

STEM That Sticks: How Schools Spark Curiosity and Build Future Skills



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EDITOR’S NOTE

Sparkling students’ curiosity in science, technology, engineering, and math doesn’t require expensive labs or elaborate programs—it requires **meaningful experiences, strong foundations, and opportunities to explore**. These articles highlight creative ways educators are making STEM come alive, from connecting students with astronauts and building robotics programs on a shoestring budget to weaving hands-on science and engineering into everyday classroom lessons. Educators are working to expand access to computer science in the age of AI and finding new ways to sustain students’ interest as they grow older. Whether through **family STEM nights, engaging classroom strategies, or low-cost innovations**, the message is clear: with the right approach, schools can cultivate curiosity, confidence, and lasting enthusiasm for STEM learning.



Photo courtesy of Trumbauersville Elementary School

Owen, a 1st grader at Trumbauersville Elementary School in Quakertown, Pa., stands in front of the TV screen that streamed a Q&A from the International Space Station between Pennsylvania elementary students and NASA astronaut Chris Williams. Experts say these kinds of real-world STEM experiences can spark students' interest in the field.

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Talking to Astronauts, and Other Ways To Get Kids Excited About STEM

By Elizabeth Heubeck

When astronauts Neil Armstrong and Buzz Aldrin first rocketed into space and walked on the moon in July 1969, school-age children could only imagine what the experience was like.

Today, as NASA astronauts prepare to make the first crewed mission around the moon since Apollo 17 nearly 50 years ago in 1972, kids won't be left to simply wonder.

Students now can watch as NASA astronauts at the International Space Station answer prerecorded questions from kids about living and working in space via NASA's YouTube channel. Since 2017, over 1.2 million children have viewed these exchanges—like one on Feb. 5 between astronaut Chris Williams and Pennsylvania elementary school students.

One 3rd grader, Neela, asked: "How does Earth look like from space?"

Williams responded: "Earth looks incredibly beautiful from space. ... You see all of the blue and all of the green. You can see the curvature of the earth with your eyes, and you

can see continents and countries flying by beneath you, and it makes me really appreciate our planet."

This kind of interaction allow kids to realize that the "limit is the universe," said Hoda Ehsan, chief learning officer at the Da Vinci Science Center in Allentown, Pa., which hosted a watch party for local students during the live Q&A with Williams. "We want them to see that they can do anything, regardless of where they come from, and what resources they have."

There are good reasons to hook kids on STEM from a young age. Early exposure to STEM concepts increases the likelihood of pursuing a related career later, research shows. And experts predict high growth for jobs in STEM-related fields over the next decade—8.1% compared to 2.7% for jobs in non-STEM fields, according to the U.S. Bureau of Labor Statistics.

Salaries are higher, too—on average, more than double of those in non-STEM jobs. And yet, teens' interest in pursuing STEM careers, particularly in non-medical STEM fields, is waning.

Experts point to a lack of real-world expo-

sure to STEM concepts and careers as a reason for that slide in interest. Several factors can get in the way of such exposure: a lack of funding and resources, inadequate support from administrators, and curricula that doesn't make room for "extras," to name a few.

But, say advocates, finding ways to connect kids to these real-world experiences is worth the effort.

"You have to be very intentional about making sure that these experiences are had," said Alicia Conerly, the retiring president of the National Science Teaching Association. "It requires a teacher to go outside of the regular curriculum that everybody has their hands on."

Conerly suggests multiple avenues for identifying real-world STEM experiences to students: networking with professional peers in other districts; connecting with STEM experts and organizations online; and exploring available partnerships, grants, and related resources with nonprofits.

A partnership between an elementary school and a neighboring science center brings science class to life

One such partnership exists between the Da Vinci Science Center, and Central Elementary STREAM Academy, a Title I school in the same town.

The school's students, along with thousands of others in Pennsylvania, watched the live interview with NASA astronaut Williams last Thursday—either from their classrooms or down the street at the center. It's a familiar spot to these students who, once a week, attend a two-plus hour science class during the school day at the center with a teacher from their school and a subject-matter expert.

"They are on the exhibit floor. They use the fab lab. We do lots of technology integration activities with them. How cool is that?" said Ehsan, the Da Vinci Center's chief learning officer.

The unique partnership brings to life the first-of-its kind "theme-based" public school in the Lehigh Valley, an area of eastern Pennsylvania that encompasses Allentown and other neighboring cities. The elementary school, which opened last school year, focuses on science, technology, reading, engineering, arts, and math. Expertise and resources from the school's neighboring science center bring to life lessons in these subjects.

For instance, kindergartners learning about the needs of plants and animals visit the science center's butterfly garden and observe

them and other insects in their natural habitat.

“It’s helping them to create emerging mini-scientists,” said Rebecca Bodnar, the school’s principal. “They have lab coats. They all have microscopes. And they are exploring at a deeper level than what we would be able to do with just textbooks.”

Technology bridges gaps in access to real-world STEM experiences

Not every school has access to this type of partnership, but many nonprofit science and learning organizations offer programs and events that deliver real-world STEM experiences to K-12 students. And when physical distance presents a barrier, technology can bridge it—as in the case of NASA’s In-Flight STEM Downlink program, which connects students to in-flight calls with astronauts on International Space Station expeditions.

For access to other virtual STEM opportunities, Conerly of the NSTA suggests the following: Facebook groups for science teachers like OpenSciEd and STEM for Teachers; podcasts like Lab Out Loud, Science in Between, and Tumble; and YouTube science educator influencers like the Amoeba Sisters and Mark Rober. Additional free resources for science educators can be found on the association’s website.

Technology lets students access real-world STEM experiences that, in turn, could change their life’s trajectory. But it’s often up to educators to jump-start the process, Conerly says.

“With the internet, we can talk to an astronaut. We can talk to a person in the medical field,” she said. “That takes intentionality on the part of the teachers who make it happen.” ■

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How One Teacher Built a STEM and Robotics Program On a Shoestring Budget

By Alyson Klein

Jennifer Watkins believes in the power of robotics to make math and science come alive for students.

But robots don't come cheap, and Watkins doesn't have any dedicated funding for her STEM program for 3rd through 8th graders in her rural Arkansas district.

So, with support from her administration and in partnership with her colleague, Emily Crabtree, who teaches gifted education, Watkins has figured out how to give her students hands-on engineering and robotics experiences on a very tight budget.

"I want for them to see that the science [concepts] that they're learning about are things that they can hold in their hands," said Watkins, who teaches in the Fouke School District, in southwestern Arkansas. "The electricity that they're learning about is something they can produce."

