communities.

Conclusion

Cañon City did not set out to dramatically change its schools. Local leaders were simply responding to the community's desire to bolster local industry and retain talented young people who may have otherwise been inclined to seek employment elsewhere. Redesigning the high school experience to be more interesting and relevant for students seemed to be the best way to make that happen—an "educonomy," as Alex Carter calls it.[119] The local businesses have benefited from training young new workers early and increasing local talent. Now, national data provide evidence that the "educonomy" works for everyone, as students who are engaged in their courses will continue to reap the benefits years later.

About the authors

Abby Quirk is a research associate for K-12 Education at the Center for American Progress. She previously worked as a research coordinator at the University of Pennsylvania and helped to connect innovative schools with leading scientists through the Character Lab Research Network. Quirk received her bachelor's degree in psychology with minors in education and religious studies from Hamilton College. She also holds a master's degree in education policy from the University of Pennsylvania.

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Ulrich Boser is a senior fellow at American Progress and the CEO and founder of the Learning Agency and the Learning Agency Lab, which are devoted to scaling the science of learning. Previously, Boser worked as a contributing editor for *U.S. News and World Report* and a researcher for the newspaper *Education Week*. He also wrote *Learn Better*, a book that examines the new science of learning, and has served as an adviser to many institutions, including the Bill and Melinda Gates Foundation and the Hillary Clinton presidential campaign.

Acknowledgements

The authors would like to thank several individuals for their insights, feedback, and review of this report. Scott Sargrad, vice president of K-12 Education Policy at the Center, and Khalilah Harris, managing director of K-12 Education Policy at the Center, provided valuable feedback throughout the process. Alex Carter, vice president of implementation at the Colorado Education Initiative; Landon Mascareñaz, vice president of community partnership at the Colorado Education Initiative; and the leadership of Cañon City School District and Cañon City High School welcomed us during a visit to their school as part of their work with other districts. Lisa Tedesko, regional internship coordinator at Cañon City High School, coordinated student interviews. Megan Ferren, a special assistant for K-12 Education at the Center; Victoria Yuen, a policy analyst for Postsecondary Education at the Center; and Rasheed Malik, a senior policy analyst for Early Childhood Policy at the Center, reviewed the data analysis. Kinga Wysienska-Di Carlo, a senior research fellow at CONSIRT, assisted with and provided feedback on preliminary analyses and methodology.

Appendix

The first dataset used in this analysis was the High School Longitudinal Study (HSLS) of 2009 from the National Center for Education Statistics (NCES), which includes survey data from a nationally representative sample of more than 20,000 students as well as data from their high school transcripts and postsecondary, job, and education enrollment records.

The present analysis uses HSLS' composite "utility" and "interest" scores for both math and science from the student surveys. In 2009, students were asked a series of questions about their current—fall 2009—math and science courses. For each course, responses were combined into a standardized interest scale and a standardized utility scale in which higher values represent perceptions of greater interest and utility. Only students who were currently taking a math or science class and provided a full set of responses were assigned a value. The following items comprised the interest and utility scores, respectively:

Interest:

- "You think [fall 2009 math/science class] is a waste of time" (response options: strongly disagree, disagree, agree, and strongly agree)
- "You think [fall 2009 math/science class] is boring" (response options: strongly disagree, disagree, agree, and strongly agree)
- "You are enjoying [fall 2009 math/science class] very much" (response options: strongly disagree, disagree, agree, and strongly agree)
- If ninth grader's favorite or least favorite school subject is math/science
- If the answer to "I'm taking this class because I really enjoy math/science" is "yes"

Utility:

- "What students learn in [fall 2009 math/science course] …"
  - "… is useful for everyday life" (response options: strongly disagree, disagree, agree, strongly agree)
  - "… will be useful for college" (response options: strongly disagree, disagree, agree, strongly agree)
  - "… will be useful for a future career" (response options: strongly disagree, disagree, agree, strongly agree)

The outcomes of interest were high school graduation, four-year college enrollment, and pursuit of a STEM major in college. Students were considered to have graduated on time if they graduated before fall 2013. Students were considered not to have graduated on time if they dropped out, were still enrolled in fall 2013, or received a GED or special education degree. Students who transferred or whose status could not be determined were not included in graduation analyses. College enrollment was based on whether or not students ever enrolled in a four-year institution, as of the 2016 data collection. Pursuit of a STEM major was based on whether or not the student's first degree major was in a STEM field, as defined by NCES codes.

