

SEPTEMBER 2024

GEORGIA PATHWAYS

M A G A Z I N E

Job Shadowing And Career Realities

Georgia AIM Week

Embracing a New Education Framework

The STEM Of Teaching

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.

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Cooperative Learning: Preparing Students for Professional Environments



To make Georgia a global hub of innovation, it's important to create a collaborative learning environment for students in our great state. This environment should prepare them for their careers by enhancing their communication and teamwork skills. Group learning can simulate real-world professional settings, where collaboration, communication, and problem-solving are crucial for success. Group discussions and internships also enable students to take on leadership roles to set them up for success in their future careers.

In a 2014 study of over 168 undergraduate groups, researchers determined that “students learning in a collaborative situation had greater knowledge acquisition, retention of material, and higher-order problem-solving and reasoning abilities than students working alone.” Group discussions often lead to deeper insights, as students build on each other's ideas, making the learning process more dynamic and interactive.

In the workplace, teamwork is a fundamental aspect of most jobs. It is estimated that 80% of all employees work in group settings. Employers highly value effective oral and written communication skills, as well as the ability to work effectively within diverse groups. Completing an internship while a student is a great way to get a head start on refining these skills. Internships allow students to practice working with others, manage different opinions, and develop interpersonal communication skills.

In every group, there are opportunities to take on leadership roles, whether through organizing tasks, guiding discussions, or ensuring the team stays on track. Students who lead in these academic settings gain confidence and experience that translate into leadership roles in their future careers. They learn to inspire others, manage group dynamics, and make decisions—all valuable traits in the professional world.

Students don't have to wait until they start their careers to begin developing essential skills for success in the workforce. By fostering collaborative environments and taking part in internships, students can begin preparing for their future careers today. TAG-Ed provides a high school summer internship program that connects exceptional high school students with STEAM internships in the Atlanta area. To find out more, please visit tagedonline.org/tagged-internship-programs.

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.

Job Shadowing and Career Realities:

"You need to know."

By Wayne Carley

Growing up, all my friends wanted to be firemen or astronauts. We had no clue about what they actually did day to day or what it took to get there. But like most kids, we changed our minds a dozen plus times before high school graduation.

Interestingly, it's estimated that the current generation of graduates will experience an average of 4 distinctive careers in their lifetime. That being said, it's in your best interest to encourage your varied career interests as several may come into play in some order down the road.

Job Shadowing, or spending time with a professional in the career field of interest is a great way to get a hands-on look and feel for the actuality of the profession. These are not always paid opportunities such as apprenticeships or on the job training, but this is your quest to see if your mental image of the career matches the reality of your dream job.

Some career shadowing opportunities are very easy and require almost no

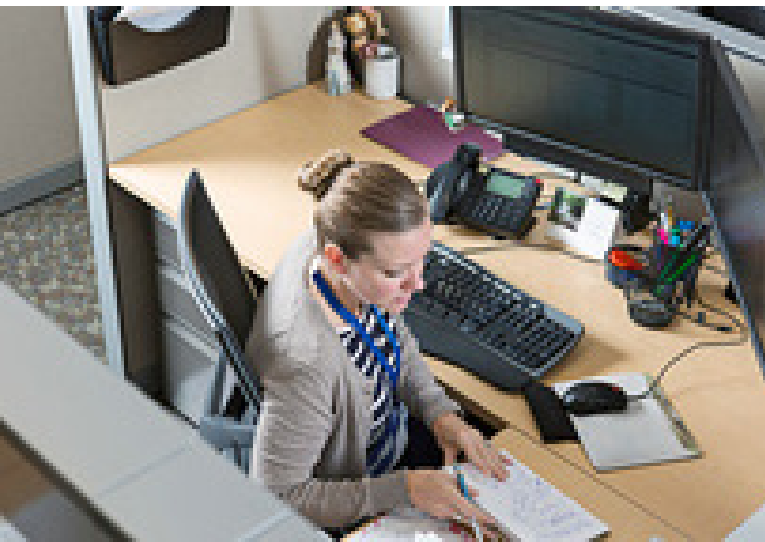


effort. Starting with an online search for example of civil engineers, title the search bar, "What do civil engineers do from day to day?" This will reveal amazing information and details about the profession well before trying to meet a civil engineer. Dozens of sites will provide education requirements, placement opportunities and details to explore.

This approach should be used for any career you're considering for important background information and college choices.

After doing this home work for a few careers of interest, then you may consider investigating “in person” shadowing. Simply making a few phone calls to the companies of interest will allow you determine who offers this type of program, when it’s allowed, any requirements and so on. Your age and grade will no doubt be a limitation as minors may not qualify to participate.

Those under the age of 16 can still do the online search approach for valuable insights into jobs of interest. There is no harm in accumulating as much knowledge (the science in STEM) as possible. This early and ongoing research will eliminate many jobs you thought were cool, only to discover the realities of sitting in a cubical, with no windows, all day, staring at an excel spreadsheet.



On the other hand, something like wildlife management could put you outdoors in the fresh air almost every

day....through good and bad weather. This could be a lonely job with limited socialization and human interaction, but you’ll need to know that sooner than later and decide how important working with others daily is to you.