Watkins added: "I want for them to see that they have the power to create the video games they love to play. I need for them to understand that that's coding and that somebody, some programmer somewhere, made that sound and that graphic and that response and all of those things happen and that they—my kids—could also do that."

To give her students those learning opportunities, Watkins has had to figure out how to stretch very limited dollars by finding inexpensive—or free—tech tools that can help her students see coding, electrical circuits, and augmented reality in action.

Here are some of her favorite, relatively inexpensive tech tools and classroom approaches, which she shared with fellow educators in a session at the ISTE+ASCD national conference in San Antonio this summer:

3D printed cubes to see and feel science

One ed-tech product, Merge Cubes, combined with a device such as a Chromebook, gives students the chance to interact with virtual simulations of the earth's core, the solar system, the inside of a frog's body, and other science concepts. Each cube retails for about



Kaylee Domzalski/Education Week

Jennifer Watkins, who runs a STEM program for the Fouke school district in rural Arkansas, shared how she uses inexpensive ed-tech tools to help students understand robotics at the ISTE+ASCD annual technology and learning conference this summer.

\$30 on Amazon.

Educators can sometimes get cubes for free at conferences like ISTE, produce them using a 3D printer, or get samples from the creators' website using cardstock, and then have their students put them together. The app that powers the cubes has both paid and free versions.

"Sitting in a desk learning about the Earth, [students] don't care, but whenever they can hold it and see it firsthand, it makes it relevant to them," Watkins said.

Making devices to teach how electrical circuits work

Makey-Makey devices, which retail for around \$50, allow students to use a circuit board, clips, and a USB cable to make just about anything—a banana, a potato—into a makeshift keyboard.

Watkins uses it to teach how electrical circuitry works. At the ISTE+ASCD conference session, she had four oranges hooked up to it and demonstrated how she could create a closed circuit by putting her hand on one of the oranges and turning the others into a piano.

They're also helpful for teaching coding.

Watkins will have her students use Scratch—a student-friendly coding language—to create a game. The Makey-Makeys can turn just about anything—cardboard, Play-Doh—into a gaming console. Students can then play the game they've created without ever touching a traditional keyboard, even though they are playing it on a computer.

That takes design thinking, Watkins said.

"I want my kids to be able to mess up," she emphasized. "I try really hard not to tell them how to do it. I try to kind of throw it in front of them and let them play around. I tell them all the time, 'I really hope you get it wrong the first time, because then you'll get to improve upon it.'"

Teaching elementary and middle school kids how to code

BBC micro:bits, a small device, which retails for around \$30, is also great for teaching coding, Watkins said. She will pre-program it for younger students and let them play a class-wide, digital version of rock, paper, scissors. She lets middle schoolers do the coding on their own, using tutorials on a free website.

She's used it to let students code informa-

tion about themselves as an icebreaker and made herself a micro:bit nametag to get students excited about using the device.

Building things to learn engineering skills

A building kit—which can be purchased for about \$20—is great for younger students building creations with cardboard and can help introduce engineering skills without a digital component, Watkins said. There’s a saw for cutting cardboard that’s safe for even small kids, a screwdriver that can help students connect two pieces, and a perforating tool to make folding easy.

“Kindergarten can use these,” Watkins said. “It’s not going to cut them. It’s very safe.”

How to use STEM products to raise money

Watkins and her colleagues also found some creative ways to generate money.

For instance, Watkins bought a 3-D printer and filament (a type of plastic) for around \$1,000.

Then she used those products to create small figurines her students and their families could buy, with prices ranging from about 50 cents to around \$8. She created small panthers (the school’s mascot), dragons, and dragon eggs, and sold them at events like Field Day. The endeavor ultimately helped generate about \$6,000 over two years. Watkins pumped those profits back into the district’s STEM program.

The district also funded a week-long STEM summer camp at a low cost per family. A local parent organization helped finance scholarships available for needy students. Watkins used part of the tuition money to purchase tools she could include in the camp and then repurpose for the classroom.

Most recently, the district secured a \$10,000 grant from the Arkansas STEM coalition to help purchase other supplies. ■

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Students Say They Care More About STEM As They Get Older. Teachers Disagree

By Lauraine Langreo

Students think they grow more motivated to tackle STEM topics as they get older. Teachers disagree.

That's according to recent surveys by the EdWeek Research Center.

A majority (59%) of teachers of STEM subjects say most of their students grow less motivated as they progress from elementary to high school. About a third said most of their students grow more motivated.

On the other hand, a majority (59%) of secondary school students say their level of motivation is higher than it was in elementary school, while 8% say their motivation is lower.

This is a potential problem because if teachers think students are not as motivated, then they might not be engaging them in the best ways possible.

The EdWeek Research Center surveyed nationally representative groups of middle and high school students and K-12 educators, including 1,058 teens and 605 teachers in March and April.

Students' and teachers' perceptions of motivation differ

The contrast between students' and teachers' views might be because they each define or perceive motivation differently, experts say.

Students are probably thinking of motivation as "things they think are fun, things that they might be interested in, what kinds of activities they do in class with the teacher," said Christine Royce, a professor at Shippensburg University's teacher education department, and a past president of the National Science Teaching Association.

Plus, as students move through their K-12 education, they have more opportunities to explore future careers that interest them and how the STEM topics they're learning intersect with those professions, possibly making them feel more motivated to work hard in those subjects, said Latrenda Knighten, the president of the National Council of Teachers of Mathematics.

Shelley Ajin, a senior at Downtown Magnets High School in Los Angeles, is one of



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those students who says her motivation in STEM classes has increased over time.

"I felt a little more motivated in high school," Shelley said. "I had amazing teachers who taught me a lot and had a lot of interactive labs."

There were also more opportunities to participate in clubs or programs related to STEM that "have really kept my motivation up, especially because they're really interactive," she added.

Meanwhile, teachers are observing students' outward reactions and behaviors in class and use that to gauge their levels of motivation, Royce said. Teachers are looking at whether students are engaged, asking questions, and working on the task—and their perceptions might be that a lot of that is not happening.

Teachers also know that content becomes more challenging and rigorous as students progress and there might be fewer opportunities for hands-on activities, prompting kids to feel less excited about STEM learning, according to Royce and Knighten.

Vy Le, a chemistry teacher at Downtown Magnets High School, hypothesizes that students' motivation follows a V shape. Younger kids have "natural curiosity—they like learning about science and how the world works," and their motivation might dip until they have more opportunities to explore their interests, which might only happen when they get to high school.

