EDITOR’S NOTE
Technology plays a vital role in career-readiness education, equipping students with the skills necessary for success in the modern workforce. This Spotlight will help you learn more about workforce readiness after-school programs; explore strategies to get girls more interested in STEM careers; investigate the benefits of virtual work-based learning; analyze the push for schools to better prep students for STEM careers; and more.

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A robust STEM education is becoming increasingly important as more jobs require higher levels of competency in these areas, especially technology.

One place to support students’ STEM learning is through after-school programs, which “complement what’s possible during the school day, including offering more flexibility and time for hands-on learning to explore career paths and gain workforce skills,” said Maud Abeel, a director for Jobs for the Future, a national nonprofit that develops programs and public policies that increase college and career readiness.

Students participating in STEM after-school programs have reported increased interest in STEM careers. And though not all students are interested in pursuing STEM careers, they still benefit from this kind of knowledge and skills, which are in high demand in today’s workforce, Abeel said.

Education Week identified three after-school programs that are expanding as they try to meet the demand for new, tech-driven skills.

Making a splash with underwater robots

When Santi Criado was younger, he thought he wanted to follow in his mom’s footsteps and become a dentist. Now as a rising senior at Thomas Jefferson High School for Science and Technology in Alexandria, Va., he knows he wants to study engineering like his father. Criado credits the change to his exposure to a SeaPerch after-school program during middle school.

SeaPerch is an underwater robotics program from nonprofit RoboNation, which provides hands-on experiences to empower students to find solutions to global challenges. SeaPerch provides students, educators, and parents with kits to get started on their underwater robots. It also provides lesson plans and educator training, and there are also regional and international competitions for students to show off their engineering skills.

“We’ve structured the program activities so it is flexible to fit into existing structures,” said Lindsey Groark, the vice president of programs for RoboNation. “So whether that is a full semester or a yearlong class in high school, or a two-week unit in the classroom or an after-school club, or summer camp, or even just a weekend community event where students come out with their parents—you can dive into the program as deeply as you want to.”

For Groark, the hope is that being part of a SeaPerch program will introduce students to the engineering design process and engineering careers.

“Ocean engineering is one of the more obvious [career] connections,” she said. But the program is focused on “multidisciplinary engineering.” Kids learn about circuitry, electricity, naval architecture, and even aerospace topics. Students have gone on to study computer science, mechanical engineering, electrical engineering, systems engineering, and other technical fields, Groark said.

One school district that participates in SeaPerch is the Wahkiakum district, in Cathlamet, Wash. The district’s robotics team took first place in the open division of the International SeaPerch Challenge in May.

Ron Wright, the STEM coordinator for Wahkiakum, said he’s seen the after-school robotics program change students’ lives and “redirect kids who were struggling in school or at home.” For example, one student was getting into “all kinds of trouble in school,” but the robotics program showed him that he’s good at something and that “he’s a really smart kid,” Wright said.

For Criado, what stood out most from his time doing SeaPerch challenges is the teamwork and collaboration, as well as the creativity to make his own design and learn from failures.

“It sparked this interest in STEM that I now have,” he said. “Getting kids into these kinds of things at a young age can be really rewarding, fun, and can help them discover different passions.”

Teaching coding to students of color

James Dominguez, 21, wanted to be an artist when he was younger. Now he’s in college, learning how to be a full-stack engineer, designing and creating websites and applications, which taps into his creative side.

He said he wouldn’t have thought about going into the technology industry when he was younger because he didn’t know anyone who was in tech. But when Google’s Code Next staff came to his middle school, he was excited to try the after-school program.

Code Next is a free computer science education program for high school students to develop the next generation of Black, Latino,
Getting kids into these kinds of things at a young age can be really rewarding, fun, and can help them discover different passions.”

SANTI CRiado
High School Senior, Alexandria, VA

and Indigenous technology leaders—groups that are underrepresented in the industry. The program began in 2016 and operates in-person “learning labs” in New York City, Detroit, and Oakland, Calif., where students can tinker with coding tools, meet each other, and meet Google mentors. There’s also an online program for students who don’t live in those cities. (Dominguez attended Code Next in Oakland).

“The program seeks to provide students with the skills and the social capital needed to pursue rewarding careers in technology,” said Kyle Ali, the lead senior program manager for Code Next.

Students learn the fundamentals of computer science and different coding languages, through a mix of direct instruction and team-based activities. For 11th and 12th graders, there’s an incubator program where students come up with an idea and try to have a tangible product by the end of the program that might be ready to be pitched, or even funded.

