

# GEORGIA PATHWAYS

M A G A Z I N E

Preparing Students for **AI** Future

**STEM Education**  
Time for a ReBrand

**Middle School CTE**

**Physics at the Wheel**

The Technology Association of Georgia Education Collaborative (TAG-Ed) strengthens the future workforce by providing students with relevant, hands-on STEM learning opportunities and connecting them to Technology Association of Georgia (TAG) resources.

Formerly the TAG Foundation, TAG-Ed is a 501(C)(3) non-profit organization formed by TAG in 2002. Later, the organization's name was re-branded to TAG Education Collaborative to facilitate our role as the leaders for K-12 STEM education in Georgia.

President / CEO  
Larry K. Williams

Executive Director  
Dr. Loretta Daniels  
<http://www.tagedonline.org>

Publisher  
Wayne Carley  
[wayne@tagonline.org](mailto:wayne@tagonline.org)

This magazine services the STEM education industry needs of the state of Georgia and is viewed by the reader with the understanding that the information presented is from various sources from which there can be no warranty or responsibility by the Technology Association of Georgia, the Technology Association of Georgia Education Collaborative and/or their affiliates as to legality, completeness or accuracy.

## **STEM Education Flips Standards** **Dr. Jeff Weld**

## **Middle School CTE** **Angela McDaniel**

## **Preparing Students for an AI-Driven Future** **Shelly A. Muñoz**

## **Physics at the Wheel** **Heather Duncan / ORNL**

## **Red Alert! Toxic Dye** **Komalpreet Kaur, PharmD, Touro College of Pharmacy-NY, Class of 2025**

Welcome to the February 2026 edition of Georgia Pathways Magazine, your monthly guide to Georgia's innovation economy, and the education advances inspiring future innovators and high-growth STEM career pathways.

As technology evolves at unprecedented speed, education systems must adapt quickly. Across K–12 classrooms, testing standards are being redesigned to reflect the realities of AI-enabled learning. These changes prepare students to think critically, adapt confidently, and lead in AI-driven environments.

Technical skill development is also beginning earlier. The expansion of Career and Technical Education into middle school classrooms reflects a growing recognition that workforce awareness and technical fluency are foundational skills. By engaging students sooner, educators are empowering them to explore technical career pathways with confidence, curiosity, and purpose.

As curricula and career pathways evolve, the importance of human skills is coming into sharper focus. While AI continues to transform education and work, creativity, collaboration, and ethical judgment remain essential. Preparing students for the future means pairing technical proficiency with the uniquely human skills that drive innovation and leadership.

Beyond education, this issue highlights how STEM innovation delivers real-world impact. From Department of Energy scientists applying physics and mathematics to enhance racecar performance to emerging pharmacy careers



focused on identifying hazardous ingredients in food and medicine, these stories illustrate how scientific discovery drives industry, boosting both safety and economic growth.

To expand access to opportunity in Georgia's rapidly evolving workforce, TAG Education Collaborative continues to invest in industry-aligned learning. Through partnership with IBM SkillsBuild, adult learners can earn no-cost certificates in fields such as data analytics, artificial intelligence, cybersecurity, and more. The next IBM SkillsBuild Certificate Program cohort begins March 30, with a mandatory orientation on March 26.

Learn more and register at no cost at <https://tagedonline.org/ibm-skillshare-certificates/>. Together, we're shaping Georgia's future through innovation, education, and STEM leadership.

Larry K. Williams  
President  
TAG / TAG-Ed

Larry K. Williams serves as the President and CEO of the TAG and the TAG Education Collaborative. TAG-Ed's mission is to strengthen Georgia's future workforce by providing students with relevant, hands-on STEM learning opportunities by connecting Technology Association of Georgia (TAG) resources with leading STEM education initiatives.

Get certified for in-demand tech skills at no cost with



In collaboration with  
**IBM SkillsBuild**



**TAG-Ed and IBM SkillsBuild are offering a no-cost, cohort-based certificate program that empowers participants to earn an IBM SkillsBuild Certificate of their choice.**

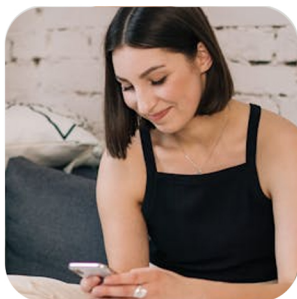


### Who Should Enroll?

- High school students (18+)
- College students
- Professionals seeking upskilling and reskilling
- Veterans seeking upskilling and reskilling

**Available courses include cybersecurity, cloud computing, generative AI fundamentals, data analytics, and more.**

1



**Apply for IBM SkillsBuild course through TAG-Ed**

2



**Begin cohort-based virtual instruction**

3



**Receive certification or digital credential upon completion!**

**SPACE IS LIMITED**  
**Apply today!**



# To understand STEM...

...you must DEFINE STEM. You cannot define an acronym without defining each of the words the letters stand for.

Universities and organizations around the world continue to debate what a STEM career is, but there is no doubt that “every career” uses STEM skills and this observation remains the focus of STEM Magazine.

**Science:** “The systematic accumulation of knowledge” (all subjects and careers fields)

**Technology:** “The practical application of science” (all subjects and careers)

**Engineering:** “The engineering method: a step by step process of solving problems and making decisions” (every subject and career)

**Math:** “The science of numbers and their operations, interrelations, combinations, generalizations, and abstractions” (every career will use some form[s])

For a moment, set aside any preconceived notions of what you think a STEM career is and use the above dictionary definitions to determine the skills used in any career field you choose.

These definitions are the “real” meaning of STEM and STEM careers.

# STEM Education Flips Standards



By Dr. Jeff Weld

America's 40-year foray into K-12 STEM education has spawned specialized STEM schools, a wealth of STEM content providers, STEM teacher credentials, STEM industry partnerships, STEM diplomas, legislative STEM priorities in every state, and hundreds of regional STEM ecosystems.