"Maybe [teachers] didn't get to see the last part, where [motivation] goes up," Le said.

"Students, on the other hand, maybe they don't remember much about the beginning where it declines, but when they're older they remember more of that upward curve."

How teachers can tap into students' motivation

How can teachers help bolster students' motivation?

First, expect students to be motivated, Royce said.

"If they expect that students are motivated, it's more likely they're going to utilize strategies and instructional methods that are going to make kids more motivated," she said.

Royce and Knighten recommend that teachers ask students for feedback on what would motivate them to learn the topics. What teachers will most likely hear from students is that they want more hands-on activities or real-world connections, they said.

In her class, Le said she's seen students' interest and motivation increase over the course of the school year, and she attributes it to the hands-on lab activities they do in class.

"In the beginning of the year, it was tough [to engage students]," she said, noting that most time then is spent learning concepts rather than conducting lab experiments. "But they've gotten used to the rigor. They also saw how, after all the learning, they were able to apply their learnings in these labs."

"By the end, a lot of students were saying, 'I think I'm going to major in chemistry [in college], you gave me that passion in chemistry,'" Le said. ■

Additional Resource
View this article's charts 

Published August 14, 2025

Making Time for Science in Kindergarten Could Have a Big Payoff

By Sarah Schwartz

At Melbourne Elementary School in north-central Arkansas, time for science is a priority—even for the youngest students.

Starting in kindergarten, teachers dedicate 30-40 minutes for the subject each day. Once a week, all students get to visit the campus' STEM lab during the school day, said Sadie Jenkins, the school's assistant principal.

"We weave it in all day, every day," Jenkins said.

This focus makes Melbourne Elementary unusual among American schools, which for decades have given short shrift to science.

"In the early grades, science is very neglected," said Kathleen Lynch, an assistant professor of learning sciences at the University of Connecticut's Neag School of Education, who studies science, technology, engineering, and math education. "Many kids aren't being exposed to science content at all at these grade levels, or if they are, it's maybe a couple of times a week, off and on."

Now, there's evidence that what schools like Melbourne Elementary are doing can pay dividends later for learning.

A new meta-analysis from Lynch and her colleagues at the University of Connecticut, the University of Michigan, and Michigan State University examines the effect of dedicating more time and resources to science instruction in grades P-1—and finds that introducing dedicated science curriculum and training for teachers improved students' scores on both standardized assessments of science achievement in these grades and researcher-developed tests, when compared with students in business-as-usual classrooms.

This finding is perhaps unsurprising: It makes sense that focusing on science would lead to better science scores. But it should prompt schools to "ask some important questions" about how they're allocating time, said Lynch.

"Clearly, all of the interventions that we looked at were above and beyond what normal classrooms in pre-K-1st grade are spending on science," said Amelia Gotwals, a pro-



Allison Shelley for AIAEd

First graders take a closer look at bees during a class lesson. Science is often neglected in the early grades, but new research suggests that young students who are exposed early to science instruction do better on science exams—potentially setting them up for later success in the discipline.

fessor of science education at Michigan State University.

And if schools want to build foundational science skills, they don't develop incidentally—dedicating time for that is essential, she said.

“Many kids aren’t being exposed to science content at all at these grade levels.”

KATHLEEN LYNCH

Assistant professor of learning sciences
University of Connecticut's Neag School
of Education

Two types of elementary science curricula target different outcomes

The researchers analyzed 33 reports and studies that tested the effect of science PD for teachers, the introduction of new science curricula, or both factors, on the achievement of students in grades P-1.

The interventions tested tended to be what science-curriculum developers and researchers would consider high quality, aligning with the Next Generation Science Standards, said Gotwals. Those standards, now in use in 20 states and the District of Columbia, emphasize science practices and investigating scientific phenomena in addition to content knowledge.

The average positive effect on students' science achievement was 0.33 of a standard deviation, which the researchers say is the equivalent of students who received these

science interventions scoring at the 63rd percentile while their peers in the control group scored at the 50th percentile. (The researchers also found a small increase in students' literacy skills, though this effect was only marginally significant.)

Curricula tended to fall into one of two categories, said Lynch. Either it aimed to develop science content knowledge and familiarity with science practices or it supported content-area literacy—focusing on science vocabulary, for example, or argumentative writing in science.

"They're both effective, but they tend to be targeting different types of outcomes," said Lynch.

Content-area literacy science instruction may be more common in elementary classrooms, where some English/language arts curricula intentionally incorporate science and social studies topics in reading and writing tasks. These programs, often called "knowledge-building curricula," aim to deepen students' general knowledge in service of their reading-comprehension abilities.

That's important, but it's only a "subset" of what young children need to be learning about science, said Lynch. They also need to be introduced to discipline-specific practices—like how to test a hypothesis—that they'll build on in middle and high school.

"One of the barriers that schools have faced is a scarcity or a shortage of curriculum materials for early-childhood science," Lynch said. "And I think we've made some progress."

Jenkins, the Arkansas assistant principal, said finding high-quality, early-elementary resources took some work. When her school started looking for materials, there was only one full course option that cleared the highest bar on EdReports, a nonprofit curriculum reviewer. It was too expensive, she said.

"We're looking at a lot of open resources," Jenkins said, piecing together different lessons from different programs.

Just like learning foundational reading or math skills sets students up for success, so does early science instruction, she said. "We knew we couldn't wait." ■



John Rucosky/The Tribune-Democrat via AP

Students at Flood City Youth Fitness Academy in Johnstown, Pa., participate in a Code 4 STEM Academy session on Oct. 25, 2022. Teachers can incorporate the STEM disciplines into their classes even when their schools don't have robust STEM programs.

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How Teachers Can Incorporate STEM—Without Making It a Big Production

By Caitlynn Peetz Stephens

Introducing students to STEM early, and consistently exposing them to those subject areas throughout their K-12 careers, can motivate students who might be searching for a subject that interests them to succeed academically, potentially changing the trajectory of their lives. And teachers can make that exposure happen in small ways throughout the school day, even when they don't work in schools with robust STEM programs.

That was the message from educators who have managed to more closely incorporate science, technology, engineering, and math into their classrooms and schools during a recent webinar organized by the National Math and Science Initiative.

"STEM is everywhere," said Kristen Vesely, the director of advanced academics in the Ector County, Texas, district. "There are so many everyday ways that we can introduce these concepts."

The emphasis on STEM learning has continued to grow in recent years, as educators and employers increasingly work together to introduce students to STEM-related concepts and

skills that can translate into in-demand jobs.