“One of the things that we are proudest about is, as we see so many of our students that have gone through the program and have ultimately gone on to college or university, they’re coming back to us and wanting to help the students that are coming through the program,” Ali said. And a majority of students who have gone through the program are continuing their computer science education in college.

For Dominguez, one of the biggest highlights of the program was meeting the people who created the products he uses daily and learning how they do it. All it takes for an after-school program like Code Next to be successful is “the right volunteer” who’s “really passionate” about coding and “makes it exciting and interesting.” Now as a Code Next intern, he hopes to be one of those impactful volunteers for the students growing up in the same community.

Exploring careers in virtual reality

In Indiana, students have access to hands-on career exploration simulations in an after-school program, thanks to a partnership between the Indiana Alliance of Boys and Girls Clubs and the immersive learning startup Transfr.

Using virtual reality headsets, kids get exposure to different skills that they didn’t necessarily know about and how those skills are used in the real world. Some professions students learn about in the virtual world include first responders, robotics specialists, health care, automotive service technicians, manufacturing, crane operator, plumbing, and more.

“Many of our clubs already have VR systems for gaming, so this was just another opportunity to expand into the needs, the interests of the kids,” said Lana Taylor, the executive director of the Indiana Alliance of Boys and Girls Clubs. Right now, 31 Boys and Girls Clubs in Indiana participate in the Transfr program, with many others on the waitlist.

When students put on the VR headset, they’re dropped into the environment of the career simulation they picked and have to follow instructions to learn a skill. For example, if they picked a lineworker (who installs and fixes overhead cables and electrical systems), they would see the power lines and they’d have to climb to the top and follow step-by-step instructions on how to fix whatever is wrong with the lines.

The Boys and Girls Clubs supplement what students are seeing in the VR headsets with a career exploration curriculum that builds on students’ math, reading, science, and civics skills. And after a simulation, students talk about what they like or didn’t like about the job, their takeaways, and whether they’d like to do the job in the future. Older students are also encouraged to work on certifications and credentials.

“It’s about getting them set up and ready for a career and I think this is one of the more fun pieces that we can use,” said Jon York, the CEO of the Boys and Girls Club of Rush County in Indiana. “It used to be guest speakers and watching DVDs. Now we’ve moved all the way so they’re immersed inside the skills. It goes over better with our kids when they are in charge and in control of their learning.”
LG CreateBoard™ classroom technology helps teachers engage students with digital lessons, videos, touchscreen writing and drawing, and easy screen sharing from personal devices.

As educators wrestle with shifting standards and the challenge of engaging today's students, Indian Creek School, a private Pre-K-12 institution based in Crownsville, Maryland, is innovating its own "classroom of the future" with a shift toward project-based learning and a strengthened focus on using the latest classroom technologies to enhance lessons for both teachers and students.

One of the most impactful changes to date is the addition of a dozen new interactive display boards that greatly enhance teacher flexibility and lesson planning. While the school had implemented classroom displays years earlier, most teachers found them to be overcomplicated and relented to using only basic functions. After reviewing several brands of classroom displays recommended by colleagues at other schools, none met the technology staff's expectations. As chance would have it, the school's Director of Educational Technology found the answer in an advertisement for a product she hadn't seen before: LG CreateBoard, a powerful and easy-to-use multi-touch interactive display board from LG Business Solutions.

With LG CreateBoards, teachers can easily augment lessons with presentations or videos, screen share lessons or content from their own devices, allow multiple students to write on the board simultaneously and enable students to screen share projects from their own devices. The new boards were implemented for the 2022-23 school year, replacing aging smart board solutions that no longer lived up to the school's expectations.

“...previous classroom smart boards had so many features and were complicated...after our staff performed hands-on evaluations of many of the most popular interactive display board products, we determined that the LG CreateBoard checked all our boxes, from build quality, reliability and intuitive operations to pricing and mobile use capabilities.”

Sara White
Indian Creek School’s Director of Educational Technology
“With our previous classroom smart boards having so many features and being so complicated, it felt as if the teachers were given a chef’s kitchen when they only wanted to make mac-n-cheese,” said Sara White, Indian Creek School’s Director of Educational Technology. “Teachers weren’t cooking up sophisticated lessons because the technology required overly complicated setup, so the boards simply weren’t serving the purpose we intended. We were paying for features and software that were never used. After our staff performed hands-on evaluations of many of the most popular interactive display board products available today, we determined that the LG CreateBoard checked all our boxes, from build quality, reliability and intuitive operations to pricing and mobile use capabilities.”