The regression analyses using HSLS data included the following covariates: gender; race and ethnicity; whether or not the student had an Individualized Education Plan (IEP) in ninth grade; whether or not the student was an English language learner; socioeconomic status, which was a composite of parent education attainment, parent occupation, and family income; the percentage of the student's grade eligible for free or reduced-price lunch; the percentage of students in school identified as white or Caucasian; and school locale—urban, suburban, rural, or town.

The second dataset used in this analysis was from the National Assessment of Educational Progress (NAEP), the largest nationally representative continuing assessment of student knowledge. For the present study, fourth grade math scores in 2015 and eighth grade math scores in 2019 were used, along with survey data from eighth grade students in 2019. The following survey items were analyzed:

- "It is important to do well in math" (response options: "not at all like me," "a little bit like me," "somewhat like me," "quite a bit like me," and "exactly like me"; analyses used the percentage of students who responded "quite a bit like me" or "exactly like me")
- "Making an effort in math is worthwhile" (response options: "not at all like me," "a little bit like me," "somewhat like me," "quite a bit like me," and "exactly like me"; analyses used the percentage of students who responded "quite a bit like me" or "exactly like me")
- "Math will help me even when I'm not in school" (response options: "not at all like me," "a little bit like me," "somewhat like me," "quite a bit like me," and "exactly like me"; analyses used the percentage of students who responded "quite a bit like me" or "exactly like me")
- "I enjoy doing math" (response options: "not at all like me," "a little bit like me," "somewhat like me," "quite a bit like me," and "exactly like me"; analyses used the percentage of students who responded "quite a bit like me" or "exactly like me")

- "I am interested in what I learn in math" (response options: "not at all like me," "a little bit like me," "somewhat like me," "quite a bit like me," and "exactly like me"; analyses used the percentage who responded "quite a bit like me" or "exactly like me")
- Math interest/enjoyment index (a composite score created by NAEP of low, medium, or high; analyses used the percentage of students who scored "high")

Endnotes

1 Alan Waldman, "'Prison Valley': The Town With 13 Prisons," Humane Exposures Blog, October 1, 2010, available at http://humaneexposures.com/blog/prison-valley-the-town-with-13-prisons.html.

2 Natalie Orenstein, "What Are Mindsets?", Mindset Scholars Network, July 13, 2015, available at https://mindsetscholarsnetwork.org/what-are-mindsets/.

3 Carissa Romero, "What We Know About Purpose & Relevance from Scientific Research" (Mindset Scholars Network, 2019), available at http://mindsetscholarsnetwork.org/wp-content/uploads/2015/09/What-We-Know-About-Purpose-and-Relevance-.pdf.

4 Mindset Scholars Network, "Purpose & Relevance," available at https://mindsetscholarsnetwork.org/learning-mindsets/purpose-relevance/ (last accessed September 2020).

5 Romero, "What We Know About Purpose & Relevance from Scientific Research."

6 Heejung Chun and Ginger Dickson, "A Psychoecological Model of Academic Performance Among Hispanic Adolescents," *Journal of Youth and Adolescence* 40 (12) (2011): 1581–1594, available at https://link.springer.com/article/10.1007/s10964-011-9640-z.

7 David S. Yeager and others, "Boring but important: A self-transcendent purpose for learning fosters academic self-regulation," *Journal of Personality and Social Psychology* 107 (4) (2014): 559–580, available at https://psycnet.apa.org/buy/2014-38071-001.

8 Adam Hartman, assistant superintendent, Cañon City School District, personal communication with authors via phone, January 27, 2020, on file with authors.

9 Scott Sargrad, "How To Make High School Graduation More Meaningful For Every Student," *Forbes*, February 25, 2020, available at https://www.forbes.com/sites/scottsargrad/2020/02/25/how-to-make-high-school-graduation-more-meaningful-for-every-student/#7a147addd8e1.

10 Cañon City High School, "Cañon City High School Pathways Program - Pathways Handbook," available at https://cchs.canoncityschools.org/apps/pages/index.jsp?uREC_ID=443322&type=d&pREC_ID=1373354 (last accessed September 2020).

11 Adam Hartman, assistant superintendent, Cañon City School District, personal communication with authors via phone, January 27, 2020, on file with authors.

12 Lisa Tedesko, regional internship coordinator, Cañon City High School, personal communication with authors via phone, February 25, 2020, on file with authors.

13 Adam Hartman, assistant superintendent, Cañon City School District, personal communication with authors via phone, January 27, 2020, on file with authors.

14 Ulrich Boser and Perpetual Baffour, "Learning Mindsets and Skills: An Opportunity for Growth with the Every Student Succeeds Act" (Washington: Center for American Progress, 2017), available at https://www.americanprogress.org/issues/education-k-12/reports/2017/06/23/434965/learning-mindsets-skills/.