Some districts have poured big bucks into building STEM programs that carve out pathways for students to pursue training—and oftentimes receive postsecondary certificates—in a variety of related careers, from nursing to automotive technology to engineering. The goal is to provide a diverse assortment of opportunities for students to prepare for college or careers after high school in high-demand, high-paying jobs.

But that's been far from a universal experience in K-12 schools.

Gaps persist in access to STEM programs based on whether districts have invested in them, and young people over time come to believe that boys are more inclined than girls to succeed in those subjects. Districts also face challenges filling STEM-specialty teaching positions.

Even without those major investments and formal advanced STEM programs, however, teachers of all grade levels and subject areas can still take steps to introduce STEM concepts in their classrooms, Vesely said.

Teachers can look to a new technology-related trending topic—like artificial intelligence—and create opportunities to dis-

cuss the new tool, how it works, and emphasize that people have careers developing and maintaining those tools. Such discussions help plant a seed, and get kids thinking about topics that interest them and how their interests can someday translate to jobs, Vesely said.

Teachers can also prioritize teaching analytical skills, creative thinking, and asking questions, she said—all crucial skills in STEM fields.

"You have more resources at your hands than you think," Vesely said. "Most classes that I step into have STEM ideas in them, and teachers are making mindset shifts ... and really starting to allow the students to own their learning."

Teachers can also use field trips as an opportunity to introduce STEM concepts, said Robin Johnson Ford, the director of advanced academics in the DeSoto, Texas, school district. She recalled taking students to the post office, for example, and talking about the logistics of processing and delivering mail and the technology that helps make it happen.

"It doesn't have to be enormous," she said. "I think people think, 'I have to have all this stuff [to teach STEM], but just one experience can literally open doors to creating a STEM culture and STEM mindset. You just have to figure out, what's that one thing that's ... within my reach?'"

Teachers can also be strong advocates for incorporating STEM, said Todd Allen, the principal of Lady Bird Johnson Middle School in Irving, Texas.

Educators can have influential conversations with school administrators and district leaders, making the case for integrating STEM teaching and other related opportunities more often through the school day. It can be helpful to recruit other teachers to share stories, anecdotes, and information about potential programs and opportunities, he said.

Efforts big and small to introduce STEM to students can influence their entire educational journey, and, for some, even the trajectory of their lives, the panelists said.

One student in Vesely's Texas school many years ago had a difficult time for much of his academic career. Educators' main goals for him were merely to keep him passing his classes and on pace to graduate, she said. Then, in high school, he took some career and technical education courses related to mechanical engineering, and "it sparked something in him," Vesely said.

When he graduated from high school, he wasn't at the top of his class, or even in the top 10, she said. But he had a passion. Now, he is

a successful adult who owns a business and works in mechanical engineering, she said.

In Irving, Allen has a student this year who began working on a class project about noise pollution and has found a passion for the subject. The student has worked with local experts as part of the project to learn more and participate in hands-on learning opportunities, Allen said.

“I think this research opportunity that presented itself in his 7th grade class may, in turn, take this student on a pathway that six months ago he would have never had,” he said. “This is going to be a young man who, in this one interaction, changed his entire perception and could lead him to a STEM career.”

Plentiful STEM exposure can also be helpful for students who ultimately don’t choose a career in one of those fields, Vesely said. Her district has a large population of students in bilingual education programs, she said, and when students who struggle in other classes can participate in the more hands-on, inquiry-driven STEM classes, “you watch them light up,” she said.

“It gives them that opportunity to engage differently with the material—they’re doing something with their hands,” she said. “And that, in turn, builds their belief in themselves in other classes. So they walk out of there and they go into English and, suddenly, they believe that they can do it, and we see an increase in academics across the board.” ■

Published December 16, 2025

How to Get More Students Into Computer Science Classes in the Age of AI

By Lauraine Langreo

Access to high school computer science courses has plateaued, and overall high school student participation in those classes has declined slightly, concludes Code.org's annual report on the state of computer science education.

Nationwide, 60% of public high schools offered foundational computer science classes, and 6.1% of eligible students were enrolled in these classes, in the 2024-25 school year, the report found. In the 2023-24 school year, the same proportion of schools offered these courses but 6.4% of students were enrolled.

Part of the reason for the plateau and slight decline could be that the number of states that require students to take a computer science course to earn a high school diploma only increased by one. This year, West Virginia joined 11 other states with such a requirement, according to the report from Code.org, a nonprofit that seeks to expand computer science education. The other states are Alabama, Arkansas, Indiana, Louisiana, Nebraska, Nevada, North Carolina, North Dakota, Rhode Island, South Carolina, and Tennessee.

Among the states with a graduation requirement, access increased from 74% to 76%, and participation increased from 9% to 10.4% of students eligible to take computer science classes, the report found.

For the first time, the annual report also features a state-by-state analysis of AI education guidance or policies. So far, four states emphasize artificial intelligence in their computer science standards, five provide AI and computer science professional development funding, and 17 have guidance that emphasizes computer science education as fundamental to AI literacy.

The relevance of computer science education is being questioned in the age of AI. Some software engineers are concerned about job security and high school computer science students have wondered if it's still worth it to learn to code. But experts argue it's still valuable to learn to code along with foundational computer science principles, because those



Erica S. Lee for Education Week

Fourth graders participate in an introductory lesson on artificial intelligence during a computer applications class at Dr. Martin Luther King, Jr., School No. 6 in Passaic, N.J. Some experts suggest schools should use computer science classes to teach AI skills.

are the skills that will help them better navigate an AI-powered world.

In a conversation with Education Week, Pat Yongpradit, the chief academic officer for Code.org, discussed the report and the importance of state and school district policies to help bring computer science education to every student.

This interview has been edited for length and clarity.

What are your big takeaways from this report?

States need to make the move now to require computer science, especially if we're going to remain globally competitive in an age of AI—asking kids to take [computer science classes] is the minimum to prepare them for an age of AI.

Second, I'd say that AI is an opportunity to broaden the relevance of a computer science experience so that more kids choose to participate when they have the opportunity. That should grow the enrollment percentage as well.

Computer science, unlike many other subjects, has evolved tremendously over the

last five, six decades since its introduction. If computer science doesn't evolve with this new technology, there's a risk of it losing relevance, and kids not choosing to take it. But if it does lean into the new technology, we're going to see a renaissance in kids wanting to learn computer science, because they'll see the tie-in to all this AI stuff that they hear about.