Yet, learning standards and the assessments, teacher preparation, and professional development that follow, have been slow to adapt, inhibiting the potential of STEM. A ready fix is to simply rethink how we use standards.

Standards are one of the grand challenges besetting STEM education today. Not because of how they're written or what they say, but because of how they're used. State and national K-12 learning standards in mathematics, the sciences\* drive curricula, publishing, testing, grading, professional development, performance reviews, teacher training, and funding. Standards set a baseline expectation for common knowledge and skills for all K-12 graduates.

But STEM education has a love-hate relationship with learning standards in math and science. As instruments for smoothing out school-to-school variability, standards are the best bet.

But as a means for driving STEM innovations like school-business partnerships, transdisciplinary inquiry, and career-connected context, they are no help. Not that standards cannot help – they could. But they aren't. STEM education is out to flip the way standards are used.



The education sector adapted the business adage “What gets measured gets done” to “What gets measured gets taught” by tying standards to standardized tests. Inevitably, public interest in uniform products of schools – graduates who know essential facts and skills – leads to the need for evidence of effect. Return on investment.

But unrealistic assessment expectations coupled with systemic constraints tilt the standards balance toward counterproductive when it comes to STEM education. Instruments for gathering evidence incubate in an incompatible broth of expectations: cheap and easy administration, brawny enough to drive reform, and untethered to curriculum development.

The result is ersatz evidence of return on investment: widescale objective assessments of baseline knowledge – facts and terms. **Teaching to the test. No help to STEM.**

The Next Generation Science Standards, and the Common Core State Standards for Mathematics have the potential to be enormously helpful to STEM educators, depending on what gets emphasized.

◆ The NGSS weave transdisciplinary “cross-cutting concepts” across the domains of science, a signature of STEM education. Concepts such as energy

flow, structure and function, and system stability and change unite sub-disciplines of science (and engineering design) through common dynamics.

A minor peccadillo to STEM educators is the NGSS exclusivity science cross-cutters only, when STEM inquiry spans economics (supply-demand), sociology (value systems), and history (precedent) too. But it’s a start. A second dimension of the NGSS are “Science and Engineering Practices” such as analyzing data, communicating findings, and defining problems. These are hallmarks of STEM education too.

Finally, the third dimension, the one we all remember as the typical science experience, are “Disciplinary Core Ideas” including atomic structure, mitosis, and plate tectonics. Despite great effort by the authors to avoid it, many local, state, and national science assessments still over-emphasize that third dimension.

◆ The Common Core State Standards in Mathematics (CCSS-M) are eighty pages organized into two sections: Mathematical Practices, and Mathematical Concepts. The first clue for STEM educators that something needs to flip is the devotion of pages to the first and second sections.

A highly STEM-relevant array of eight

practices, including sense-making and perseverance, viable argument and critique, and mathematical modeling, grace the first three pages.

Such skills are the very heart of STEM education. The remaining seventy-seven pages spell out what students should know: vocabulary, calculation, identification, and understanding. For example, a 3rd grader should develop an understanding of fractions as numbers. A high schooler should know how to find arc lengths and areas of sectors of circles. There is no question the importance of mathematical competency as foundational to STEM education.

The means for teaching and learning such competencies, though, lies in practicing the application of mathematics to contextual inquiry, where the CCSS-M fall short.

Users of the CCSS-M are appropriately encouraged to amplify “points of intersection” where practices and concepts meet. In reality, though, similarly to the NGSS experience, too often the classroom emphasis defaults to decontextualized concepts and procedures.

In contrast to the NGSS and the CCSS-M, learning standards in technology are more helpful to STEM education. The International Society for Technology in Education Standards for example occupy a total of eleven pages. Within that stingy span reside guidelines for four different stakeholder groups – students, teachers, administrators, and professional developers. That lean feat owes to broad and adaptable learning standards that mature over time.

For example, student standard 1.3.b. “Evaluate the accuracy, validity, bias,



origin, and relevance of digital content.” And 1.5.b. “Collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.” Any grade level, all sorts of contexts.

Unlike the NGSS and CCSS-M, the ISTE-S does not separate standards into “things you need to know” versus “things you should be able to do.” It’s all do: Build, Evaluate, Safeguard, Demonstrate, Take action, Select, Formulate, Collect, Use, Create, Publish, Explore. For teachers, administrators, and professional developers the ISTE-S push modeling, equitable use, support, mentoring, and staying current. The ISTE-S have all the attributes of STEM education – they’re application-focused, skills-based, and transdisciplinary. How did they pull that off?

Prominent among the factors at play are the absence of grade level layer-cake coverage expectations and accompanying high stakes rote recall exams. Thus, today’s testing culture enabled by content standards retard the progress of STEM. The goal of STEM education – transdisciplinary-thinking, life-and-work-skills competent, career-ready graduates – defies standardized testing. These attributes are not cheap to measure but they are certainly brawny enough to drive reform if coupled with assessment reform.

“In the future,” predicted the NGSS twelve years ago, “...science assessments will not assess students’ understanding of core ideas separately from their abilities to use the practices of science and engineering. They will be assessed together.” STEM education is that future, and recasting standards and their assessments to skills competencies is one of eight grand challenges before STEM education.

About the author -

Jeff Weld is the Senior Policy Advisor for the STEM Education Coalition and STEM Executive Consultant at [www.jeffweldLLC.org](http://www.jeffweldLLC.org), and Professor Emeritus, University of Northern Iowa.