If you enter higher education (college), experiential education opportunities such as are offered at Kennesaw State, UGA and Ga. Tech. may be available to you in a very structured platform.

This avenue usually offers the following benefits:

- Visit a company to see how it runs on a daily basis
- Get a real look into different career paths you can potentially take
- Use this time as a “pre-interview” for potential internship, co-op or job opportunities
- See different ways you can incorporate your major into a career
- See the specific benefits or unique perks to working for a specific company, and see what their work culture is like
- Practice using professionalism and gain some hands-on experience networking with other professionals



High demand careers in computer related applications will no doubt be on your list and how you spend every day is no less relevant than any other career. It's been said that it doesn't matter how much money you make if you hate your job. Personally I find this quote to be very true.

As we look across Georgia, several of the most needed career fields include nursing, miscellaneous medical sub-fields, teaching and of course dozens of computer science and programming applications.

The financial (banking) industry has an ongoing demand for computer related

careers, focusing on very specific software programs on a variety of skill and pay levels. Cyber security, malware protection, hacking prevention and general computer safety are always in great demand by dozens of companies and dozens of fields. Some of these are "in house" jobs where you'll be required to be on site, whereas others are remote from home or another office.

Opportunities to shadow in the medical fields are very limited, but shadowing a teacher may be one of the easiest. Shadowing in the "trades" such as plumbing, construction, electrical and food service are very easy to find, learn about online and explore if these are of

interest. Many trades are entrepreneurial, or individually owned, allowing the owner to decide when and how to give you a good look at the field from the inside out. Their personal insights and experiences in the career are incredibly valuable to you as a “matter of fact” looking at the responsibilities, rewards, stress and details of what it means to do this job every day.



As you also consider starting your own business, shadowing with a similar business is enlightening and a good start toward your personal vision. Be sure and consider the “SCORE” mentoring programs (<https://www.score.org>) as an effective and valuable resource to do your own thing.

Knowledge is power, and you need to

gather as much accurate information as possible, as soon as possible, to better understand the careers paths of interest ahead of you. Increasing the possibility of landing a satisfying and rewarding “first” job or career would smooth the way and lessen the certain stresses of this life process. As it’s said, “do what you love” which sounds great, but make sure it’s what you think it is.