What impact do graduation requirements have on students' interest in computer science-related careers?

Anecdotally, here's the thing: How can a kid decide whether they like something or not, until they actually take it, until they even have the opportunity to take it?

All this computer science stuff is about giving kids that opportunity to decide. You cannot decide when it's not even on the menu, and even when it's on the menu, you sometimes have to put people in a position where they're going to learn something so that they can decide whether they want to get into it further or not.

Why? Because there are a lot of stereotypes out there about who should be taking comput-

er science or not. But when you “force” kids to learn a little something about computer science, you give them the opportunity to see, “Oh, yeah, I can learn this. And no, it has nothing to do with my gender, this is just what it is. It’s cool. And yes, I should [continue learning this].” I saw that firsthand as a teacher.

Data-wise, Maryland has a longitudinal data system where they track high school course-taking all the way to what career kids have after they graduate and how much money they’re making. They found out that not only is participation in a high school computer science course indicative of participation later on [in] undergrad and then getting a job in that field. But it’s also indicative of higher earnings as well.

That’s like the Holy Grail of the education-to-workforce pipeline thinking. That’s what we want. We want to have kids take these experiences in high school and translate them into future earnings.

A couple states—Mississippi and South Carolina—have seen high participation from girls. How have they done that?

Graduation requirements. South Carolina is [one of the first states] in the nation to make computer science a graduation requirement, so it’s no surprise that they have [gender] parity. Mississippi has a computer science and technology graduation requirement. That means it’s not just computer science courses that earn that credit, you can take some general tech courses as well, but the majority of kids who go after that credit get it through a computer science course.

These things still take time to have effect. If you look at Mississippi, 87% of the schools offer computer science so that means there are still some schools that probably just offer a tech course for those kids to get their credit, and they don’t even have an option for a kid to take a computer science course to earn that credit.

Is a graduation requirement the most effective way to close that participation gap?

It is the biggest, most effective way. It sounds like it’s like forcing people, but we force kids to take, like, 10 years of math. All we’re saying is one little itty bitty computer science course, at some point.

In education, we make mandatory the things that we feel are core and foundational.

If we want to move kids into an age of AI, they should probably learn a little bit of computer science.

What should states do to continue to move the needle in computer science education?

They should adopt those policies—put AI into standards, adopt an AI and CS graduation requirement, fund PD, and develop guidance that is comprehensive and talks about the fundamental roles.

Computer science is much more than just coding and teaches lots of other stuff. Coding might change, but computer science education overall still is fundamental.

Computer science is a rich and willing context for AI education. People are talking about societal things in computer science class now. ■

Making Science Work in Real Classrooms

A More Doable Approach to K–5 Science

In elementary classrooms, interruptions and schedule shifts are the daily reality. When reading goes long, math needs extra time, or an assembly, fire drill, or long transition breaks up your routine, science can feel like one more thing that isn't doable.

Many science curricula assume time, preparations, and materials that simply don't exist in real-world classrooms. As a result, science instruction is often rushed, inconsistently taught, or dropped altogether.

In modern classrooms, teachers are asking for a curriculum that, even in tight schedules, removes barriers to 3D learning and ensures students are consistently reading, speaking, and practicing with the skills of scientists and engineers. Teachers are looking for resources that make science doable.

What Makes Science “Doable?”

A doable science curriculum begins with a realistic understanding of classroom environments and recognizes that teachers often work with limited time, few resources, and many competing instructional demands.

Informed by this understanding, a doable science program gives teachers control over their pacing and schedule with resources that can be quickly adapted while still covering standards. A high-quality science program doesn't reduce rigor or take shortcuts on standards, but removes barriers that prevent science from being taught consistently.

High-quality science doesn't reduce rigor, but removes barriers that prevent science from being taught consistently.

When science becomes doable, teachers can integrate it consistently, students can regularly engage in scientific thinking, and science becomes an important part of the school day again.

One such curriculum is the new K–5 science offered by Studies Weekly, [Science Studies Weekly](#). Science Studies Weekly gives teachers the flexibility to adapt their instruction while maintaining rigor, standards coverage, and the standard of engagement and excellence educators can expect to see in all Studies Weekly materials.

Indicators of A Doable Science Program

- Gives teachers control
- Materials are flexible and adaptable
- Does the heavy lifting
- Reduces barriers to standards coverage
- Materials are high-quality

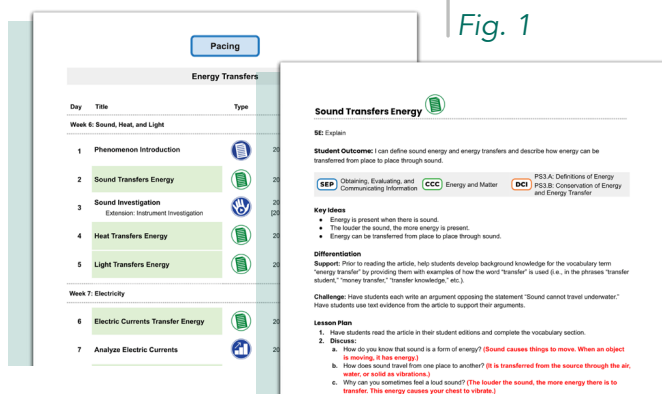
Giving Teachers Control

When a lesson that seemed manageable in the morning needs to be shortened by the afternoon, teachers need to be able to adjust instruction quickly.

Science Studies Weekly comes in a predictable, repeatable print and online structure that teachers can adapt as needed. Depending on their schedule, teachers can follow the full sequence or take advantage of a feature only in Science Studies Weekly that helps teachers identify the most essential, standards-based content: the Quick Path.

Quick Path

Fig. 1



The Quick Path is a built-in instructional track that identifies focused articles that ensure full coverage of the NGSS Disciplinary Core Ideas (DCI) in fewer days of instruction, to help teachers prioritize and maintain momentum when time is short.

About the Quick Path

- Identifies focused articles that can be taught in 20 minutes or less
- Ensures full coverage of the lesson's Disciplinary Core Idea (DCI)
- Embeds Science and Engineering Practices (SEP) & Crosscutting Concepts (CCC)
- Quick Path articles require minimal prep and no materials

Reducing Barriers to NGSS

When balancing the demands of multiple subjects, fidelity to the Next Generation Science Standards (NGSS) and three-dimensional learning can be intimidating, but with Science Studies Weekly, it doesn't have to be!