15 Mindset Scholars Network, "What Are Mindsets?".

16 Daniel C. Molden and Carol S. Dweck, "Finding 'Meaning' in Psychology: A Lay Theories Approach to Self-Regulation, Social Perception, and Social Development," *American Psychologist* 61 (3) (2006): 192–203, available at https://psycnet.apa.org/doiLanding?doi=10.1037/0003-066X.61.3.192.

17 Mindset Scholars Network, "What Are Mindsets?".

18 Carol Dweck, "Mindsets for the 21st century and beyond," Brookings Institution, June 6, 2016, available at https://www.brookings.edu/blog/education-plus-development/2016/06/06/mindsets-for-the-21st-century-and-beyond/.

19 Romero, "What We Know About Purpose & Relevance from Scientific Research."

20 David S. Yeager and Gregory M. Walton, "Social-Psychological Interventions in Education: They're Not Magic," *Review of Educational Research* 81 (2) (2011): 267–301, available at https://journals.sagepub.com/doi/10.3102/0034654311405999.

21 Carol Dweck, "Growth mindset is on a firm foundation, but we're still building the house," Mindset Scholars Network, January 18, 2017, available at https://mindsetscholarsnetwork.org/growth-mindset-firm-foundation-still-building-house/.

22 Education Week Research Center and the Raikes Foundation, "Mindset in the Classroom: A National Study of K-12 Teachers" (Bethesda, MD: 2016), available at https://www.edweek.org/ew/projects/mindset-in-the-classroom-a-national-study.html.

23 Paul Thomas, "More on Rejecting Growth Mindset, Grit," Medium, May 30, 2018, available at https://medium.com/@plthomasedd/more-on-rejecting-growth-mindset-grit-52e5eb47374e; Dave Paunesku, "The Deficit Lens of the 'Achievement Gap' Needs to be Flipped. Here's How," *Education Week*, July 9, 2019, available at https://www.edweek.org/ew/articles/2019/07/10/the-deficit-lens-of-the-achievement-gap.html.

24 Bettina L. Love, "'Grit Is in Our DNA': Why Teaching Grit Is Inherently Anti-Black," *Education Week*, February 12, 2019, available at https://www.edweek.org/ew/articles/2019/02/13/grit-is-in-our-dna-why-teaching.html.

25 Christine Gross-Loh, "How Praise Became a Consolation Prize," *The Atlantic*, December 16. 2016, available at https://www.theatlantic.com/education/archive/2016/12/how-praise-became-a-consolation-prize/510845/.

26 Susana Claro, David Paunesku, and Carol S. Dweck, "Growth mindset tempers the effects of poverty on academic achievement," *Proceedings of the National Academy of Sciences* 113 (31) (2016): 8664–8668, available at https://www.pnas.org/content/113/31/8664.

27 David S. Yeager and others, "A national experiment reveals where a growth mindset improves achievement," *Nature* 573 (2019): 364–369, available at https://www.nature.com/articles/s41586-019-1466-y.

28 Gregory M. Walton, and Geoffrey L. Cohen, "A question of belonging: Race, social fit, and achievement," *Journal of Personality and Social Psychology* 92 (1) (2007): 82–96, available at https://psycnet.apa.org/record/2006-23056-007.

29 Claro, Paunesku, and Dweck, "Growth mindset tempers the effects of poverty on academic achievement."

30 Elizabeth A. Canning and others, "STEM faculty who believe ability is fixed have larger racial achievement gaps and inspire less student motivation in their classes," *Science Advances* 5 (2) (2019), available at https://advances.sciencemag.org/content/5/2/eaau4734.abstract.

31 C. Kirabo Jackson and others, "School Effects on Socio-emotional Development, School-Based Arrests, and Educational Attainment" (Cambridge, MA: National Bureau of Economic Research, 2020), available at https://www.nber.org/papers/w26759.

32 Mindset Scholars Network, "National Study of Learning Mindsets," available at https://mindsetscholarsnetwork.org/about-the-network/current-initatives/national-mindset-study/. (last accessed September 2020).

33 Yeager and others, "A national experiment reveals where a growth mindset improves achievement."

34 Sophie von Stumm, Benedikt Hell, and Tomas Chamorro-Premuzic, "The Hungry Mind: Intellectual Curiosity Is the Third Pillar of Academic Performance," *Perspectives on Psychological Science* 6 (6) (2011): 574–588, available at https://journals.sagepub.com/doi/abs/10.1177/1745691611421204.