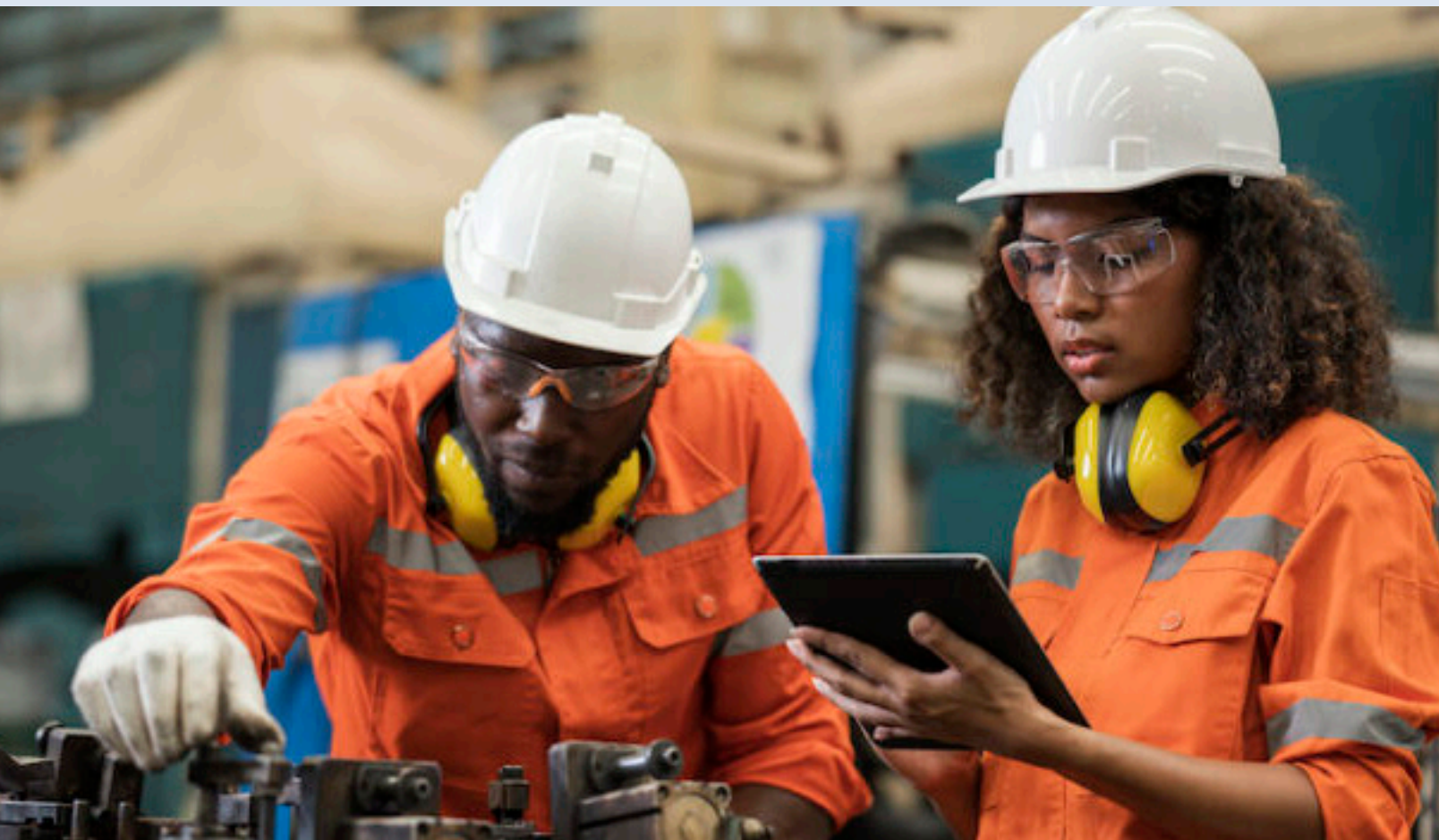


Join us for Georgia AIM Week 2024!

Get ready for mobile studio tours, accessible technology, coding, new career pathways, and manufacturing like you've never seen it before! Georgia AIM is celebrating National Manufacturing

Day with a week of events highlighting communities and technology. We want to see you there! Sign up for any of our events.

<https://georgiaaim.org/georgia-aim-week/>





GEORGIA AIM WEEK

**Join us September 30
through October 4, 2024**

Events include tours and demonstrations of mobile studios, coding events for kids, community events and more!

MONDAY

GEORGIA AIM WEEK KICKOFF

11 a.m.-2 p.m. at Tech Green on the campus of the Georgia Institute of Technology. Event includes local officials and project representatives and celebrates the unveiling of the RICE/UGA Mobile Studio. Studio tours, food trucks, and information from local organizations.

M.A.K.E. Series

A special edition of the Manufacturing Advancement and Knowledge for Executives series, hosted by Georgia AIM and the Georgia MBDA Business Center at Georgia Tech in conjunction with the kickoff event.

K-12 HOUR OF CODE

Georgia Tech's CEISMC will host a virtual "Hour of Coding" for sixth-12th graders.

TUESDAY

MIDDLE GEORGIA EXPO

Central Georgia Technical College will host a manufacturing expo at the VECTR (Veterans Education Career Transition Resource) Center in Warner Robins. Includes tours of the AI-Enhanced Robotic Manufacturing Studio and a special appearance by the Fort Valley Mobile Makerspace Lab.

MOBILE STUDIO TOURS

The RICE/UGA Mobile Studio will make a stop in North Georgia (location to be announced).

Also, Southern Crescent Technical College will host demonstrations and tours of its Mobile Studio at The Academy for Advanced Studies in McDonough

COMMUNITY CODING

CEISMC and TCSG/Southern Technical College will host a city-wide STEM event in Thomasville.

WEDNESDAY

MOBILE STUDIO TOURS

The Georgia Cyber Innovation & Training Center hosts the RICE/UGA Mobile lab 2-5 p.m. at the center on the Augusta University campus near downtown Augusta.

The Georgia Tech Supply Chain and Logistics Institute joins the Fort Valley Lab at Georgia Tech Savannah in Pooler.

THURSDAY

WEST GEORGIA MANUFACTURING

The Georgia Manufacturing Extension Partnership will host "West Georgia Manufacturing Day - Student Career Expo" with industry partners in LaGrange.

MOBILE STUDIO TOURS

The RICE/UGA Mobile Studio will travel to Colquitt County High School in Moultrie for tours and demonstrations.

MEDTECH + MANUFACTURING

An event at the Advanced Manufacturing Pilot Facility on the Georgia Tech campus focuses on innovators and new technologies in the medtech field.

FRIDAY

NATIONAL MANUFACTURING DAY CELEBRATION

The week ends at the University of Georgia campus in Athens, with an event 10 a.m.-2 p.m. at the Driftmier Engineering Building. The RICE/UGA Mobile Studio will be open for tours and other community organizations will be on hand.

K-12 HOUR OF CODE

CEISMC will host a virtual "Hour of Coding."

The Manufacturing Skills Gap:

What Is It and How to Solve It?



The manufacturing skills gap is not simply a buzzword within the industry. Instead, it's the reality that many manufacturers are facing right now. Learn what is causing this divide, and steps employers and education institutions can take to bridge it.

The manufacturing industry is a juggernaut when it comes to moving the economy forward. According to the National Association of Manufacturers (NAMI), manufacturers in the United States accounted for 11.39% of the economy's total output in 2018. In addition, plants across the country created over \$2,334.60 billion in product output for a wide range of industries and consumers. Yet, jobs are going unfulfilled.

Job positions remain empty because there aren't enough skilled workers. Referred to as the manufacturing skills gap, this issue revolves around the labor market being unable to find workers who have the manual, operational,

and highly technical skills, knowledge, or expertise to take the open positions.