From the moment you open your Studies Weekly curriculum, your hands-on activities are already ready to go. The experiments found in your curriculum, like sorting items by solid or liquid, or creating a food web with pictures and string, have already been modeled and recorded in engaging videos. Simply watch the video together as a class, or do the activity together if time permits.

The hands-on activities are intentionally designed to only use items already commonly found in elementary classrooms, so you can do the activities without a late-night trip to the store.

Hands-on activity video

Fig. 2



Whether you choose to do the activity together as a class, watch the video, or both, the activities always help your students practice synthesizing data to find the conclusion on their own, ensuring they're not just learning science content, but practicing thinking like scientists.

Studies Weekly does the heavy lifting for you, so you can expose students to grade-level Science and Engineering Practices (SEPs) and Crosscutting Concepts (CCC) without needing to dedicate time to planning labs or chasing down materials.

The Importance of High-Quality Materials

High-Quality Instructional Materials (HQIM) make a difference. They can not only improve student outcomes, but can also greatly ease the burden on teachers, who often dedicate their time to finding resources online or even making them from scratch.

All of Studies Weekly's materials are designed and frequently updated to ensure teachers have access to high-quality, standards-based materials to help them accomplish their goals.

Science Studies Weekly Print & Online materials

Fig. 3



In the Studies Weekly Online learning platform, teachers are provided with a vast library of digital lesson videos, activities, printables and graphic organizers, extended reading articles, and much more to support their teaching.

The online platform also makes it easy to accomplish the administrative side of teaching. Online features automatically grade assignments and compile student progress into visual reports, so teachers can easily reference student data and identify opportunities for intervention.

With the added online flexibility offered by Studies Weekly, teachers have more freedom to do what they do best.

Science That Works

When science becomes doable, students engage with science content more consistently and more often. A doable science curriculum doesn't lower expectations, but removes barriers so meaningful science learning can happen.

Want to learn more about how Science Studies Weekly can remove obstacles for teachers and improve student outcomes? Reach out to a Studies Weekly representative for samples, quotes, and more through the contact information below.

Curriculum that helps teachers do what they do best.

Reach out to unlock what's possible.



s-w.co/quote

**Studies
Weekly**



Peter Prato for Education Week

Seniors at Thurgood Marshall Academic High School in San Francisco practice the use of a pipette as part of a STEM initiative. Science teachers say they often have to shore up students' math skills in their lessons.

Published August 29, 2025

Want Students to Be Better in Science? Bolster Their Math Skills

4 tips from teachers on how attending to math can benefit higher-level science work

By Sarah Schwartz

Students in Kristen Gonsoir's classroom at Groton Area High School in Groton, S.D., spend a lot of time solving equations together.

Early this school year, they passed almost an entire period working in groups on a particularly tricky word problem: If someone has a garden 10 feet by 10 feet, divided into three plots, how many kilograms of fertilizer would they need for each plot, applying fertilizer at a concentration of 1,000 pounds per acre?

Gonsoir walked around from group to group, listening in on students' conversations and reviewing their calculations to see where she had to shore up misunderstandings.

But despite all of the math going on in her room, Gonsoir isn't a math teacher. She teaches science. The word problem was a way for them to practice the skills they'd need to make conversions between different components involved in chemical reactions.

"Chemistry is, as the kids say, just another math class," said Gonsoir.

Math has always been a core part of science, especially in high school chemistry and physics—so much so that many studies have found a correlation between students' high school math abilities and their performance in college science classes. More recently, the Next Generation Science Standards, first unveiled in 2013, emphasized quantitative reasoning and data analysis. The standards have been adopted by 20 states and the District of Columbia.

But some high school teachers say that many of their students come into science classes unprepared to handle the math demands the subject requires of them.

"They've kind of forgotten the really, really basic things from algebra," said Lisa Kern, a chemistry and environmental science teacher at Avon High School outside of Indianapolis.

The gaps in math knowledge that students arrive with in high school may be especially wide now, as multiple studies of student achievement show lagging middle school achievement.

Even so, teachers say, science curricula

don't often build in time or resources to reinforce basic math concepts—and it's usually logistically difficult to facilitate collaboration between high school math and science departments.

Education Week spoke with science educators for their tips on how to embed math practice into their classrooms and align their math teaching to that of the math teachers in their district. Read on for four ways that educators said they approached these challenges.

1. Model math frequently

Because students come into class with different levels of math skill, Kern, the Indianapolis teacher, explicitly reteaches some concepts from the beginning.

When she introduces the formula for density—density equals mass divided by volume, or $d=m/v$ —she shows students how to cross-multiply. During the course of the unit, she might show a worked example of a problem or two on the board every day.

Dylan Fedell, a science teacher at Palisades High School in Kinterville, Penn., reteaches geometry concepts in his physics classes, when explaining how forces act on moving objects.

"I find myself teaching—I don't want to say from scratch; I'm not doing any derivations—but I'm explaining right triangles, how we're labeling them," he said.

It's not that students never learned the geometry concepts, but they need a teacher to help them make the connection that the same skills apply in science, too, Fedell said. "It's just two different mindsets," he said. "Unless you actively work to bring them together, it's not going to happen."

2. Work on students' conceptual understanding of mathematical relationships

In chemistry, students might memorize a formula for, for example, converting grams to moles—two different measurements of mass.

But if they don't understand the process the formula represents, they're likely to use it incorrectly at some point, said Gonsoir, the South Dakota teacher.

To try to build that conceptual understanding, Gonsoir assigns lots of problems that require students to convert quantities—like the gardening problem at the beginning of this year, which asked students to translate kilograms to pounds and feet to acres.

"The thing I start the year with is, 'I know a lot of you aren't going to be chemists. No one's

going to walk up to you and say, how many grams are in a molar solution of 5% of sodium chloride?” said Gonsoir. “But I do say, ‘You’re going to have to solve problems, and chemistry gives you a good base for problem-solving.’”

3. Teach math language

Explicitly teaching math vocabulary in science has helped her students grasp concepts more easily, said Jill Christman, a chemistry teacher at Canyon del Oro High School in Oro Valley, Ariz.

She has worked with science teachers across the department so that the terms educators use to describe, for example, how to make a scale on a graph, are the same in biology classes and chemistry classes.

“It’s really helped our students—it’s actually kind of amazing,” Christman said.

Looking forward, she’d like to work with the math department, too, to see if there are other terms that teachers across subjects could use consistently.

If students aren’t making the connection between some of the formulas they’re using in both math and science, Christman said, “there’s something we’re missing as educators.”