FORMERLY Founding director of Iowa Governor’s STEM Council 2012-2023 (retired); White House Office of Science and Technology Policy STEM Education director 2017-2019; Author of “Charting A Course for American Education” (2021 Torchflame), “Creating a STEM Culture for Teaching and Learning” (2017 NSTA), and *The Game of Science Education* (2004, Pearson)

*\*Click Links List Here for examples only. The Common Core Mathematics Standards are widely adopted by states and districts, as are the Principles and Standards for School Mathematics produced by the National Council of Teachers of Mathematics.*



## **Middle School Career Technical Education (CTE):** Exploration Before Expectation, Strengths Before Pathways

By **Angela McDaniel, EdD.**

STEAM TAC Director Curriculum / West Virginia University

Middle school is one of the most misunderstood phases of education. Often treated as a holding pattern between elementary curiosity and high school specialization, it is actually one of the most powerful windows for learning, identity formation, and confidence building. This is precisely why Career and Technical Education (CTE) belongs in the middle grades.

When designed as instruction—not tracking or job training—middle school CTE aligns with how the adolescent brain learns, how identity forms, and how engagement grows. More importantly, it gives students something many have never had before: evidence of what they are good at.

### WHY THE BRAIN RESPONDS TO MIDDLE SCHOOL CTE

Research in learning science and neuroscience consistently shows that adolescents learn best when four conditions are present: context, relevance, application, and feedback.

Learning anchored in real-world context is easier to understand and retain. Relevance increases motivation and attention. Application requires students to use knowledge rather than simply recall it. Feedback through iteration strengthens understanding over time. Middle school CTE naturally embeds all four conditions.

Rather than memorizing isolated facts, students design, build, test, trouble-

shoot, and revise. Learning becomes active, purposeful, and connected. This approach aligns directly with research on self-efficacy and motivation, which shows that applied learning experiences significantly improve student engagement and persistence.

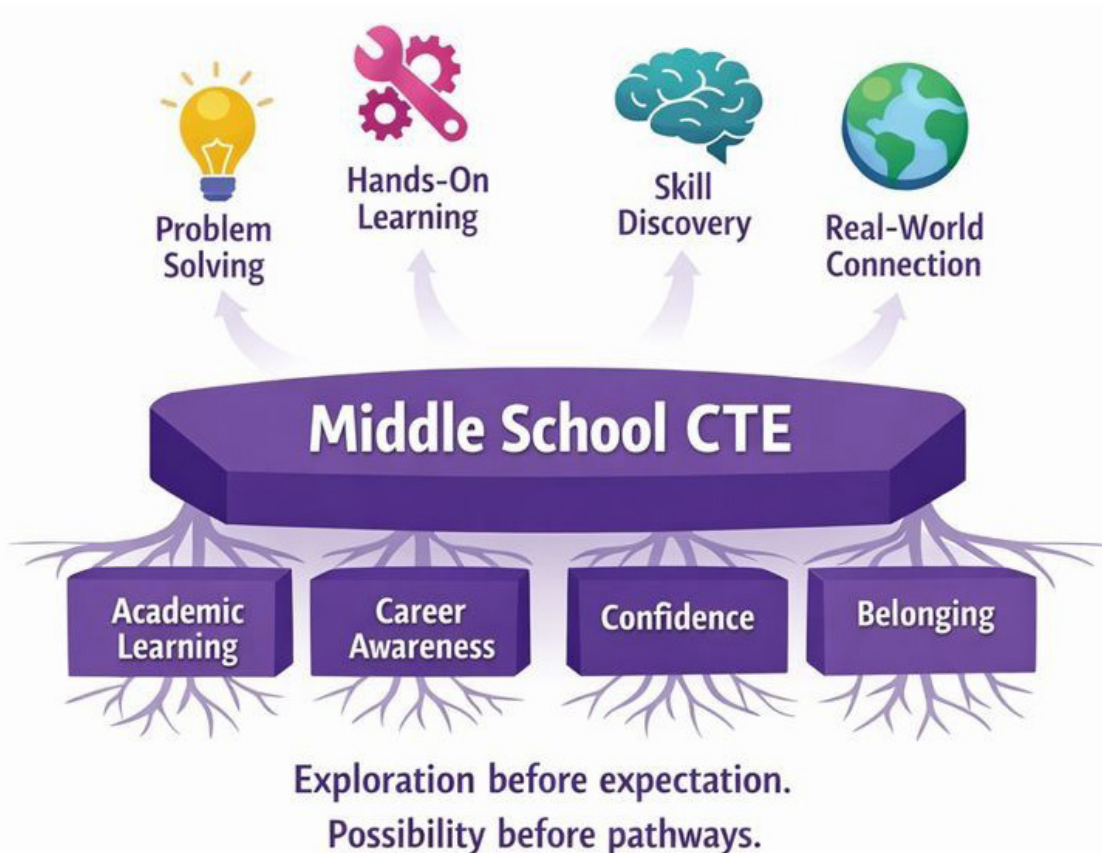
## MAKING STRENGTHS VISIBLE THROUGH DOING

Middle school is a critical period for identity development. During these years, students begin forming beliefs about what they can do and where they belong. Career and Technical Education supports this process by creating environments where strengths emerge naturally. Through hands-on learning, students discover talents that may not appear in traditional academic settings.

Some students excel at problem solving. Others show leadership, creativity, or technical skill. These realizations are powerful because they are grounded in experience, not labels. When students can say, “I’m good at this,” their confidence grows—and so does their willingness to engage in learning.

## IDENTITY, BELONGING, AND CONFIDENCE

Belonging is essential for learning. Middle school CTE classrooms provide multiple entry points for success, allowing diverse learners to contribute meaningfully. Students collaborate, solve problems together, and see the value of their ideas.



This is particularly important for students who have struggled in traditional academic environments. By offering different ways to demonstrate competence, CTE helps students build confidence and feel a sense of belonging.

## ACADEMIC LEARNING AND CAREER AWARENESS

CTE strengthens academic learning by giving content purpose. When students apply math, science, literacy, and technology skills to real-world problems, understanding deepens and retention improves.