The manufacturing skills gap is not simply a buzzword within the industry. Instead, it's the reality that many manufacturers are facing right now. There are more open job positions than there are workers ready to fill them.

A 2021 study conducted by Deloitte and the Manufacturing Institute (MI) predicts that 2.1 million manufacturing positions will go unfulfilled by 2030. These empty positions could cost the U.S. a loss of about \$1 trillion in GDP.

The pandemic also contributed to the loss of manufacturing workers. Roughly 1.4 million jobs vanished at the start of the pandemic, and employers only filled 63% of those jobs with employees returning to work during 2020. Yet, with 570,000 jobs not added back into the industry, the absence of workers may set the manufacturing field back by decades.

Cause of the Manufacturer's Skills Gap

It would be easy to claim that the cause of the skills gap is the adoption of newer technologies. Yet with more automated processes and robotics used on the plant floor, these technologies are actually creating more jobs within

operations. Companies need workers who understand robotics, the Internet of Things (IoT), artificial intelligence, and analytics. As a result, manufacturers are expanding and diversifying their workforce with open positions for:

- Robot teaming coordinators
- Smart factory managers
- Digital twin engineers
- Smart Q.A. managers

Still, pinpointing the cause of the manufacturer's skills gap is not an easy task because there's no singular issue contributing to the problem. However, factors that can impact the skills gap include:

False Job Perception

People have varying perceptions of what manufacturing entails since the industry is so vast while having differing processes based on operations. These perceptions impact how young talent views the industry.

They may look at manufacturing jobs from the viewpoint of their aging parents and grandparents, who might have worked long hours under laborious conditions. They might believe that working in manufacturing means sub-



jecting themselves to a large, dark, and dusty shop floor with workers standing in line assembling products along a conveyor belt that is constantly moving.

Most young employees simply don't want to deal with the same harsh work conditions as they're looking to break out of the generational job rut. These outdated perceptions lead to disinterest in younger workers.

Lack of Technology Skills Sets

Even if you can change the perception of manufacturing into the ideal of a bright and clean plant with shiny robot arms welding and assembling parts, people still aren't rushing to fill positions. Some workers may have one skill that may or may not be highly specialized.

tech·nol·o·gy

/tek'näləjē/

noun: technology; plural noun: technologies

- the application of scientific knowledge for practical purposes, especially in industry. (science is best defined as the systematic accumulation of knowledge.

“advances in computer technology”
- machinery and equipment developed

from the application of scientific knowledge.

- the branch of knowledge dealing with engineering or applied sciences.

In today's job market, many manufacturers are looking for workers who have several skill sets. They want workers who know about IoT, robotics, and automation. While machinist knowledge is desirable if the machinist is also versed in engineering and advanced robotics, they have greater opportunities to land available jobs. Manufacturing employers covet workers with overlapping skills.

However, this desired trait isolates some adult employees. Middle-aged workers may shy away from manufacturing jobs as they believe they don't have the time or money to learn additional skills independently. They see manufacturing jobs as a static position that doesn't allow upward mobility due to their lack of additional skills, knowledge, or expertise. They also don't want to take on the debt to learn these additional skills as they will have to carry that financial burden into retirement.

Retiring Baby Boomers

Workers who may have spent their entire employment at a manufacturer are now leaving the workforce. These are highly skilled employees who have

10+ years of experience under their belt. Finding replacements for these employees is extremely difficult. Not only did these workers bring in a unique set of skills when first taking on the job, they learned their enhanced expertise with hands-on experience.

When it comes to operations using customized equipment and machines, it can be nearly impossible to find workers who understand and have in-depth knowledge of the same equipment that can get started immediately on the production line. As a result, many manufacturing leaders may find themselves in the position of trying to lure talented veteran workers from other competing facilities.

They might also offer higher salaries and more enticing benefits packages. Yet smaller manufacturers on tight budgets may not be able to afford to take this route to locate experienced employees. Also, they may not want to take the chance that the baby boomer might soon retire if they do find someone.

Blue Collar Work Avoidance

In today's society, people hold a stigma toward people who are considered blue-collar workers. Many people view blue-collar workers as less educated. Many young workers also avoid

blue-collar work because they believe employees don't fully value this work segment. They believe CEOs and managers place unfair demands on blue-collar workers while paying them the lowest wages possible.

Blue Collar Defined:

A blue-collar worker is a working class person who performs manual labor. Blue-collar work may involve skilled or unskilled labor.

The type of work may involve manufacturing, warehousing, mining, excavation, electricity generation and power plant operations, electrical construction and maintenance, custodial work, farming, commercial fishing, logging, landscaping, pest control, food processing, oil field work, waste collection and disposal, recycling, construction, maintenance, shipping, driving, trucking and many other types of physical work. Blue-collar work often involves something being physically built or maintained.

Due to this mentality, more people flock to white-collar jobs for more job stability, upward career mobility, and higher wages. Unfortunately, this problem has led to a shortage of blue-collar workers taking manufacturing positions, such as welders, machinists, and freight carriers.