4. Seek out cross-disciplinary professional development

When she asks students to solve problems, Gonsoir often uses techniques that she learned from sitting in on math professional development—something she does frequently.

She groups students and asks them to work on the problems at mounted whiteboards throughout the room, a technique from *Building Thinking Classrooms*, a book of suggestions for teaching practices in math.

Having students talking in groups, and being able to see their problem-solving approaches clearly, makes it easier to identify when students have misunderstandings and correct them quickly, Gonsoir said.

Christman, in Arizona, regularly checks in with the math department to get a better sense of what skills students already have. “A lot it’s very informal,” she said. “I’ll have conversations like, ‘I’ll be using slope this week in my class—at what point did the students learn slope?’”

Still, it can be hard for teachers to find this kind of collaboration time, or for districts to intentionally schedule it, said Dave Celotto, the director of program design and innovation at the National Math and Science Initiative, a nonprofit professional development provider.

Among the organization’s offerings is “vertical team training”—an option in which math and science teachers across several grade levels learn about skill progressions together.

A PD session might focus on a physical science concept that comes up in 7th grade, for instance, and the prealgebra concepts that students learn in earlier grades that they would need to understand the 7th grade content, Celotto said.

This gets teachers across disciplines into this mindset: “How might we do this better, so that we can support what you’re doing?” ■



Vanessa Solis/Education Week via Canva

OPINION

Published February 10, 2026

6 Practical Tips for Planning a Family STEM Night at Your School

How to spark kids' curiosity for science with afterschool events

By Stefanie Macaluso

What do science, pajamas, and school cafeterias have in common? They can all be part of a powerful after-school experience that makes STEM learning more accessible, collaborative, and fun.

Informal science, technology, engineering, and math programs—"STEM in pajamas," if you will—offer students unique opportunities to explore science outside the traditional classroom. Community-based science clubs, evening workshops, or family-engagement nights can help spark curiosity and creativity by turning STEM into something students can enjoy in a relaxed environment after school hours.

I first encountered a STEM-in-pajamas experience as a visiting co-teacher in a science education course at Barnard College organized by education professor Maria Rivera. The concept was a simple one that any school leader can emulate: Host a family engineering night where students and their caregivers work together on fun, hands-on engineering challenges.

The events were held in school cafeterias, science rooms, and libraries across New York City public schools and drew on programming from the American Society for Engineering Education's activity book, *Family Engineering: An Activity and Event Planning Guide*.

Each school I visited was full of laughter, trial and error, and light bulb moments as families collaborated on challenging DIY engineering tasks. More importantly, the events demonstrated that engineering is indeed for everyone, regardless of background or prior experience.

In the high school environmental science class that I teach, I've seen firsthand how informal science activities can deepen student engagement and enthusiasm. One recent project asked students to design earthquake-resistant buildings out of Popsicle sticks and Silly Putty as part of a unit on the environmental impact of natural disasters and climate change.

To simulate seismic activity, students used a hand massager to create increasing vibrations and test the resilience of their structures. With limited in-class time, the challenge

evolved into an after-school competition. Students worked on their designs at home, compared results, and shared strategies. I saw how their excitement didn't end at dismissal but was invigorated with more time spent outside the classroom thinking about ways to improve the structural integrity of their Popsicle-stick buildings. Thus, not only was science extended beyond their classroom experiences, but they were dreaming about science as well.

Research supports my own observations about the power of after-hours STEM, with a recent metaanalysis offering empirical evidence that STEM outreach programs, particularly in informal settings, build student confidence and interest in the discipline.

If you don't have time to manage an after-school club to develop opportunities for informal STEM enrichment, consider creating a simple family-friendly STEM night. Here are a few practical tips for principals interested in planning one at your own school:

- **Start with a theme.** Whether it's sustainability, engineering, or a specific topic (like outer space), a cohesive theme can help drive excitement and engagement.
- **Design interactive activities in stations.** Think spaghetti towers, edible DNA, or homemade slime—anything that's fun and exploratory. Of course, don't be afraid to think outside the box of these more traditional activities. (The family-night activity book which I noted earlier, has endless interactives that are easy to prepare.)
- **Empower student leadership.** Let students co-design activities or take on facilitation roles to build ownership during the STEM night or club event.
- **Recruit volunteers and partners.** Pass out flyers or make a phone tree to involve parents, school staff, local organizations, or STEM professionals who can enrich the experience with real-life examples. Continue to show students that STEM/STEAM does not live in the school alone.
- **Foster inclusivity.** Ensure all activities are accessible to students of varying abilities, languages, and backgrounds. For example, provide translated materials and visuals to supplement directions at different activity stations.

- **Celebrate participation.** Highlight student work and recognize creativity by providing prizes or other types of incentives to help build hype and interest.

The possibilities for engaging students in STEM outside the bounds of a classroom are endless. Informal science programs, especially ones rooted in community, can create meaningful opportunities for students to connect with science in their own time and space. With just a little time and creativity, the children in your school can have their own STEM pajama parties and fall asleep at night thinking of science. ■

Stefanie Macaluso is a postdoctoral fellow at Teachers College, Columbia University, where she trains preservice teachers. She has also been a science curriculum coach and science teacher in New York City public schools for the last nine years.



OPINION

Published December 04, 2025

Strategies to Help Students Embrace Science Instruction

By Larry Ferlazzo

The Scientific Method

Bertha Vazquez is a retired science teacher and currently the education director at The Center for Inquiry where she runs programs that offer free, valuable resources and professional development for teachers:

Every science course contains a primer on the nature of science. Teachers cover the importance of the scientific method and offer countless opportunities for students to explore how science works. However, many of us do not teach why we need the scientific method.

When we teach students about how science works, an important strategy is to emphasize two key components. These components should be introduced early on and reiterated frequently throughout the school year. First, it's crucial to recognize that everyone, including ourselves, is susceptible to flawed thinking influenced by our biases, perceptions, experiences, and identities. The scientific method plays a crucial role in countering these biases and seeking the truth.

Second, we must acknowledge that science denial and pseudoscience often permeate the news, social media, and even our classrooms.

It's essential to understand what they are and how to avoid falling victim to them. By incorporating how science mitigates biases through established methods such as using control groups, double-blind protocols, the peer-review process, and replicability, students will grasp why the scientific facts they learn are credible and reliable.

I often say in class, "Scientists do not try to prove themselves right; they try and prove themselves wrong. When you really feel strongly about a topic, you need to be extra aware that you will try to prove yourself right. Without even noticing it, you will look for evidence that proves you right and discount any evidence that proves you wrong. Let's work on changing this."