35 Sarah D. Sparks, "Bored, Stressed, Tired: Unpacking Teenagers' Emotions About High School," *Education Week*, February 13, 2020, available at http://blogs.edweek.org/edweek/inside-school-research/2020/02/high_school_students_feel_bored_tired_stressed.html.

36 Valerie J. Calderon, "How to Keep Kids Excited About School," Gallup, June 8, 2017, available at https://news.gallup.com/opinion/gallup/211886/keep-kids-excited-school.aspx.

37 Ulrich Schiefele, "The role of interest in motivation and learning," in Janet M. Collins and Samuel Messick, eds., *Intelligence and Personality: Bridging the Gap in Theory and Measurement* (Mahwah, NJ: Lawrence Erlbaum Associates, 2001).

38 Susan Headden and Sarah McKay, "Motivation Matters: How New Research Can Help Teachers Boost Student Engagement" (Stanford, CA: Carnegie Foundation, 2015), available at https://www.carnegiefoundation.org/wp-content/uploads/2015/07/Motivation_Matters_July_2015.pdf.

39 Ulrich Schiefele, Andreas Krapp, and Adolf Winteler, "Interest as a Predictor of Academic Achievement: A Meta-Analysis of Research," in K. Ann Renninger, Suzanne Hidi, and Andreas Krapp, eds., *The Role of Interest in Learning and Development* (Hillsdale, NJ: Lawrence Erlbaum Associates, 1992).

40 Kusum Singh, Monique Granville, and Sandra Dika, "Mathematics and Science Achievement: Effects of Motivation, Interest, and Academic Engagement," *The Journal of Educational Research* 95 (6) (2002): 323–332, available at https://www.tandfonline.com/doi/abs/10.1080/00220670209596607.

41 Olaf Köller, Jürgen Baumert, and Kai Schnabel, "Does Interest Matter? The Relationship Between Academic Interest and Achievement in Mathematics," *Journal for Research in Mathematics Education* 32 (5) (2001): 448–470, available at https://www.nctm.org/Publications/journal-for-research-in-mathematics-education/2001/Vol32/Issue5/Does-Interest-Matter_-The-Relationship-Between-Academic-Interest-and-Achievement-in-Mathematics/.

42 Andreas Krapp and Manfred Prenzel, "Research on Interest in Science: Theories, Methods and Findings," *International Journal of Science Education* 33 (1) (2011): 27–50, available at https://hal.archives-ouvertes.fr/hal-00658698/file/PEER_stage2_10.1080%252F09500693.2010.518645.pdf

43 Evie Blad, "Teachers Say Social-Emotional Learning Is Important, But They Can't Do It Alone," *Education Week*, March 13, 2018, available at https://blogs.edweek.org/edweek/rulesforengagement/2018/03/teachers_say_social-emotional_learning_is_important_but_they_cant_do_it_alone.html.

44 Josef Basl, "Effect of School on Interest in Natural Sciences: A Comparison of the Czech Republic, Germany, Finland, and Norway based on PISA 2006," *International Journal of Science Education* 33 (1) (2011): 145–157, available at https://www.tandfonline.com/doi/abs/10.1080/09500693.2010.518641.

45 Katja Upadyaya and Jacquelynne S. Eccles, "How Do Teachers' Beliefs Predict Children's Interest in Math From Kindergarten to Sixth Grade?", *Merrill-Palmer Quarterly* 60 (4) (2014): 403–430, available at https://www.jstor.org/stable/10.13110/merrpalmquar1982.60.4.0403?seq=1.

46 Sheldon Berman, Sydney Chaffee, and Julia Sarmiento, "The Practice Base For How We Learn: Supporting Students' Social, Emotional, and Academic Development" (Washington: The Aspen Institute, 2018), available at https://assets.aspeninstitute.org/content/uploads/2018/03/CDE-Commission-report.pdf.

47 Sarah D. Sparks, "The Myth Fueling Math Anxiety," *Education Week*, January 7, 2020, available at https://www.edweek.org/ew/articles/2020/01/08/the-biggest-myth-about-math.html.

48 Chris Hulleman, "I could be changing the world right now, but instead I'm solving for X," Medium, September 22, 2015, available at https://medium.com/@chris.hulleman/i-could-be-changing-the-world-right-now-but-instead-i-m-solving-for-x-599b7ce7e4a3.

49 Chris S. Hulleman and Judith M. Harackiewicz, "Promoting Interest and Performance in High School Science Classes," *Science* 326 (5958) (2009): 1410–1412, available at https://science.sciencemag.org/content/326/5958/1410.short.