Having located a solution that’s simple to use and presents more opportunity for student engagement, the school purchased the interactive digital boards to be used on mobile carts: ten 75-inch models that rotate between classrooms, another 75-inch model that provides messaging in the cafeteria, and a massive 86-inch model that stays in the library for various uses. The school’s choice to implement LG CreateBoards also significantly reduced the required budget and enabled the purchase of a 3D printer and a professional laser cutter for a new Innovation Lab, giving students even greater access to the latest learning and creativity tools.

“Today’s students and parents who have spent their whole lives using mobile and interactive devices are increasingly weighing a school’s technology integration when choosing where to attend,” said Victoria Sanville, LG’s National Sales Manager for Public Sector Vertical. “As alternative educational funding structures spread to more districts, these prospective students may consider a potential school’s hybrid learning options, media or digital production facilities, collaborative tools and other high-tech capabilities. LG CreateBoards can form a major component of a school’s technological offerings and prove to newcomers that all students are given enhanced and individualized learning opportunities.”

Whether a language teacher shows instructional content to demonstrate mouth movements and pronunciation, or a coach plays video from yesterday’s game to improve teamwork, there are applications for virtually every discipline. Indian Creek School is also using the CreateBoard with a low-height stand to help 4-, 5- and 6-year-olds with handwriting and reading.

“The LG CreateBoard provides a valuable set of presentation and collaborative tools that enhance student engagement and provide teachers much greater flexibility in arranging and managing their classrooms”

Sara White
Indian Creek School’s Director of Educational Technology
From sixth grade up, students at Indian Creek School are welcome to use their own personal devices for certain classroom activities, while school facilities provide access to software tools such as the Adobe Creative Cloud and 3D modeling software. Classroom activities have already included making advertising pitches, coding video games and creating a graphic thumbnail in Adobe Photoshop. These projects can then be shared wirelessly to LG CreateBoards to enable student presentations.

“The LG CreateBoard provides a valuable set of presentation and collaborative tools that enhance student engagement and provide teachers much greater flexibility in arranging and managing their classrooms,” White added. “Even seemingly simple functions, such as reliable and easy to use screen sharing, can transform a classroom, allowing teachers to move around as they show a presentation or to help individual students without losing control of video content. Our goal is to provide every student with the best possible education, and that requires giving our teachers effective technology tools like the LG CreateBoard that can be used every day without complication.”

Staff also cited unrivaled service from LG Business Solutions, noting that they had never before been provided a technician’s cell phone number to assist with early troubleshooting and setup. The school’s future plans include upgrading the library CreateBoard to an upcoming 98-inch-model and to consider additional digital signage opportunities to share school messaging.
Want to Get Girls Interested in STEM Careers? Try Minecraft

By Lauraine Langreo

New Orleans

To get girls interested in STEM careers, two teachers in a Louisiana school district decided to start their own after-school club called Girls Who Game.

“Computer science is very, very under-taught,” said Allyson Turner, one of the teachers who sponsor the club, during a session at the 2022 International Society for Technology in Education conference in New Orleans.

In Louisiana, there are 2,677 open computing jobs, but only 574 computer science college graduates to fill those jobs, and only 23 percent of high schools teach the Advanced Placement Computer Science course, according to Turner. The U.S. Census Bureau reported that women represented 27 percent of STEM workers in 2019.

“The fundamental problem we’re trying to solve here is getting women involved in STEM,” Turner added.

Now with their third cohort at LeBlanc Middle School, Turner and her co-sponsor Jordan Allen have found that the program “opens [the girls’] imagination to everything that they could do in this world.”

Their club is part of the larger Girls Who Game program created in 2019 by Dell Technologies, in partnership with Microsoft and Intel. The program provides girls in grades 4-8 an opportunity to learn about STEM through gaming. The students use Minecraft, a 3D game where you can create anything, to learn skills such as communication, collaboration, critical thinking, problem solving, and creativity.

Every year, each club participates in challenges aligned to one or more of the United Nations Sustainable Development Goals.

Turner and Allen’s team won this year’s Girls Who Game People’s Choice Award for sustainable technologies. Their team focused on the oil and gas industry because all of their students have at least one family member who works in that industry. The students created a world in Minecraft that included concepts such as propane-powered vehicles, artificial intelligence, and zero-waste initiatives.

With Dell Technologies’ Girls Who Game program, the students also get to meet and be mentored by other women already working in a STEM field. Last year, Turner and Allen’s team met someone who studied international politics but ended up working for Microsoft and is in charge of making sure all the buttons in a video game will fit words in different languages when released in those languages.