Industry 4.0: How It Will Shape the Future of Manufacturing

You may have heard that the world has entered its newest industrial revolution. Called the Fourth Industrial Revolution, or simply Industry 4.0, it's the rapid pace of digitalization adoption in the manufacturing industry. It encompasses the digital technology advancements previously discussed above, including robotics, IoT, artificial intelligence, and other tech advancements, including cloud computing, wireless communication, and many others.

Industry 4.0 could advance the manufacturing segment in vast and ever-changing ways as newer innovations enter the field. Currently, Industry 4.0 may allow advanced communication

capabilities within manufacturing equipment through wireless capabilities, meaning that workers may access equipment through any mobile device in remote locations.

Another way industry 4.0 could shape manufacturing is the decentralization of networks and data. Instead, the interconnections of equipment using wireless technologies and the cloud would allow more information transparency in operations.

Workers could access this information effortlessly, allowing them to make better decisions to increase productivity. Employees turn into problem solvers as

they rely on critical thinking and creativity to overcome problems.

The concept of Industry 4.0 could allow for more straightforward and accessible methods for manufacturers to become more efficient and sustainable in their operations. In turn, these advancements could lead to lower waste and increased revenue growth. Having workers who understand these changes and can obtain the skills required for digital adoption in processes will benefit manufacturers in the long term.

Future Jobs in Manufacturing

With Industry 4.0 arriving, many new jobs will appear, only increasing the number of unfilled positions in the manufacturing sectors. These jobs will require workers to understand and fully embrace the digital tools soon appearing in operations. Some job examples that we're likely to see in manufacturing in the future include:

- **Predictive Supply Network Analyst:** These analysts rely on the use of digital tools to move materials through a digital supply network to provide just-in-time (JIT) deliveries.
- **Manufacturing Cybersecurity Strategist:** The strategist helps prevent network security threats and hackers

from creating breaches and stealing data.

- **Smart Factory Manager:** This manager uses machine learning algorithms and artificial intelligence to manage inventory levels and build schedules.
- **Digital Twin Architect:** An architect that makes virtual representations of processes, products, and systems
- **Smart Quality Assurance (Q.A.) Manager:** A manager who uses digital tools to manage product quality
- **Collaborative Robotics Technician:** This technician sets up, monitors, and maintains collaborative robotics systems.



Skills Lacking in Manufacturing

Keep in mind that the skills required for a manufacturing position will depend on the specific work provided. Also, these skills may change if the requirements for the position changes.

Generally, manufacturers may seek out people with the following skill sets:

- **Manufacturing Experience/ Know-How:** Previous work experience in the field or in a related area where skills are transferable
- **Physical Know-How:** Physical experience with manufacturing tools, such as welding and machining
- **Digital Fluency:** Having the aptitude for interpreting and using digital information
- **Programming:** Proficiency with computer programming languages and debugging tasks
- **Problem Solving/Troubleshooting:** The ability to process problems and find solutions
- **Big Data Analytics:** Understanding how to use advanced analytical techniques with large data sets
- **Soft Skills:** Consists of core or common skills, such as work ethic,



communication, adaptability, teamwork, and leadership.

Fixing the Skills Gap

To fix the wage gap, manufacturers will need to focus on the worker challenges commonly faced in the industry as mentioned above, including young workers having a false perception of manufacturing, blue-collar job avoidance, retiring older workforce, and lack of technology skill sets. Here are some ways that manufacturing leaders can help bring more workers to the industry:

Take Advantage of MFG Day

Manufacturing (MFG) Day occurs annually on the first day of October. It provides an opportunity for manufacturers to throw open their doors and invite the public to see what's involved

with their manufacturing processes. The public can observe how workers interact with machinery and other manufacturing methods and advancements, as the day inspires curiosity and allows people to ask questions.

Using MFG Day as a learning day may help change the skewed perception that many young workers have about the manufacturing industry. It also shows them the possible jobs available that they may want to pursue as a lifelong career. According to the U.S. Department of Commerce, there are typically 2,600 open houses held every year with roughly 400,000 parents, students, and community members in attendance.

Educate Younger Workers and Students

Once piquing the interest of young workers and students, you need to keep that interest going and motivate them into taking that next important step toward a career in manufacturing. Disseminating manufacturing job information and skill requirements to younger workers and students allows them to understand what skill sets employers are looking for so they can tailor their education to align with the open job positions.

Manufacturers may also hold workshops and seminars about how to oper-

ate certain tools and machines. Having students gain hands-on experience allows them to develop their physical know-how regarding tool usage further.

Upskill Current Workers

Never overlook the current workforce. Existing employees may be eager to enter new job positions in the company if given the opportunity for enhanced learning. Developing the required skills in existing employees may allow them to become specialized in specific processes and special equipment. It also cuts down on hiring costs.

Steps Employers and Education Institutions Can Take to Tackle the Skill Gap Current manufacturers and educational institutions may not be in alignment regarding the types of skills workers require. According to the Brookings Institution, employers may partner with local higher education institutions to offer intern programs. These intern programs can overcome the existing skills gap obstacles and offer degree and credentialing pathways to help students succeed.