50 Alex Carter, vice president of implementation, Colorado Education Initiative, personal communication with authors via phone, March 11, 2020, on file with authors.

51 Kate Stringer, "Only Half of Students Think What They're Learning in School Is Relevant to the Real World, Survey Says," The 74, December 11, 2017, available at https://www.the74million.org/article/only-half-of-students-think-what-theyre-learning-in-school-is-relevant-to-the-real-world-survey-says/.

52 Alexandra Pannoni, "STEM Pros Share Secrets to Boost Teen Interest, Participation," *U.S. News & World Report*, December 14, 2015, available at https://www.usnews.com/education/blogs/high-school-notes/2015/12/14/stem-pros-share-secrets-to-boost-teen-interest-participation.

53 Romero, "What We Know About Purpose & Relevance from Scientific Research."

54 Evie Blad, "'When Are We Going to Use This?' Strategies to Help Students Find Relevance in School Work," *Education Week*, January 17, 2018, available at http://blogs.edweek.org/edweek/rulesforengagement/2018/01/when_are_we_going_to_use_this_strategies_to_help_students_find_relevance_in_school_work.html.

55 Chris S. Hulleman and others, "Enhancing interest and performance with a utility value intervention," *Journal of Educational Psychology* 102 (4) (2010): 880–895, available at https://psycnet.apa.org/record/2010-21220-001.

56 Hulleman, "I could be changing the world right now, but instead I'm solving for X."

57 Carol S. Dweck, Gregory M. Walton, and Geoffrey L. Cohen, "Academic Tenacity: Mindsets and Skills that Promote Long-Term Learning" (Seattle: Bill & Melinda Gates Foundation, 2014), available at http://k12education.gatesfoundation.org/download/?Num=2807&filename=30-Academic-Tenacity.pdf.

58 Daphna Oyserman, Deborah Bybee, and Kathy Terry, "Possible selves and academic outcomes: How and when possible selves impel action," *Journal of Personality and Social Psychology* 91 (1) (2006): 188–204, available at https://psycnet.apa.org/doiLanding?doi=10.1037/0022-3514.91.1.188.

59 William Damon, Jenni Menon, and Kendall Cotton Bronk, "The Development of Purpose During Adolescence," *Applied Developmental Science* 7 (3) (2003): 119–128, available at https://www.tandfonline.com/doi/abs/10.1207/S1532480XADS0703_2.

60 Heather Malin, Indrawati Liauw, and William Damon, "Purpose and Character Development in Early Adolescence," *Journal of Youth and Adolescence* 46 (6) (2017): 1200–1215, available at https://link.springer.com/article/10.1007/s10964-017-0642-3.

61 Yeager and others, "Boring but important."

62 Hyungshim Jang, "Supporting students' motivation, engagement, and learning during an uninteresting activity," *Journal of Educational Psychology* 100 (4) (2008): 798–811, available at https://psycnet.apa.org/record/2008-16034-006.

63 David Paunesku and others, "Mind-Set Interventions Are a Scalable Treatment for Academic Underachievement," *Psychological Science* 26 (6) (2015): 784–793, available at https://journals.sagepub.com/doi/pdf/10.1177/0956797615571017?casa_token=GCK-DP5FOhQAAAAA:ccvXHktrE3or5UZZWziBeVR29m4IDVA8iy3mFTDtabXnV4VNlKfH85XjRisdVtgpHKnZjY07CGywEw.

64 Olga Khazan, "'Find Your Passion' Is Awful Advice," *The Atlantic*, July 12, 2018, available at https://www.theatlantic.com/science/archive/2018/07/find-your-passion-is-terrible-advice/564932/.

65 Lisa Tedesko, regional internship coordinator, Cañon City High School, personal communication with authors via phone, February 25, 2020, on file with authors.

66 Kodee Summers, student, Cañon City High School, personal communication with authors via phone, February 19, 2020, on file with authors.

67 Ibid.

68 Adam Hartman, assistant superintendent, Cañon City School District, personal communication with authors via phone, January 27, 2020, on file with authors.

69 Beth Hawkins, "The 74 Interview: Authors Jal Mehta and Sarah Fine on What the Best HS Classrooms Have in Common — Mastery, Identity & Creativity," The 74, April 3, 2019, available at https://www.the74million.org/article/the-74-interview-authors-jal-mehta-and-sarah-fine-on-what-the-best-hs-classrooms-have-in-common-mastery-identity-creativity/.