After that meeting, the girls realized that they don’t necessarily have to be a videogame designer, that they can do other jobs in the STEM industry, Allen said.

There is also a Girls Who Game curriculum, which Turner and Allen started using with their last cohort. Their school has a specific STEM Academy but only students accepted into that program can attend those classes. Turner and Allen wanted to bring STEM to other students, so they started an elective class that uses the Girls Who Game curriculum.

“The fundamental problem we’re trying to solve here is getting women involved in STEM.”

ALLYSON TURNER
Teacher and Club Leader,
Girls Who Game

A screenshot from the game, Minecraft Dungeon.
3 Big Advantages of Virtual Work-Based Learning Experiences for Students

By Arianna Prothero

Podcasts aren’t just for indulging in true crime mysteries while commuting or cleaning, they’re also a powerful teaching tool: They can be used in project-based learning, to spice up lectures, and even improve school climate, say educators who incorporate podcasts into their instruction.

But the biggest benefit, said Daniel Nemerow, an instructional technology coach for Gainesville high school in Virginia’s Prince William County, is that podcasts help students find their voice.

“You have quiet kids who don’t speak in class, and they come in and they sit down in front of the mic and they just talk,” he said during a presentation on the topic at the International Society for Technology in Education’s annual conference in Philadelphia late last month. “I have found they have so many things to say, and they are gifted and smart and eloquent and articulate and so many other things that you wouldn’t see if you asked them to stand in front of the class doing a PowerPoint presentation. There’s a safety in being behind the microphone.”

There are many ways for teachers, administrators, and support staff to use podcasting in their schools, said several educators presenting on the topic at ISTE. On one end, schools can build an audio studio for students and faculty alike to create podcasts for the entire school to hear.

But for teachers who find the idea of having students create their own podcasts daunting, simply incorporating existing podcasts into instruction is an effective way to increase student engagement, said Donnie Piercey, a 5th grade teacher in the Fayette County school district in Lexington, Ky.

Listening to a podcast as a whole class provides variety in the routine. Piercey, who shares tips on using podcasts in the classroom on his website, said he has students shut down their devices and plays podcasts on YouTube so that students can read the closed captioning provided if they need to.

Lisa Highfill is a technology integration specialist for a new virtual academy in the Pleasanton Unified district in California. She uses the podcast “Iowa Chapman and the Last Dog” in her classes. It’s a story about a dystopian future that embeds lessons on a range of subjects in each podcast episode, such as sustainable farming, how dams work, and the history of dogs, said Highfill. Every episode ends with an interview with an expert on the topic.

That podcast is produced by the media company Gen-Z Media, which also provides companion instructional materials for each podcast, several of which have been created by Highfill.

Piercey and Highfill, who presented together at the ISTE conference, also have their students make their own podcasts. They say it helps students develop a range of important skills such as problem solving, creative thinking, working collaboratively, communication, and public speaking. And it helps get students engaged in school. Highfill started having students produce their own fan fiction podcasts, where they write stories about their favorite characters from books, TV shows, and movies.

“My students are really into fan fiction,” said Highfill. “I work with a lot of high school students, and I said, ‘Any of you write fan fiction? Well you could release it every other week in a podcast form.’ And they were like, ‘I could?!’ It was really exciting for them.”

There are plenty of podcasting tools for teachers and students to use, such as freesounds.org to create free sound effects; Online Voice Recorder for recording; Descript, Soundtrap, GarageBand, or Audacity to edit audio; and Spotify for Podcasters to distribute the final product, to name several used by presenters at ISTE.

Teachers can go as high or low tech as they want, said Piercey.

“What do you need to record a podcast? My answer to that question is whatever you have,” he said. “If you have five iPads in your whole school, use those. If you have 30 Chromebooks in your class, they all have mics, use those.”

He said it’s often best to stick with technology that students already know how to use.

‘It’s like an on-demand library for families’

The adults in a school building can also produce podcasts. There are benefits to
teachers, support staff, and administrators taking a turn at the mic, said William Watts, the instructional technology coach at Charles J. Colgan High School in Prince William County, Va. Those podcasts can help improve school-family communication, he said.

For example, recording a podcast series where each episode is dedicated to a different school staff member telling their personal story and talking about their interests gives families an opportunity to learn about the people educating their children in a way that wouldn’t otherwise be feasible.