At the same time, middle school CTE builds career awareness without forcing early decisions. Students explore industries and skills without being tracked or limited. According to the Association for Career and Technical Education, early career-connected learning expands opportunity and supports equity by keeping pathways open.

## EQUITY AND ACCESS

Middle school CTE supports equity by valuing multiple forms of intelligence and ability. Students who may not excel on standardized tests often thrive in hands-on environments. CTE offers alternative pathways to success while strengthening academic skills.

## Middle School CTE:

Where Strengths Emerge and Futures Expand



# Middle School CTE Works Because the Brain Works This Way



## CONTEXT



Learning is anchored  
in real situations

## APPLICATION



Students use knowledge,  
not just recall it

## RELEVANCE



Purpose increases  
attention and retention

## FEEDBACK



Iteration strengthens  
understanding

CTE as instruction • not tracking • not job training

## SKILLS FOR LIFE

The future of work demands adaptability, collaboration, creativity, and problem solving. Middle school CTE builds these skills through authentic, iterative learning experiences that prepare students not just for careers, but for life.

## EXPLORATION BEFORE EXPECTATION

The most effective middle school CTE programs prioritize exploration before expectation. Students are encouraged to try, reflect, and grow without pressure to choose a career path. This approach honors developmental readiness and keeps possibilities open.

Middle school CTE works because it aligns with how students learn, think, and develop. By helping students discover their strengths early, it builds the foundation for future success.



# Career & Technical Education

## A WIN FOR EVERY STUDENT



Boosts  
Academic  
Success



Engages and  
Motivates



Prepares for  
College & Careers

# Career & Technical Education

## A WIN FOR EVERY STUDENT



Earns Industry  
Certifications



Builds  
Skills for Life



Explores Career  
Pathways



Benefits  
Diverse Learners





## Preparing Today's Students for an AI-Driven Future

By Shelly A. Muñoz

*A*rtificial intelligence is no longer a distant prediction—it is reshaping the world around us right now. From automating routine tasks to transforming entire industries, AI is accelerating change at a pace unprecedented in human history. We are in the midst of the Fourth Industrial Revolution, a period marked by the fusion of digital, biological, and physical systems. Unlike previous revolutions—steam engines, electricity, computers—this transformation is faster, more pervasive, and affecting nearly every aspect of life.

As educators, our role is to prepare students not only to survive this disruption, but to thrive within it. This means equipping them with enduring skills, ethical frameworks, and critical perspectives that will allow them to navigate an uncertain, AI-driven future.

### *Understand the Changing Landscape*

The Fourth Industrial Revolution is altering traditional career pathways. While technological revolutions historically create more jobs than they eliminate, the speed and scope of AI-driven change make preparation essential. Students need more than static knowledge—they need adaptability, resilience, and the ability to think critically about the systems shaping their world.



## *Encourage Students to Tackle Hard Challenges*

The experience of taking on difficult tasks—whether a rigorous research project, designing a product, leading a community initiative, or mastering a creative skill—teaches resilience, problem-solving, and persistence. These are qualities that AI cannot replicate.

Educators can support this by providing opportunities for sustained effort and reflection, celebrating growth and perseverance alongside achievement. Real-world challenges help students see themselves as capable problem-solvers ready for complex, unpredictable situations.

## *Foster Lifelong Learning*

In this rapidly evolving era, knowledge becomes outdated faster than ever. Students must become agile learners, capable of acquiring new skills independently and continuously. Encourage exploration of topics that spark curiosity, provide access to online courses or tutorials, and model learning as a lifelong practice. Helping students learn how to learn is as important as the content itself.



## *Prioritize Human Skills*

AI excels at processing information, analyzing data, and executing repetitive tasks—but it cannot replicate human judgment, empathy, creativity, or collaboration.

*“Preparing students for the AI-driven future isn’t just about teaching them technology—it’s about helping them develop resilience, curiosity, and the human skills that no machine can replicate.”*

*— Shelly Munoz*

Classroom strategies might include group projects, collaborative problem-solving, peer mentoring, leadership opportunities, and reflection on teamwork. Real-world interaction builds social intelligence that machines cannot replace.

## *Integrate Ethical and Critical Thinking*

AI is more than a tool; it is a system shaped by human decisions, labor, and resources. Kate Crawford's *Atlas of AI* reminds us that AI relies on global labor, massive data collection, and environmental resources, often with profound social consequences. Educators can help students develop critical awareness by exploring questions such as:

- Who builds AI, and whose work is behind the data that powers it?
- What social or environmental costs are hidden behind AI technologies?
- How do AI systems encode bias, and what responsibilities do users and creators have?

Embedding these discussions in STEM classrooms ensures students are not only technically skilled, but socially and ethically informed—prepared to use AI responsibly and thoughtfully.

## *Support Exploration and Curiosity*

The “safe” path is no longer predictable. Encourage students to explore authentic interests across academic, creative, and personal pursuits. Passion-driven learning fuels engagement, perseverance, and deeper skill development,

equipping students to adapt to careers that do not yet exist.

## *Practical Steps for Educators*

- Design learning experiences that challenge students and require sustained effort.
- Provide tools and opportunities for self-directed exploration and skill development.
- Incorporate collaboration, communication, and problem-solving into everyday learning.
- Integrate ethical discussions about AI, bias, and social impact.
- Model curiosity, adaptability, and continuous learning.



## *Conclusion*

The Fourth Industrial Revolution is here, accelerated by AI, robotics, and advanced digital systems. Preparing students is not about teaching them specific jobs—it's about developing their capacity to learn, adapt, and make ethical, informed decisions. By emphasizing resilience, human skills, curiosity, and critical thinking, educators can help students navigate uncertainty and seize opportunities in a rapidly changing world.

The AI revolution is transforming everything—but with the right guidance, students can enter this future empowered, adaptable, and ready to lead.