70 Sapna Cheryan and others, "Ambient belonging: How stereotypical cues impact gender participation in computer science," *Journal of Personality and Social Psychology 97* (6) (2009): 1045–1060, available at http://psycnet.apa.org/journals/psp/97/6/1045/.

71 Victor Lavy and Edith Sand, "On the Origins of Gender Human Capital Gaps: Short and Long Term Consequences of Teachers' Stereotypical Biases" (Cambridge, MA: National Bureau of Economic Research, 2015), available at https://www.nber.org/papers/w20909.pdf; Shankar Vedantam, "Hard Evidence: Teachers' Unconscious Biases Contribute To Gender Disparity," NPR, September 1, 2015, available at http://www.npr.org/2015/09/01/436525758/how-teachers-unconscious-bias-play-into-the-hands-ofgender-disparity.

72 Seth Gershenson and Thomas S. Dee, "The insidiousness of unconscious bias in schools," Brookings Institution, March 20, 2017, available at https://www.brookings.edu/blog/brown-center-chalkboard/2017/03/20/the-insidiousness-of-unconscious-bias-in-schools/.

73 Catherine Riegle-Crumb and others, "The More Things Change, the More They Stay the Same? Prior Achievement Fails to Explain Gender Inequality in Entry Into STEM College Majors Over Time," *American Educational Research Journal* 49 (6) (2012): 1048–1073, available at https://doi.org/10.3102/0002831211435229.

74 Jessica Ellis, Bailey K. Fosdick, and Chris Rasmussen, "Women 1.5 Times More Likely to Leave STEM Pipeline after Calculus Compared to Men: Lack of Mathematical Confidence a Potential Culprit," *PloS One* 11 (7) (2016): e0157447, available at https://journals.plos.org/plosone/article%3Fid%3D10.1371/journal.pone.0157447.

75 Carly Berwick, "Keeping Girls in STEM: 3 Barriers, 3 Solutions," Edutopia, March 12, 2019, available at https://www.edutopia.org/article/keeping-girls-stem-3-barriers-3-solutions.

76 Xueli Wang, "Why Students Choose STEM majors: Motivation, High School Learning, and Postsecondary Context of Support," *American Educational Research Journal* 50 (5) (2013): 1081–1121, available at https://doi.org/10.3102%2F0002831213488622.

77 Sandra L. Dika and Mark M. D'Amico, "Early experiences and integration in the persistence of first-generation college students in STEM and non-STEM majors," *Journal of Research in Science Teaching* 53 (3) (2016): 368–383, available at https://doi.org/10.1002/tea.21301.

78 Annette E. Alliman-Brissett and Sherri L. Turner, "Racism, Parent Support, and Math-Based Career Interests, Efficacy, and Outcome Expectations Among African American Adolescents," *Journal of Black Psychology* 36 (2) (2010): 197–225, available at https://doi.org/10.1177/0095798409351830.

79 Jennifer M. Grossman and Michelle V. Porche, "Perceived Gender and Racial/Ethnic Barriers to STEM Success," *Urban Education* 49 (6) (2014): 698–727, available at https://doi.org/10.1177/0042085913481364.

80 Gloria Crisp, Amaury Nora, and Amanda Taggart, "Student Characteristics, Pre-College, College, and Environmental Factors as Predictors of Majoring in and Earning a STEM Degree: An Analysis of Students Attending a Hispanic Serving Institution," *American Educational Research Journal* 46 (4) (2009): 924–942, available at https://doi.org/10.3102/0002831209349460.

81 Hollie Young, "Secondary Education Systemic Issues: Addressing Possible Contributors to a Leak in the Science Education Pipeline and Potential Solutions," *Journal of Science Education and Technology* 14 (2) (2005): 205–216, available at https://link.springer.com/article/10.1007/s10956-005-4422-6.

82 Nicole M. Joseph, Meseret Hailu, and Denise Boston, "Black Women's and Girls' Persistence in the P–20 Mathematics Pipeline: Two Decades of Children, Youth, and Adult Education Research," *Review of Research in Education* 41 (1) (2017): 203–227, available at https://journals.sagepub.com/doi/full/10.3102/0091732X16689045.

83 Rebecca Holmes and Alex Carter, "Redesigning the High School Experience for the Modern Student," RealClearEducation, September 25, 2019, available at https://www.realclearеducation.com/articles/2019/09/25/redesigning_the_high_school_experience_for_the_modern_student_110356.html.

84 EdBuild, "$23 Billion," available at https://edbuild.org/content/23-billion (last accessed September 2020).

85 Chelsea Waite, "A View From the Canopy: Building Collective Knowledge on School Innovation" (San Mateo, CA: Clayton Christensen Institute, 2019), available at https://www.christenseninstitute.org/wp-content/uploads/2019/09/The_Canopy.pdf.