“One of the big benefits for administrators that we’ve seen with podcasting is that those episodes don’t have to be heard at the moment that you publish them. It’s like an on-demand library for families,” Watts said. “And that was really big, our principal noticed that he would be at the grocery store and somebody would come up to him—he loves cruise ships—and have this deep conversation with him about cruise ships, and he would be like, ‘do we know each other?’ It was because he told his story on the podcast and that family felt like they could connect.”

Clair Handville is a counselor in the same school Watts works in, and she helps students produce podcasts as well as hosting her own. In one, she interviewed a group of juniors about research they presented at a medical conference—what the experience was like and what they hoped to do with that experience. She was surprised to hear from a parent.

“One mom reached out and said ‘I’m really grateful you did that, not because they got to talk about this accomplishment, but because I learned things about my son that he has never shared with me,’” Handville said. “We’re extending that partnership with families and helping them communicate as well.”

Handville and Watts said they always get parental permission before broadcasting a podcast outside of class or beyond the group of students who created it.

Podcasts can help make a school feel like more of a community to students and teachers as well, improving school climate, said Nemerow from Gainesville high school in Virginia.

He started a podcast with a counselor, teacher, and student at his school where they bring on guests to discuss different topics related to their campus—whether it be school meals, a recent concert, or an upcoming lacrosse game, he said. While podcasts can be used as class projects or to replace traditional assessments, that’s only tapping part of their potential, he said.

“We’re also going to impact the culture of our building—the area that our students live in and that our families send their kids to—by podcasting about the art projects that kids are working on and ‘did you see them in the hallway?’” he said. “That sounds like a silly little thing, but it changes how people feel, like they belong to a school community as opposed to just sending kids to a building.”

Nemerow said that about 95 percent of the podcasts he records with his students don’t get published anywhere. But, in the end, that’s not really the point.

“It’s the process of creating the thing where the learning happens,” he said.
Published July 31, 2023

Good-Paying Careers in Data Are Booming. But Schools Aren’t Teaching It

By Sarah D. Sparks

This city has become one of the fastest-growing technology hubs in the country. The region’s low cost of living and cheap real estate has drawn heavy-hitters like Microsoft and Facebook, and that success has helped Utah acquire one of the highest rates of billion-dollar startups of any state.

But business leaders say the schools in this area, which has come to be known as “Silicon Slopes,” need to build a stronger foundation in data and statistics skills for their future workers if that growth is to be long lived.

Elizabeth Converse, the executive director of Utah Tech Leads, an industry group in Salt Lake City, said she sees national declines in K-12 math performance, particularly in data and statistics, as economic “red flags” for her state as well as the nation.

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Elizabeth Converse, the executive director of Utah Tech Leads, an industry group in Salt Lake City, said she sees national declines in K-12 math performance, particularly in data and statistics, as economic “red flags” for her state as well as the nation.

“Our companies are growing at a clip that is kind of unimaginable in a state our size. We just can’t, we don’t have enough talent to fill the jobs,” Converse said. “For us, it’s really important that Utah lead the pack when it comes to absorbing data standards into everyday curriculum so that students are taught this from the very beginning.”

Converse’s group is working with the state board of education to develop a data-science pathway in high school and integrate more data science throughout the Beehive State’s K-12 math standards, which are up for renewal this fall.

Converse said industry groups like hers are working to change the image of data science as only useful for science, technology, engineering, and math careers.

“All the way from our state legislature down to the student level, the way we talk about math is like this isolated thing like a club,” she said. “Instead, data science needs to be a seamless transition. It needs to be a part of [students’] education overall.”

The efforts of these advocacy groups are part of a nationwide trend to expand how teachers, parents, and students consider the full range of possible careers that utilize math skills.

Data and statistics know-how has become one of the most sought-after skills for new employees, even in fields outside of STEM. From a social entrepreneur using housing statistics to investigate building sites to a YouTube vlogger analyzing his content views and audience demographics, technology tools have made data a bigger part of many jobs.

“It’s important to keep in mind that ... most of us are probably using statistics in our work under the hood,” said Geoff Hing, a data journalist at the Marshall Project, a nonprofit investigative news group, “and that’s especially the case with generative AI [artificial intelligence] as ChatGPT becomes a part of more and more industries.”

The U.S. Department of Labor estimates that over the next decade, 2 of the 10 fastest-growing career fields will be related to data and statistics. The numbers of jobs available for statisticians and data scientists—both of which boast annual incomes around $100,000—are expected to increase more than 30 percent, and most related careers also are growing faster than average.

“We see these effects cutting across sectors, and it’s every entry-level job where data and technology and the basics of statistics are being used more frequently,” said Zarek Drozda, the director of the nonprofit Data Science for Everyone, one of the groups helping Utah and other states.