**Shelly A. Muñoz** is a STEM educator and instructional leader dedicated to advancing innovative teaching practices in K–12 classrooms. With experience designing and implementing project-based learning, coding, robotics, and 3D design initiatives, she helps teachers integrate research-based strategies that promote critical thinking, collaboration, and real-world problem solving.

Shelly also works closely with administrators and instructional coaches to support evidence-based professional development and coaching cycles, ensuring that STEM education is engaging, equitable, and impactful for all students.



## Christi Johnson puts physics at the wheel

By Heather Duncan / ORNL

When Christi Johnson finishes clocking an eighth of a mile in 4.7 seconds, she jumps out of the dagger-shaped drag racer while its wheels are still smoking, pulls off her helmet... and the next morning, pulls on her lab coat.

As a technical professional at the Department of Energy's Oak Ridge National Laboratory, Johnson has developed, built and tested hardware and

software for innovations including a jet blast deflector, an ultrasonic dryer, a sensor system for driver recognition and waveguide inspection tubes for the world's largest magnetic fusion device. But Johnson, who works in the Multimodal Sensor Analytics Group, said her scientific career really began when she was a little girl eager for her turn in a fast car.



A native of Maryville, Tennessee, Johnson grew up at the speedways across the South where her father raced. “Being around race cars and tools is mostly what got me into engineering. Those are my earliest memories as a little kid,” said Johnson. “I’ve always understood things by taking them apart with my hands and putting them back together.” In the garage, she repaired her Barbie jeep while her dad perfected the dragster.

By age 10, she took the driver’s seat in her own junior racer. (Picture a go-kart that zooms 70 miles per hour.) She has been racing in non-professional races ever since.

Her father, who has won a world championship, buys the car’s chassis and body but builds and wires the rest himself. The two Johnsons function as each other’s pit crew, taking turns behind the wheel during the same events most weekends from April to November for a prize purse that might just cover the next round of car upgrades.

Johnson’s father became a professional welder after teaching himself by building race cars after work. “When I was young, Dad instilled that racing was a privilege,” Johnson said. “It’s expensive, so it has to be earned: If you make good grades and do your best, then you get to go to the racetrack.”



Christi Johnson, shown here with her father in the winner’s circle at Bristol Dragway, learned racing from her dad and now trades driving and crew responsibilities with him. Credit: Christi Johnson

Johnson stayed in the fast lane through high school, weaving between academic and trade tracks on weekdays and racetracks on the weekend. “I figured out the formula for drag racing in my physics class,” she said.

She’s not kidding: She competes in a concise type of drag racing, called bracket racing. The winner is not the driver of the fastest car, but the driver who most accurately estimates exactly how long it will take to cross the finish line. The goal is to get as close as possible to that calculation – but no faster – through perfect reaction time and control.

“A race between two people is a big math problem that comes down to whoever’s time diverges the least from perfect,” Johnson said. In other words: applied physics, at 145 miles per hour.

But Johnson was learning other lessons from high school unrelated to academics or cars. She ranked welding, automotive and carpentry as her top trade course interests. To Johnson's surprise, her guidance counselor placed her in cosmetology, saying that as a girl she'd probably be happiest there.

Johnson made the best of it. In fact, she excelled at nail care, even progressing to the Skills USA national championship competition. However, cosmetology was just a pit stop. College had always been her chosen destination. And as a first-generation college student, Johnson became one of only three female physics majors in her class at the University of Tennessee.

"I'm very comfortable in male-dominated fields, because that's basically all I've ever known," Johnson said. "At the track, you kind of got discounted as a female. There was this mentality that because you were a girl, you weren't as good. That just made me want to beat them even more. Coming through school in engineering, I definitely had that same sense of having to prove why I was there."

She learned to power through adversity, whether skepticism from professors or a high-speed wreck at the racetrack. Her focus paid off. One of her professors recommended Johnson for an

ORAU Science Undergraduate Laboratory Internship. Roger Kisner, a senior researcher in a sensors and controls group, mentored her after she graduated with a bachelor's degree in physics. He hired Johnson as a staff technical professional in 2016.

For her first ORNL project as an intern, Johnson helped develop a specialized lighting system for airport runways. FedEx had outfitted cargo planes with thermal imaging, allowing for delivery flights in tough weather conditions. But the company's cameras relied on a heat signature missing from new LED runway lights. "We came up with some custom circuitry to run an infrared ampule the FedEx system could recognize," said Johnson, who shared in the resulting patents and technology commercialization awards.

Johnson has applied her instrumentation design, mechanical design, software development and fabrication skills to field testing electrical systems, sensors and hardware assemblies. She was part of a team that won an R&D 100 Award in 2021 for a technology that combined mapping, software and hardware for targeted distribution of salt brine on local roads, protecting drivers during icy conditions while saving taxpayer dollars.



Christi Johnson has tackled a variety of challenges in hardware and software to create sensing and electrical technologies for applications from image recognition to nuclear fusion. Credit: Amy Smotherman Burgess/ORNL, U.S. Dept. of Energy

Johnson and her colleagues earned another technology commercialization award for an optical array that reconstructs clearer pictures of faces photographed through a windshield of a moving vehicle. That helped lay the groundwork for a four-year intelligence project called Biometric Recognition and Identification at Altitude and Range, or BRIAR, which developed systems for facial, whole-body and gait recognition from a distance and at odd angles. Johnson led design and fabrication of BRIAR sensor hardware.

To hone the technology, volunteers were needed so researchers could build datasets of images for training the recognition algorithm. During more than half the project, Johnson led the range

team preparing the hardware and sensors for image collecting events across the U.S. Each event required more than six weeks of setup. At the largest event, the team installed 76 sensors over 14 range stations covering 1,000 square meters of tarmac. “I think we should all get Olympic medals for rolling ethernet cables and power cords,” Johnson added, no stranger to hours on the tarmac.