86 Kevin Mahnken, "Study: Career and Technical Education Yields Not Just Higher Earnings but Higher Test Scores," The 74, April 8, 2020, available at https://www.the74million.org/study-career-and-technical-education-yields-not-just-higher-earnings-but-higher-test-scores/.

87 Sally Stevens, Rosi Andrade, and Melissa Page, "Motivating Young Native American Students to Pursue STEM Learning Through a Culturally Relevant Science Program," *Journal of Science Education and Technology* 25 (6) (2016): 947–960, available at https://link.springer.com/article/10.1007/s10956-016-9629-1.

88 Jennifer L. DePaoli and others, "Building a Grad Nation: Progress and Challenge in Raising High School Graduation Rates, Annual Update 2018" (Washington: Civic Enterprises, 2018), available at https://files.eric.ed.gov/fulltext/ED585524.pdf.

89 Kimberly Adams, "What federal funding for civics reveals about American political discourse," Marketplace, November 6, 2019, available at https://www.marketplace.org/2019/11/06/what-federal-funding-for-civics-reveals-about-american-political-discourse/.

90 Kevin Mahnken, "New Study Warns the Push for More Math & Science Classes in High School Isn't Yielding More College Students Pursuing STEM Careers," The 74, March 20, 2018, available at https://www.the74million.org/new-study-warns-the-push-for-more-math-science-classes-in-high-school-isnt-yielding-more-college-students-pursuing-stem-careers/.

91 Ashley Jeffrey and Laura Jimenez, "Math Pathways: The Way Forward" (Washington: Center for American Progress, 2019), available at https://www.americanprogress.org/issues/education-k-12/reports/2019/09/19/474645/math-pathways/.

92 Craig Jerald, Neil Campbell, and Erin Roth, "High Schools of the Future: How States Can Accelerate High School Redesign" (Washington: Center for American Progress, 2017), available at https://www.americanprogress.org/issues/education-k-12/reports/2017/12/04/443615/high-schools-future-states-can-accelerate-high-school-redesign/.

93 Alex Carter, vice president of implementation, Colorado Education Initiative, personal communication with authors via phone, March 11, 2020, on file with authors.

94 Katherine Burd, "Design Thinking: The Problem With Education's Latest Trend," *Education Week*, February 3, 2020, available at https://www.edweek.org/ew/articles/2020/02/04/design-thinking-the-problem-with-educations-latest.html.

95 Neil A. Lewis Jr., "On 'light-touches' and 'heavy-hands': 2 strategies to tackle educational inequities," Brookings Institution, September 12, 2019, available at https://www.brookings.edu/blog/brown-center-chalkboard/2019/09/12/on-light-touches-and-heavy-hands-2-strategies-to-tackle-educational-inequities/.

96 Samantha Batel, "Batel: Rethinking the School-to-Work Pipeline With Career and Technical Education That Is Rigorous, Inclusive, and Equitable," The 74, April 27, 2018, available at https://www.the74million.org/article/batel-rethinking-the-school-to-work-pipeline-with-career-and-technical-education-that-is-rigorous-inclusive-and-equitable/.

97 Ryan Smith, "Advancing Racial Equity in Career and Technical Education Enrollment," Center for American Progress, August 28, 2019, available at https://www.americanprogress.org/issues/education-k-12/news/2019/08/28/473876/advancing-racial-equity-career-technical-education-enrollment/.

98 Colorado Department of Education, "Graduation Guidelines," available at https://www.cde.state.co.us/postsecondary/graduationguidelines (last accessed September 2020).

99 *An Act To Implement Certain Recommendations of the Maine Proficiency Education Council,* Maine Public Law 489, 127th Maine Legislature, 2nd sess. (2016), available at https://www.mainelegislature.org/legis/bills/bills_127th/chapters/PUBLIC489.asp.

100 Laura Jimenez and Scott Sargrad, "Are High School Diplomas Really a Ticket to College And Work? An Audit of State High School Graduation Requirements" (Washington: Center for American Progress, 2018), available at https://www.americanprogress.org/issues/education-k-12/reports/2018/04/02/447717/high-school-diplomas/.

101 National Center for Education Statistics, "High School Longitudinal Study of 2009 (HSLS:09) Features," available at https://nces.ed.gov/surveys/hsls09/ (last accessed September 2020).

102 Sean Kelly and Yuan Zhang, "Teacher Support and Engagement in Math and Science: Evidence from the High School Longitudinal Study," *The High School Journal* 99 (2) (2016): 141–165, available at https://www.jstor.org/stable/44075288.