Another option for both employers and educators is to have postsecondary programs that offer a more transparent look into what competencies students hope to gain from learning.



Understanding the skills they need to obtain allows students to make better career decisions when seeking manufacturing jobs.

Young workers may also get involved with many online manufacturing programs that can help support their careers in this exciting field. Some programs include the NIIMBL eXperience, the AFFOA's MITxFIT Program, Next-Flex's Flex Factor, and RAPID's eLearning Programs.

Students, workers, or employers interested in these programs can visit Manufacturing USA, a network of member institutes sponsored by the U.S. Department of Energy, Commerce, or Defense.

The STEM of Teaching

BY WAYNE CARLEY



Teachers are among the most numerous STEM career in America. With nearly 4 million public and private school educators, this group of professionals has the responsibility of not only presenting curriculum throughout the school year, but possibly as import-

ant, influencing students in a variety of ways.

For educators who understand what STEM *really* means, they realize that every teachers in every subject and every grade uses STEM, as defined in

every issue of this magazine. Let's take a closer look as to how every teacher is a STEM teacher in application regardless of curriculum.

THE SCIENCE OF TEACHING

By definition, science is the “systematic accumulation of knowledge”. I cannot name one subject in school at any grade level that does not require this systematic accumulation. By definition, all teachers use this form of science daily as well as their students. Memorization, testing, homework, research and assignment completion all require this gathering of facts, theories, historical data, and personal experiences in preparation for a testing evaluation of how well this knowledge has been gathered or accumulated.

THE TECHNOLOGY OF TEACHING

As defined, technology is the “practical application of science”. Practical application is the use of something for a reasonable purpose. The age old question posed by students remains relevant; “How am I going to use this in the real world?”

An example of practical application is using a school math lesson to figure out the total cost of items while grocery shopping. Calculating percentages, discounts, simple math or more compli-

cated geometry used by carpenters on a daily bases are good examples. Simply following a recipe while cooking is a great math example of how we use this every day.

The technology or practical application of knowledge accumulation in English class is used in all career fields since communication's, writing skills, grammar, and spelling are all included in your chosen job.

This would be a good topic of discussion at home between students and parents (with life experience) to consider and evaluate the practical application (use) of school subjects such as:

- Math
- Social Studies
- Geography
- History



- Earth Science
- Language Arts
- Foreign Language
- Music
- Health Class
- any other subjects you are taking

THE ENGINEERING OF TEACHING

This feature of education is one of my favorites to discuss and probably the least understood by most teachers. Engineering is one of those words that has hundreds of practical applications and hundreds of career definitions, but must be specifically defined in order to be discussed.

Engineering is a process defined by the engineering method that is used to “solve problems”. Engineers are problem solvers, and problem solvers are engineers, regardless of their education or career field. The process of solving problems remains the same, even for teachers.

- ASK: What is the problem?
- IMAGINE: What are some possible solutions? Has anyone else had to deal with this problem?
- PLAN: Make a list of possible solutions to the problem?

- Financial cost
- Available resources or supplies
- Time line for solution
- Other needs such as people or a location needed

● TRY IT: Pick a single solution and try it out.

● EVALUATE: Did it work? Why or why not?

If your choice and evaluation fails to solve your problem, you simply go through the process again until something works. This is a fun process that offers challenges, deep thought and imagination. I personally find deep gratification is solving problems of all kinds. The reward is very satisfying and boosts your self-esteem too.

Teachers are solving problems daily in class and at home using this method... often without their knowledge of the steps.

THE MATH OF TEACHING

Math is the “science of numbers and their operations”. Once again we see the systematic accumulation of knowledge mentioned in the definition of mathematics as a science. We have to build our stored knowledge of numbers operations for future use.

In all subjects, students are individuals but also numbers in the broader

picture of education as a whole. Student performance is tracked using numbers, evaluated numerically and charted using graphs, percentages, and statistics. The total number of class periods projected for a school year is considered with the total amount of information needing to be taught by the teacher. These calculations are constantly revised numerically throughout the school year as unexpected delays or interruptions occur.

Grading is the obvious use of math as well as tracking those numbers for each student and the combined data of the class as a whole and then as a school. This application of math usually involves the use of mathematical statistics, a widely needed area of math in industries worldwide.

So here we have a Language Arts teacher who suddenly realizes the use of STEM in their class and personal life on a daily basis. This “ah-ha” moment can provide great influence in the lives of their students as to the practical applications of STEM in every school subject as well as every career field.

There is a national and global shortage of teachers in all grade levels. Even though teaching is the second most populated career in America, the shortage is severe. Teachers in all 50 states are quitting faster than the student dropout rate.

With very few exceptions, every student I’ve asked in the last 20 years has said, “No way. I could never teach this class. The students would drive me crazy.”

Under paid, over worked and usually unsung, teachers remain the most influential in the lives of students. If your passion is to shape lives and influence the future with less regard for yourself than others, teaching may be a good fit.

The best educators have a broad understanding of the interrelationship between subjects and curriculum which is why a more complete understanding of STEM skills and their career paths is so important. It’s my hope that this brief overview of teachers and STEM has sparking questions to consider and the desire to know more about STEM skills on behalf of our students and their families.