Sheri Johnson, a math teacher at the independent Mount Vernon School in Sandy Springs, Ga., said schools across her state are expanding data and statistics standards across K-12 this fall, in part to broaden future job opportunities for students.

“There’s a disconnect between what we learn in school and what employers want people to know. Employers really want employees who can use spreadsheets and data,” Johnson said.

If schools begin to introduce data and statistics in elementary school, she noted, students are also likely to get earlier exposure to the kinds of jobs that use data.

While mathematics fields can seem abstract to students, statistics can give teachers a way to help students develop a personal stake in their careers, according to public-health researcher Kristin Baltrusaitis. For example, at Harvard University’s Center for Biostatistics in AIDS Research, Baltrusaitis uses statistics from clinical trials to study differences between adults and children in effective doses and potential side effects for medicine used to treat HIV, the virus that causes acquired immunodeficiency syndrome.

“I look at infants and children and pregnant people, because these are populations that are typically not included in regular clinical trial designs. So we want to look at how...
effective are these drugs in these different populations,” she said.

When either teaching students statistics or guiding their career planning, “I think there’s a huge benefit of making those interdisciplinary connections of [students] seeing the goal and the purpose of what they’re learning in their math course and where it could be useful,” said Baltrusaitis, who previously taught high school math and science through the New York City Teaching Fellows program.

Are the roles of calculus and data changing?

Utah has long integrated different strands of math, including calculus and statistics, in high school. But in the run-up to math standards discussions in 2021, Mark Tullis, a co-founder of the Salt Lake City-based TechBuzz, a local industry-news group, surveyed the area’s business leaders about the kinds of math they had learned in high school and the math they most needed in employees.

“So I asked them, ‘Did you take calculus in high school?’ And most of them said yes. ‘And are you applying it in your work, your career right now?’ And they would say, ‘Indirectly, I guess calculus helped me achieve a certain level of problem-solving skills.’”

“And I said, well, did you have any data science in high school? Any statistics? ‘No, in college but not in high school’ was generally the response,” Tullis said.

“Generally, the applicability of calculus or even algebra to their daily work was very small, like 5 or 10 percent said it was relevant to their current careers. But what they did say was that if they could have learned more statistics, more data science, and machine-learning skills in high school, it would have prepared them to a much greater extent,” Tullis said. “The results were pretty clear, that the companies that are hiring for jobs that are math-related want data science to be taught in high schools so that the workforce is better prepared.”

In most states, statistics is a high school elective after students complete a “traditional sequence” of at least Algebra 1 and 2 and geometry by grade 11. But the vast majority of students never get that far.

A 2022 study by the University of Texas-Austin’s Charles A. Dana Center found that across nine states including Utah only about 27 percent of students complete that course sequence by grade 11, and only 13 percent ended up taking statistics in high school.

Low-income students and students of color, who are already underrepresented in calculus courses, likewise end up with less access to data and statistics courses, according to Josh Recio, a course program specialist in secondary mathematics at the Charles Dana Center at the University of Texas-Austin.

Back in Utah, nearly 40 districts have signed onto the state pilot to develop a data-science pathway.

“Because we have standards revisions coming up in the fall, the data that we collect from the pilot, I think, will make a compelling case for a data-science strand to be built,” said Lindsey Henderson, secondary-math specialist for the Utah board of education.

Evidence of effectiveness will be critical because in other states like California, standards changes have led to conflicts between advocates for calculus and those who favor statistics pathways, something San Antonio statistics teacher Dashiell Young-Saver, called “weird and unproductive.”

Instead, Young-Saver, who creates statistics lessons for teachers on the site Skew the Script, argued that schools would be better off infusing data and statistics education across the curriculum—both in math and in other subjects like science or civics—to encourage students to think more broadly about their applications.

“I think students are not fully aware that statistics is one of the most relevant maths for the professional world now,” he said. “Ultimately, calculus is used by engineers, physicists, and a few other professions. Stats is used by everyone else—and also engineers and physicists.”

### Fastest Growing Occupations

Top ten occupations with the highest projected percent change of employment between 2021-31.