103 Steven Elias Alvarado and Brian P. An, "Race, Friends, and College Readiness: Evidence from the High School Longitudinal Study," *Race and Social Problems* 7 (2) (2015): 150–167, available at https://link.springer.com/article/10.1007/s12552-015-9146-5.

104 Kenneth Alonzo Anderson, "Examining Organizational Practices That Predict Persistence among High-Achieving Black Males in High School," *Teachers College Record* 118 (6) (2016): 1–26, available at https://eric.ed.gov/?id=EJ1100382; Jemimah L. Young and others, "Maximizing Opportunities to Enroll in Advanced High School Science Courses: Examining the Scientific Dispositions of Black Girls," *Journal of Urban Learning, Teaching, and Research* 13 (2017): 174–183, available at https://eric.ed.gov/?id=EJ1149860; Stephen Kotok, "Unfulfilled potential: High-Achieving Minority Students and the High School Achievement Gap in Math," *The High School Journal* 100 (3) (2017): 183–202, available at https://www.jstor.org/stable/90024211.

105 Daniel M. Mangu and others, "Motivational factors predicting STEM and engineering career intentions for high school students," *2015 IEEE Frontiers in Education Conference Proceedings* (2015): 1–8, available at https://ieeexplore.ieee.org/abstract/document/7344065/.

106 Lori Andersen and Thomas J. Ward, "Expectancy-Value Models for the STEM Persistence Plans of Ninth-Grade, High-Ability Students: A Comparison Between Black, Hispanic, and White Students," *Science Education* 98 (2) (2014): 216–242, available at https://onlinelibrary.wiley.com/doi/abs/10.1002/sce.21092.

107 Sarah D. Sparks, "'No Progress' Seen in Reading or Math on Nation's Report Card," *Education Week*, October 30, 2019, available at https://blogs.edweek.org/edweek/inside-school-research/2019/10/reading_math_NAEP_2019.html.

108 Sarah Schwartz, "Low-Achieving and High-Achieving Students Receive Different Instruction, Report Finds," *Education Week*, August 16, 2019, available at https://blogs.edweek.org/teachers/teaching_now/2019/08/low-achieving_and_high-achieving_students_receive_different_instruction_report_finds.html.

109 Eleanor L. Harvill and others, "Effects of College Access Programs on College Readiness and Enrollment: A Meta-Analysis," *Society for Research on Educational Effectiveness* (2012), available at https://eric.ed.gov/?id=ED530404.

110 Ibid.

111 Adam Hartman, assistant superintendent, Cañon City School District, personal communication with authors via phone, January 27, 2020, on file with authors.

112 Kate Zernike, "Testing for Joy and Grit? Schools Nationwide Push to Measure Students' Emotional Skills," *The New York Times*, February 29, 2016, available at https://www.nytimes.com/2016/03/01/us/testing-for-joy-and-grit-schools-nationwide-push-to-measure-students-emotional-skills.html?partner=rss&emc=rss&_r=0.

113 Angela L. Duckworth and David Scott Yeager, "Measurement Matters: Assessing Personal Qualities Other Than Cognitive Ability for Educational Purposes," *Educational Researcher* 44 (4) (2015): 237–251, available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4849415/.

114 National Center for Education Statistics, "Fast Facts," available at https://nces.ed.gov/fastfacts/display.asp?id=514 (last accessed September 2020).

115 Adam Hartman, assistant superintendent, Cañon City School District, personal communication with authors via phone, January 27, 2020, on file with authors.

116 Garett Lopez, student, Cañon City High School, personal communication with authors via phone, February 19, 2020, on file with authors.

117 Meg Benner and Abby Quirk, "One Size Does Not Fit All: Analyzing Different Approaches to Family-School Communication" (Washington: Center for American Progress, 2020), available at https://www.americanprogress.org/issues/education-k-12/reports/2020/02/20/480254/one-size-not-fit/.

118 Meg Benner and Scott Sargrad, "Creating Strong Building Blocks for Every Student: How Middle Schools Can Lay the Foundation for Rigorous High School Pathways" (Washington: Center for American Progress, 2020), available at https://www.americanprogress.org/issues/education-k-12/reports/2020/08/05/488493/creating-strong-building-blocks-every-student/.

119 Rebecca Holmes, "Supporting Whole Communities Through a Redesign and Reimagining Process," Colorado Education Initiative, December 19, 2019, available at https://www.coloradoedinitiative.org/supporting-whole-communities-through-a-redesign-and-reimagining-process/.

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