She also leads by example. “Christi Johnson is the kind of teammate every technical team hopes for: brilliant, humble and fiercely reliable,” said David Cornett, who led the BRIAR project for ORNL. “Christi earned the trust and admiration of her peers by consistently demonstrating her deep technical expertise, proactive leadership, and a

willingness to step up wherever needed. This combination of excellence and integrity makes Christi an ideal technical team lead and a powerful role model for women pursuing careers in STEM.”



Christi Johnson and Kyle Reed demonstrate the operation of precision de-icing hardware in 2017. Credit: Jason Richards/ORNL, U.S. Dept. of Energy

But she doesn't rest on those accomplishments in the field. Johnson continues to step up her skills, now managing a lab where she was once an intern. She shares those skills and enthusiasm by mentoring new lab space managers, valuing the many perspectives each individual contributes. After all, her own curiosity, creativity and drive make Johnson more than the sum of her parts.

UT-Battelle manages ORNL for the Department of Energy's Office of Science, the single largest supporter of basic research in the physical sciences in the United States. The Office of Science is working to address some of the most pressing challenges of our time. For more information, please visit:

[energy.gov/science](https://energy.gov/science)





# Registered Tech Apprenticeship Program

Georgia's first nationally registered tech apprenticeship program

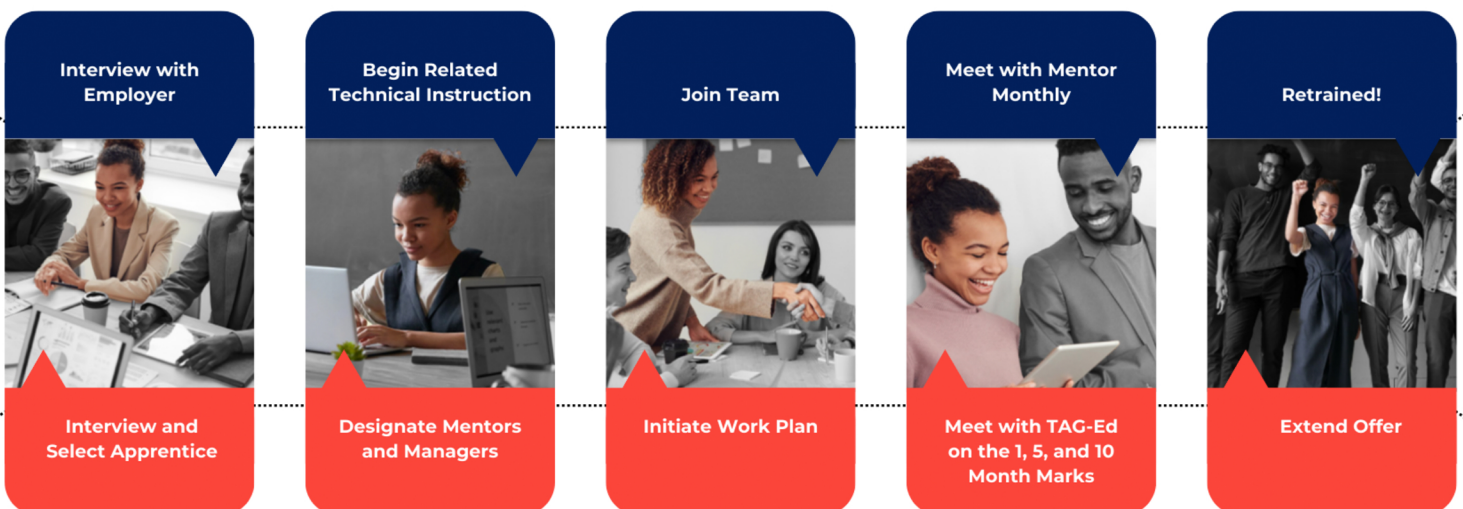
## For applicants:

A thriving career in technology awaits you! No prior technology experience or degree is required to start paid on-the-job training at major companies!

## For employers:

TAG-Ed has adapted the Registered Apprenticeship model to create a simplified path to qualified and certified talent. Access an array of tech talent address digital skills shortages!

### Apprentice Journey



### Employer Journey



- ✓ Higher retention rates
- ✓ No college degree or prior technical experience required
- ✓ Save costs over traditionally sourced talent

# Red Alert!

## FDA Bans Toxic Dye in Your Food & Medicine!

By Komalpreet Kaur, PharmD, Touro College of Pharmacy-NY, Class of 2025

Edited by: Anastasiya Shor, PharmD, BCPS, Irene Cokro, PharmD

On January 15, 2025, the U.S. Food and Drug Administration (FDA) issued an order revoking the use of Federal Food, Drug, and Cosmetic (FD&C) Red No. 3, a synthetic food dye, in food and drugs. This change was supported by recent studies linking Red No. 3 to cancer in male laboratory rats. Manufacturers who use Red No. 3 in food will have until January 15, 2027 to change their products; manufacturers who use this dye in their ingested drugs have until January 18, 2028.<sup>1</sup>