In other words, rather than simply presenting scientific findings and expecting our students to accept them despite the fact they may contradict their existing beliefs, the best strategy is to help them understand why we need the scientific method in the first place.

This strategy will help our students not only in their academic journey but also in their daily lives long after they have left our classrooms. Our students undoubtedly encounter a firehouse of misinformation on their favorite social media outlets. This strategy will equip

them with the tools to be more open to accepting "controversial" topics like climate change whether they are introduced in the classroom or on television at home.

They will understand why some sources of climate information are more credible than others, thereby making informed decisions. This understanding of the scientific method will benefit them in the long run, making them more critical thinkers and responsible citizens.

Encouraging humility in our own thinking is one of the most important strategies we can teach our students.

'Taking Feedback From Students'

Kelley T. Lê has been in the educational field for over 15 years as a high school science educator, instructional coach, and educational leader. She is the author of two books, including Teaching Climate Change for Grades 6-12: Activating Science Teachers to Take on the Climate Crisis Through NGSS (2024):

If we were to cancel math and science classes tomorrow, what would students really be missing out on that they couldn't get from the internet, ChatGPT, or social media with just a few clicks?

This is a question I often pose to teachers to get them to reflect on the deeper purpose of learning, schooling, or what's included (or not) in their current teaching curricula. A great deal has to do with recognizing what's within our power and privilege to change and unveiling the deeper beliefs and values we hold for the purpose of teaching and learning.

Without that time to get deep, even the best strategies will only get you so far with students. So let me share a little cheat sheet based on my experiences working with thousands of teachers across the nation to get us started. Note that these strategies have worked with engaging students because they are foregrounded in values of equity, justice, respect, cultural relevance, belief in students' capacity and capabilities, and so much more magic sauce.

Take a peek, collect your thoughts, challenge what you're reading while reflecting on why you had that reaction, and gain more clarity on your everyday teaching decisions and philosophy.

Strategy 1: I can't tell you how many times I've seen noneducators post about how teachers need to "make it fun!" to captivate students' attention. Absolutely, but I've also seen really "fun" lessons be completely meaningless to build on students' knowledge, disconnected to learning sequences, and recycled

Sonia Pulido for Education Week

year after year without student input as to what they consider is “fun.”

Make it fun but make it challenging and directly connected to an issue within their community that they can actively find solutions for to build their critical-thinking capacity. When they succeed (and they will!), “fun” can equate to building their resilience and confidence levels by completing something they know can be applied to their everyday lives.

So many strategies can be included here. For instance, have students take the lead on teaching when they’ve successfully talked out loud how to navigate a problem to unveil their thinking. Teach them about critical media literacy skills so they understand that not everything on the web should be trusted.

Strategy 2: “You can’t be what you can’t see.” This is so true in many ways for students who are often told they need to put on a “scientist,” “engineer,” or “mathematician” hat. The thing is, we’re born curious about the world with desires to understand it and driven to find solutions to challenges what we may face. Students are already scientists, engineers, and mathematicians. The way students are positioned could have them thinking otherwise, however; and if we want them to understand relevance in deeper ways, we can bring in industry, community, and higher education leaders to broaden their views.

Beyond connecting with diverse professionals across STEM areas, they should have the opportunity to listen to that person’s journey into the field. They might be surprised (and inspired) to learn that the engineer in front of them barely passed math but had to display leadership and resilience in different ways. Those are the moments students often recall when they realize that they, too, are capable and that everyone has shortcomings. Hearing how others from similar backgrounds or experiences have navigated those challenges are just as crucial for their sense of belonging.

Strategy 3: Remember that sometimes the topic makes for the perfect vehicle to learn critical skills and dispositions needed to eventually be an “adult.” Mistakes are part of the learning journey, and if we want to build students’ capacity, we have to let our teaching actions reflect that belief.

This doesn’t mean that we don’t guide students, but, instead, we build into our lessons strategic opportunities for them to take the lead, work together to solve problems without us (“Each one, teach one, right?”) have opportunities to engage in argumentation to express alternative approaches, and hear them

teach their peers using their own examples and ways of explaining.

That last one is huge for hearing about how they understand and personally relate to what they’re learning. Taking feedback from students makes all the difference in the classroom to learn about what is or isn’t relevant. It’s also those micro-moments that help to build deep connections and relationships built on strong beliefs that, as adults, we are also teachable.

Let me leave you with a final question to consider. If you were to ask students what they remember most about your class, what would they say? Why? Likely, what students remember most is exactly those important points of connection, capacity-building, or even challenging times they persevered. That’s exactly what the internet and AI can’t provide, and we should think about those responses more to humanize teaching and learning.

‘Local Geology’

Elaine V. Howes and Jamie Wallace are co-editors of the book Culturally Responsive and Sustaining Science Teaching: Teacher Research and Investigation from Today’s Classrooms and they work on educational programs at the American Museum of Natural History:

In our experiences with teacher researchers in a professional learning group (PLG) exploring culturally responsive teaching in their science classrooms, two strategies emerged as opportunities to support students in seeing connection between their own lives and the science they are learning. We share strategies, each used by several teachers in different ways, illustrating how science teachers seek to support their students in seeing how science can matter in their lives.

Autobiography to Connect to Students’ Lives

Drawing on place-based pedagogy, one teacher encouraged students to describe their own experiences with nature in a “science autobiography.” As the teacher learned about students’ experiences with nature (e.g., seeing stars, hiking around the city), he used those examples to connect to local landscapes in his students’ neighborhood and the phenomena of weathering, erosion, and glacial processes.

Another teacher had students create “future bio” posters, modeled on profiles of diverse scientists, to illustrate career goals of interest. The teacher then connected science content with students’ individual career goals where applicable (e.g., how makeup, important to striving aestheticians, contains minerals). These ap-

proaches can help teachers get to know their students, incorporate examples from students’ experiences into instruction, and highlight a diversity of scientists and careers.

Connecting Science to Students’ “Place”

Another teacher created a “local geology” assignment in which students take photos they see as related to the science they are learning. Then they prepare a presentation to share with the class, explaining how each photo connects to their lives and relates to the science content. This assignment provides entry points for teaching required science content, helping students see that the science they are learning is about their experiences, communities, and their world.

Thanks to Bertha, Kelley, Elaine, and Jamie for contributing their thoughts! ■

Larry Ferlazzo is a former award-winning high school English and social studies teacher of more than two decades. He is currently a volunteer tutor to English-learner newcomers at a local school and to youth in juvenile hall.

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