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<th>Occupation</th>
<th>Median Pay</th>
<th>Percent Change</th>
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<tr>
<td>Nurse practitioners ($120,680)</td>
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<tr>
<td>Wind turbine service technicians ($56,260)</td>
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<td>Ushers, lobby attendants, and ticket takers ($24,440)</td>
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<td>Motion picture projectionists ($29,350)</td>
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<td>Athletes and sports competitors ($77,300)</td>
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<td>Data scientists ($100,010)</td>
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<td>Information security analysts ($102,600)</td>
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<td>Statisticians ($95,570)</td>
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<tr>
<td>Umpires, referees, and other sport officials ($35,860)</td>
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<td>32%</td>
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NOTE: The 2021 annual median pay appears in parenthesis with the occupation title. SOURCE: U.S. Bureau of Labor Statistics

Additional Resource
View this article's charts
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² [https://research.com/education/interactive-learning-statistics](https://research.com/education/interactive-learning-statistics)
⁴ [https://www.ascd.org/el/articles/teaching-with-interactive-whiteboards](https://www.ascd.org/el/articles/teaching-with-interactive-whiteboards)
How Will AI Automation Affect Career And Technical Education?

In theory, students in these programs should be better prepared for automation

By Rick Hess

The introduction of ChatGPT last fall thrust artificial intelligence into the national consciousness, putting an exclamation mark on questions about how automation will affect the job prospects for today’s students. This has particular salience given that concerns about the cost of college have prompted parents and policymakers to embrace career and technical education programs, which prepare students for the workforce. How should we think about the intersection of these two trends? Is AI going to gut the kinds of jobs that CTE will prepare students for, or is CTE a key to preparing students for an AI-infused future? I’ve been wondering about all of this and thought it worth reaching out to someone who’s actually studied it. Cameron Sublett is an associate professor and director of the Educational Leadership & Policy Studies Department at the University of Tennessee, Knoxville and has written, among many other studies, the report “Time and Place: An Examination of Career and Technical Education Course Taking and Labor Markets Across Two High School Cohorts” and the article “Community College Career and Technical Education and Labor Market Projections: A National Study of Alignment.” Here’s what he had to say.

—Rick

I’ve been on ChatGPT a lot lately and—apparently—I’m not the only one. I’m not actually using it (though I intend to); I’m there to gawk over what it can do—and, spoiler, it goes well beyond producing first-year term papers. At a recent social gathering, one of my colleagues demonstrated that—if given a fictional research question—the generative artificial intelligence behind ChatGPT can write nearly flawless computer code for a certain syntax-based statistical package commonly used among policy-researcher types, like myself. It was humbling; I’ve spent years learning to write such code, to middling ability. As you might imagine, this demonstration led to some inevitable—and now ubiquitous—hand-wringing about automation and the implications for society.

After Career and Technical Education (CTE) month in February, my mind naturally returned to an area of inquiry I’ve had for some time now: To what degree can automation affect the career outcomes of graduates of CTE programs? I’ve done some preliminary digging and have an idea, but a quick CTE primer is a useful starting point.

Today’s “career and technical education” is yesterday’s “vocational education,” though not really. Like previous iterations, contemporary CTE focuses on equipping high school and community college students with technical skills that are closely tethered to specific workforce applications—think carpentry or plumbing. By contrast, courses and programs within the “academic” curriculum emphasize subject-matter knowledge and the development of broadly applicable skills—think history, science, language studies, etc.

Modern-day CTE advocates would argue the similarities to former vocational education models end there, however, and would likely (and rightly) assert that making the “academic” versus “vocational” education distinction is a bit anachronistic given the college- and career-readiness movement, and material changes to federal CTE legislation have, over time, successfully blurred the lines between the two. There’s a collective (and bipartisan!) sense that these changes have steered CTE in a positive direction, toward “relevance and rigor,” and away from its “dark history” of tracking disadvantaged students into low-wage, low-opportunity occupations.

My recent ChatGPT experience has me wondering about this consensus opinion, however. Let me explain.

To begin, jobs requiring skills that are difficult to automate with available technologies are at lower risk of automation. These skills include things like two-way communication, critical thinking, creativity, planning, management, and problem-solving. These are transferable skills, not technical skills. Career and technical education courses and programs need to equip students with both. Not only will the combination of technical and transferable skills help CTE students compete for the automation-resilient jobs of today (which tend to require bachelor’s degrees), the combination will give them greater agility when automation threats come knocking tomorrow.

This shouldn’t be a stretch; a key element of contemporary, “rigorous and relevant” CTE is a push to better integrate academic content within technical learning contexts. The concern I have is that “academic integration” is mostly open to interpretation, and there’s not a lot of guidance for how to do it well across the 16 different trades-based (e.g., Architecture & Construction, and Manufacturing), service-based (e.g., Education & Training and Human Services) and tech-based (e.g., Information Technology and Science, Technology, Engineering and Mathematics (STEM)) CTE fields of study or “career
clusters.” There’s also little accountability for academic integration baked into federal policy. Consequently, states, districts, schools, and teachers take different approaches to academic integration, and some approaches are more successful than others.