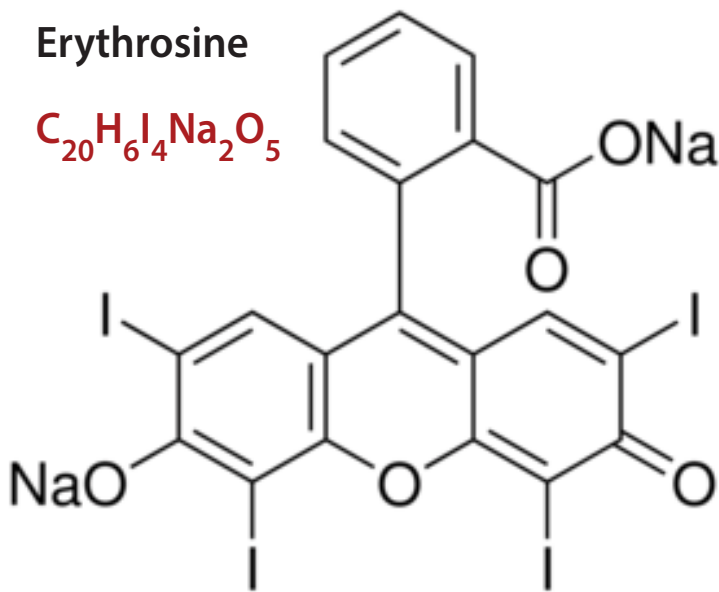
FD&C Red No. 3, also labeled as Red 3 or Red No. 3, was approved for use in food in 1907. Chemically known as erythrosine, it is derived from petroleum and is commonly used to give foods and drinks a bright cherry-red color, which is visually appealing.<sup>2,3</sup>

Red 3 appears in candy, cakes and cupcakes, cookies, frozen desserts, and frostings and icings, as well as certain ingested drugs for cosmetic appeal.<sup>3</sup>



A recent study examined the effects of oral erythrosine on the pituitary thyroid axis in rats. Previous research has shown an increase in the incidence of thyroid adenomas and adenocarcinoma in rats fed a 4% erythrosine diet for 30 months. In this study, rats were randomly divided into 6 groups, each with 15 rats, and fed diets containing varying amounts of erythrosine (0.5%, 1.0%, 4.0%), sodium iodide (0.16%), or fluorescein (1.6%) for 3 weeks.

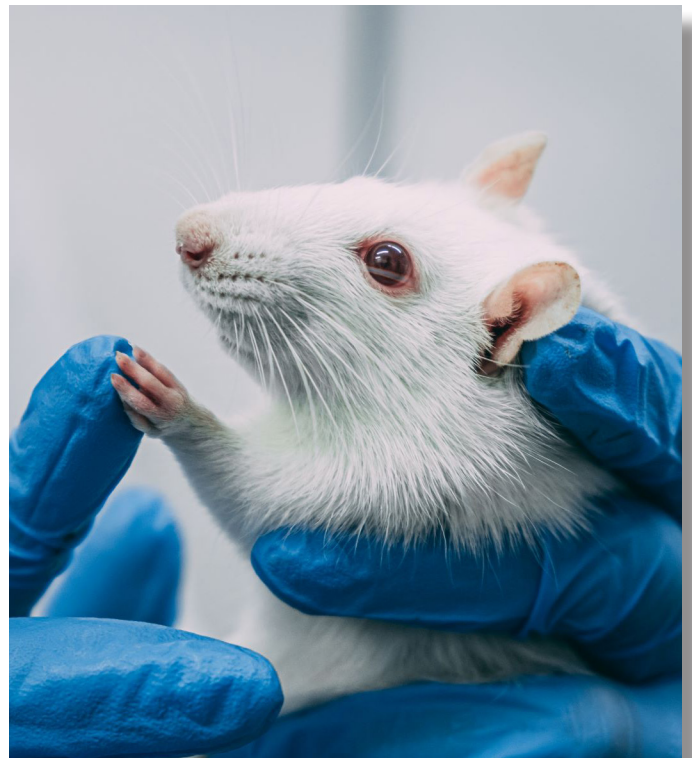
### Erythrosine



The results showed that erythrosine produced a dose-dependent increase in serum T4 levels. In the group that consumed the 4% erythrosine diet, both serum T4 and T3 levels, along with free-T4 index, were significantly increased. These data demonstrate that dietary ingestion of 4% erythrosine disrupts the normal functioning of the pituitary-thyroid axis. Therefore, it raises concerns that chronic erythrosine ingestion may promote thyroid tumor formation in rats.<sup>4</sup>

The ban is a result of a petition filed in 2022 by a food safety advocacy group, the Center for Science in the Public Interest (CSPI). CSPI also urged the FDA to require warning labels on products containing other synthetic food dyes. They argued that Red 3 should be banned due to its links to cancer and its widespread use by U.S. consumers, particularly children.<sup>7</sup>

There is currently no available evidence showing this effect in humans yet, however, the FDA has still required manufacturers to remove Red 3 from ingested drugs based on the Delaney Clause of FD&C Act.<sup>5</sup> The Delaney Clause, enacted in 1960 as part of the Color Additives Amendment to the FD&C Act, requires a ban if any link to cancer is found in humans or animals.<sup>6</sup>



California became the first U.S. state to ban Red 3 in 2023. Since then, 10 other states have moved to ban the food dye.<sup>8</sup> It is also banned or severely restricted in places like Australia, New Zealand, and most countries in the European Union.<sup>7</sup>

The FDA currently requires manufacturers to list Red No. 3 in the statement of ingredients when added to food. Consumers could see Red No. 3 as an ingredient, in a food or drug product on the market past the effective date in the order if that product was manufactured before the effective date.<sup>1</sup>

As experts in medication, pharmacists can inform patients about potential health risks linked with synthetic dyes like Red No. 3 and can assist patients in reviewing their medications that contain this artificial additive, which may appear under different names, such as erythrosine, Red Dye 3, FD&C Dye #3. Additionally, pharmacists can provide guidance on dye-free options and safe alternatives, helping patients make informed choices to protect their health.