A Journey Through Pandora's Cluster

How a Multi-disciplinary Team Combined Art and Science to Transport Visitors into Deep Space

By Bryant Maxwell, Katrin Ludwig and Jancy McPhee



Imagine this...

What if you could travel on a futuristic spacecraft to the farthest reaches of the universe? You're strapped in tightly, the countdown begins, and the vibrations and hum of the engines shake your body. Before you know it, you're launched into the vastness of space. Your destination?

The awe-inspiring Pandora's Cluster, a stellar marvel 4 billion light-years away. To put that in perspective, 4 billion light-years is roughly 23.5 trillion miles! It's like looking 4 billion years into the past, long before our solar system even formed. While we can't travel such distances, this is your chance to imagine the ultimate space adventure.

Reality Check: The Power of Space Telescopes

Now, back to reality! The James Webb Space Telescope (JWST) was launched on the Ariane 5 rocket and is stationed about a million miles from Earth. This amazing telescope collects data from deep space, giving us detailed images and information about places we can't yet reach. JWST acts like the ultimate space photographer, equipped with a giant, golden eye capable of peering deep into space and time, capturing the universe's secrets in incredible detail. It's like a time machine that lets us see the light from the earliest galaxies, helping scientists understand the universe's birth.

The JWST is designed to see in the infrared spectrum, allowing it to peer through cosmic dust and capture images of ancient galaxies. Its enormous, segmented mirror, over 21 feet across, collects faint light from the distant universe.

The Hubble Space Telescope, launched in 1990, sees primarily in visible and ultraviolet light and has provided some of the most detailed images of space, like the famous Pillars of Creation. The Chandra X-ray Observatory focuses on X-rays, revealing high-energy phenomena such as black holes and supernovae. Each telescope offers a different perspective, working together to give us a complete picture of the universe.



James Webb Space Telescope (Getty Images)

A Multisensory Experience: Pandora's Cluster Installation

What exactly is Pandora's Cluster, or Abell 2744? Imagine a galactic traffic jam, where multiple galaxy clusters collide in a spectacular deep space pile-up. This cluster is one of the most complex and chaotic regions of space, revealing the universe's dramatic beauty and turbulent history.



SciArt Exchange's Sensing Deep Space: Pandora's Cluster multi-sensory installation, which had a limited run at the Eisemann Center for Performing Arts in January 2024, allowed audiences to experience this distant galaxy cluster without leaving Earth. Visitors stepped inside and were surrounded by towering screens displaying stunning projections of the universe. Future iterations of this immersive experience are already

being discussed, promising more awe-inspiring journeys through space.

These visuals weren't just pretty pictures—they're derived from real data collected by the James Webb, Hubble, and Chandra space telescopes. You're not just observing the universe; you're interacting with it. This immersive installation was a fusion of science and art, thanks to artist Ben Heim.

Using generative art—art created through algorithms and data—Heim transforms complex astronomical information into a symphony of sights and sounds. Using a touchscreen, you could layer different types of data—infrared, visible light, X-rays—and create your own unique visual and auditory experience. It's like painting with stardust and composing music with the very waves of light that travel across space.

The Science Behind the Art

Ben Heim carefully encoded telescope data into visual and musical artwork to preserve the scientific data's essence. He used particle simulations to create three-dimensional visual representations, assigning different colors and movements to various data sources.

Ben Heim



For instance, infrared data from JWST was given a low frequency and warm hues, reflecting its long wavelengths. Visible light data from Hubble added vibrant colors, while X-ray data from Chandra brought high-energy visuals

with sharp, intense features. Heim's approach ensured that the art was not just visually stunning but also scientifically meaningful, allowing viewers to grasp the scale and complexity of the universe.

The installation's auditory component was equally thoughtful. Heim translated the light's wavelength frequencies into sound frequencies, creating a soundscape that mirrored the visual data. Infrared light, with its low frequency, was assigned deep, resonant tones, while higher-frequency visible light was matched with brighter, more piercing sounds. This careful encoding helped preserve the scientific data's meaning, making the experience both informative and emotionally impactful.

The Value of Interdisciplinary Collaboration

This installation was more than just sounds and visuals. It's a collaboration between Heim and top scientists, including Dr. Carol Christian from the Space Telescope Science Institute, and from the University of Texas at Dallas Dr. Roger Malina, Dr. Lindsay King and their students. Heim's art, influenced by the intricate data from JWST, bridges the gap between scientific discovery and human creativity.

By combining the expertise of scientists, artists, and technologists, the



project brought together the precision of science and the creativity of art. This synergy not only made the installation visually stunning but also educationally enriching, helping visitors understand complex astronomical concepts through an immersive experience.

Scientists study regions like Pandora's Cluster to understand how galaxies form and evolve. This cluster is a chaotic collision of multiple galaxy clusters, providing insights into dark matter, the distribution of galaxies, and the dynamics of such massive structures. By studying these regions, scientists hope to uncover the secrets of the universe's past, present, and future, helping us understand our place in the universe and potentially unlocking new technologies and scientific advancements.