The importance of—and challenges to—carving out space in every CTE classroom in every CTE career cluster for the development of transferable, nontechnical skills becomes especially salient when you analyze automation risks across the different CTE career clusters. To do this, I merged Bureau of Labor Statistics (BLS) Occupational Employment and Wage Statistics (OEWS) data with an available automation-risk index that assigns each occupation an individual risk score. This particular index has a base of 100; occupations with a score above this base have higher risks of automation, and occupations below the base have lower risks of automation. I calculated the average automation risk (weighted by total 2019 employment) for each CTE career-cluster area by entry education level (see Figure 1). Several things stand out.

First, average automation risks decrease as education level goes up, largely because jobs requiring bachelor’s degrees involve a greater number of transferable skills that are less easy to automate. Second, some CTE career-cluster areas have average automation risks that are low: Education & Training, Health Sciences, Information Technology, and Science, Technology, Engineering and Math. Other CTE career-cluster areas have automation risks that are high: Architecture & Construction, Hospitality & Tourism, Manufacturing, and Transportation, Distribution & Logistics. Third, the gap between the lowest and highest levels of education is greatest in clusters with the highest aggregate automation risk, which suggests the academic-integration hurdle is higher in these clusters compared with others.

All this matters because existing research indicates CTE participation can be stratified by race, gender, income, and rurality. Consequently, some student groups may be overrepresented in at-risk clusters. In other words, exposure to automation risk can be correlated with student characteristics. And if our efforts to equip these students with automation-resilient, transferable skills are not successful in these clusters, we risk the possibility of, once again, funneling disadvantaged students into low-wage, low-opportunity occupations. CTE’s “dark history” becomes its future.

Can contemporary CTE shield students against risks posed by automation? Absolutely. In theory, CTE students should be better prepared for automation. The pieces are there; done right, academic integration, work-based learning, the Comprehensive Local Needs Assessment, and apprenticeship models can work to close the gap between the skills students have and the skills employers need, today and tomorrow. And the “special populations” set-aside now within federal CTE legislation that requires providers to allocate funds toward recruiting low-income, disabled, and racially marginalized students into CTE should help diversify cluster pipelines and mitigate tracking. It’s always been important to get these things right, but the arrival of ChatGPT means it’s now more important than ever.

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Published May 10, 2023

How to Prepare Kids Now For a Workplace With ChatGPT

We need to work with artificial intelligence, not against it

By Tomas Chamorro-Premuzic

How do I prepare kids for the future of work so they don’t get replaced by artificial intelligence?

You can help them develop the capacities that will make them skillful supervisors of artificial intelligence. Here’s something I wrote about the topic for Character Lab as a Tip of the Week:

With recent advances in artificial intelligence such as ChatGPT, parents and teachers were first impressed by its abilities—then worried about what this means for kids. What happens when students can ask a bot to write their papers for them in seconds? Will they replace deep learning with copycat plagiarism?

Automated knowledge agents like ChatGPT fundamentally change the value of human expertise. In a world where much of our thinking can be outsourced to machines, the key role of humans is to ask rather than answer questions. In particular, developing the capacity for asking questions AI can’t answer is the best way to advance the collaboration between humans and machines to everybody’s benefit.

Since ChatGPT and similar technologies are optimized for providing quick, generic, and relatively adequate or accurate answers (not too different from Wikipedia), you can also teach young people to identify errors and mistakes, which requires deep learning and research. Think of human intelligence as a supervisor of machine intelligence and expertise as the ability to go beyond the pre-packaged “fast facts” churned out by AI and provide value beyond the wisdom (or ignorance) of the crowds.

So what can you do now to prepare kids for the future? Help them develop curiosity to ask more and better questions. Research finds that playful activities such as games can boost curiosity—say, by using digital voice agents like Alexa and Siri to answer questions about things kids want to understand.

Don’t ban new technologies like chatbots. It risks turning kids into Luddites—or can tempt them to use it even more.

Do help young people cultivate curiosity by playing games. Establish family quiz time to ask questions, then use technology like chatbots and digital voice agents to search for the answer. Kids who can extract the right insights—because they’ve learned how to ask the right questions—and verify or correct the accuracy of the information will have skills no machine can replace anytime soon.

Tomas Chamorro-Premuzic is a professor of business psychology at Columbia University and University College London and the author of I, Human: AI, Automation, and the Quest to Reclaim What Makes Us Unique.