---

## References

1. U.S. Food and Drug Administration. FD&C Red No. 3. U.S. Food and Drug Administration. Published February 8, 2025. Accessed October 9, 2025. <https://www.fda.gov/industry/color-additives/fdc-red-no-3>
2. Hernandez A. FDA Bans Red No. 3, Artificial Coloring Used in Beverages, Candy. NBC News. Published February 8, 2025. Accessed October 9, 2025. <https://www.nbcnews.com/health/health-news/fda-bans-red-no-3-artificial-coloring-beverages-candy-rcna185479>
3. Center for Science in the Public Interest. Red 3: FDA Finally Bans Cancer-causing Food Dye. Center for Science in the Public Interest. Published 2025. Accessed October 9, 2025. <https://www.cspinet.org/cspi-news/red-3-fda-finally-bans-cancer-causing-food-dye>.
4. Jennings AS, Schwartz SL, Balter NJ, Gardner D, Witorsch RJ. Effects of oral erythrosine (2',4',5',7'-tetraiodofluorescein) on the pituitary-thyroid axis in rats. *Toxicol Appl Pharmacol*. 1990;103(3):549-556. doi:10.1016/0041-008x(90)90327-q
5. U.S. Food and Drug Administration. FDC Red No. 3. U.S. Food and Drug Administration. Updated November 4, 2021. Accessed October 9, 2025. <https://www.fda.gov/industry/color-additives/fdc-red-no-3>
6. U.S. Food and Drug Administration. FDA to Revoke Authorization for the Use of Red No. 3 in Food and Ingested Drugs. FDA website. Published January 15, 2025. Accessed October 9, 2025. <https://www.fda.gov/food/hfp-constituent-updates/fda-revoke-authorization-use-red-no-3-food-and-ingested-drugs>
7. National Center for Biotechnology Information. PubChem Compound Summary for CID 12961638. <https://pubchem.ncbi.nlm.nih.gov/compound/Erythrosin-B>. Accessed October 9, 2025.
8. Center for Science in the Public Interest. (n.d.). Where is Red 3 Legal? See Where Your State Stands. Accessed October 9, 2025. <https://www.cspinet.org/page/where-red-3-legal-see-where-your-state-stands>



**TAG-Ed**  
Education Collaborative

## GEORGIA PATHWAYS MAGAZINE

Georgia's most influential workforce development and STEAM magazine which is distributed monthly to over 62,000 individuals state-wide.

### Readership:

68%

Educators, K-12  
Students, Parents, and  
School Administrators

16%

Industry  
professionals

8%

University  
professors and their  
students

8%

Other interested  
individuals

### Contact Us:

For assistance with  
sponsorship, advertising, or  
other inquiries please contact  
[tag-ed@tagonline.org](mailto:tag-ed@tagonline.org)

## STANDARD ADVERTISING

### Full Page Advertisements Only

- Front Cover: \$950
- Inside Front cover: \$550
- Back Cover: \$375
- Resource Page: \$50 / Issue

## ARTICLE SUBMISSION PACKAGES

### TWO PAGE FEATURE ARTICLE - \$2500

- Full page ad included
- Hyperlink and embedded video capability
- Article title on cover
- Inclusion of programs, events, state initiatives, and efforts of note

### TWO PAGE SPREAD ARTICLE - \$1000

- Interior location
- Hyperlink capability

### ONE PAGE ARTICLE - \$1000

- Interior location
- Hyperlink capability

# Accelerate Your Career with AI Certification



Start with the Microsoft Azure AI Fundamentals courses where you'll learn the foundation of modern artificial intelligence (AI) and machine learning (ML). This will enable you to recognize common applications of AI and identify the available AI services in Microsoft Azure.

- 4 Week Course | 10 hours/week
- 100% Online, Instructor led
- Equipped to pass the AI-900 exam
- Exam voucher included
- Price: \$750



Once you have the fundamentals or programming experience, you can be eligible for the Microsoft Azure AI Solutions course. This is where you'll gain a comprehensive understanding of the responsibilities encompassing the design, deployment and maintenance of AI solutions.

- 8 Week Course | 8-10 hours/week
- 100% Online, Instructor led
- Equipped to pass Azure AI Associate AI-102 exam
- Exam voucher included
- Price: \$2,400

**Ask About Bridge Builders Scholarship:** TAG Bridge Builders and SkillStorm are committed to promoting equity and diversity in the workforce. Apply for a scholarship tailored to serve minorities in Georgia who are looking to advance their tech careers.

**Sign up for a course today!** 



# AI Skills: The New Currency in Today's Job Market

The AI revolution is here. Ever since ChatGPT arrived on the scene in late 2022, artificial intelligence has been reshaping the way we live and work. What does that mean for tech professionals looking to compete in a changing labor market?

TV pundits and talking heads love to get riled up about whether robots are coming for our jobs — but the truth is that AI will probably create more jobs than it eliminates. And one thing's for sure: understanding how AI works, and mastering AI skills, will be the key to success in tomorrow's ever-changing world of work.

New research shows that a growing number of companies are asking for AI skills in job descriptions — including non-tech roles. And a survey of HR professionals released last month shows that job candidates with AI skills ask for more money during the interview process — and tend to get it once they're hired. Simply put, AI is going to be underpinning nearly every job out there. That's why staying ahead of the latest in AI development is so important.

Building AI skills doesn't just mean learning how to engineer prompts for ChatGPT. It's everything from programming to data modeling and analysis to mastering concepts like machine learning and natural language processing. And if there's anything certain in our fast-paced economy, it's that building AI fundamentals today will translate to career opportunities tomorrow and beyond.

That's where SkillStorm comes in. In partnership with TAG, we offer Microsoft Azure AI courses that are instructor-led, career-aligned tech certification courses and will help you build the AI skills that employers need. From the basics of AI and machine learning to a comprehensive understanding of how to design, deploy, and maintain AI solutions, you'll learn everything you need to accelerate a career in the economy's hottest fields.

It won't be long before all kinds of jobs, all across the economy, require AI skills. And starting now is the best way to accelerate your ascent up the career ladder. Build those skills today and you'll lay the foundation for opportunity for years to come — and set yourself up for success in an AI-driven future of work. [Register today](#) to get started with a career in tech.



Blue Ridge

Rome

Atlanta

Athens

# STEM is Georgia Wide

Macon

Columbus

Savannah

Albany

Valdosta

Brunswick