Through this blend of art and science,

“Sensing Deep Space: Pandora's Cluster” ignites a passion for discovery that transcends traditional learning. So, whether you're on an imaginary rocket to the stars or stepping into an installation that brings those stars to life, remember this: space is cool. Go out, share the wonder, and tell the world!



SciArt Exchange fosters the fusion of space, STEM and the arts, inspiring future generations to engage in innovative and meaningful ways. Our goal is to ignite curiosity, creativity, and a passion for discovery through projects like this one, bridging the gap between scientific inquiry and artistic expression. This installation demonstrates the value of interdisciplinary collaboration and the powerful impact of integrating STEM with the arts, providing a platform for creative exploration and learning. Learn more about SciArt Exchange at www.sciartex.net.

Sensing Deep Space: Pandora's Cluster was conceived and produced by SciArt Exchange. The installation was funded by Eisemann Edge Initiative at Communities Foundation of Texas, City of Richardson Cultural Arts Commission, Texas Commission on the Arts, and SciArt Exchange.

Bank of America Hall at the Eisemann Center (Ben Heim)



Embracing a New Framework:

Integrating Rules and Precepts in Modern Education

By Shelly A Munoz
STEM CEO and Consultant

In the rapidly evolving landscape of modern education, the balance between maintaining order and fostering empathy has never been more critical. As artificial intelligence (AI) and technological advancements reshape our world, the need to cultivate empathetic, responsible, and ethical individuals

“Raise your hand to speak,” and “Complete your homework on time” are essential for maintaining discipline and preventing chaos. They offer students a clear understanding of acceptable behavior and the consequences of not adhering to these guidelines.

“Education is not the learning of facts, but the training of the mind to think.”

- Albert Einstein

becomes paramount. One effective approach to achieving this balance is by integrating traditional rules with guiding precepts, creating a holistic framework that not only enforces discipline but also encourages deeper understanding and personal growth.

The Importance of Rules

Rules are the backbone of any educational environment. They provide structure, set clear expectations, and ensure a safe and orderly space where learning can flourish. Traditional rules such as “No running in the hallways,”

However, while rules are necessary for order, they often lack the depth needed to foster intrinsic motivation and ethical behavior. This is where precepts come into play.

The Power of Precepts

Precepts are broad principles or values that guide behavior beyond the confines of specific rules. They emphasize the “why” behind actions, encouraging students to internalize positive values and think critically about their behavior. For example, a precept like “Move safely and respectfully” complements

the rule “No running in the hallways” by promoting an understanding of the importance of safety and respect. Explaining the “why” behind rules helps students grasp the underlying principles and encourages them to adopt these behaviors willingly rather than out of fear of punishment. Understanding the reasons for rules fosters a sense of ownership and responsibility, leading to more meaningful and lasting behavioral changes.

Bridging the Gap: Rules and Precepts in Action

Here are some examples of how traditional rules can be paired with precepts to create a balanced educational framework:

Traditional Rules

No running in the hallways.
Raise your hand to speak.
Complete your homework on time.
No bullying or teasing.
Keep your hands to yourself.
Follow the dress code.

Be on time for class.
No cheating on tests.
Clean up after yourself.
Listen to the teacher.



Precepts

Move safely and respectfully.
Respect others' opportunity to be heard.
Take responsibility for your learning.
Treat others with kindness and empathy.
Respect personal space and boundaries.
Dress in a way that shows respect for yourself and others.
Value your time and the time of others.
Uphold honesty and integrity in your work.
Take pride in your environment.
Show respect and attentiveness.

The Importance of Explaining the “Why”

Explaining the “why” behind rules and precepts is crucial for helping students understand the significance of their actions. When students comprehend the rationale behind a rule, they are more likely to follow it willingly and internalize the associated values. This understanding fosters intrinsic motivation, encouraging students to behave ethically even when not being directly supervised.

For instance, explaining that “Move safely and respectfully” helps prevent accidents and shows consideration for others can make the rule “No running in the hallways” more meaningful. Similarly, understanding that “Take responsibility for your learning” pro-

motes personal growth can enhance the importance of “Complete your homework on time.”

By providing the “why,” educators can help students see the bigger picture, promoting a sense of accountability and personal growth. This approach nurtures critical thinking and empowers students to make informed, ethical decisions throughout their lives.

As Albert Einstein wisely stated, “Education is not the learning of facts, but the training of the mind to think.” This quote emphasizes the importance of fostering critical thinking through precepts. When students understand the reasons behind their actions, they develop the ability to think critically and make better decisions, a crucial skill in today’s complex world.



Addressing Post-Pandemic Behavioral Challenges

Since the pandemic, there has been a significant increase in complaints from teachers and schools regarding student behavior. The disruptions caused by the pandemic have affected students' social and emotional development, making it more challenging to maintain discipline and order in classrooms. Traditional rules alone may not be sufficient to address these complex behavioral issues.

Integrating precepts into the educational framework can provide a more comprehensive approach to managing behavior. Precepts encourage students to understand and internalize positive values, promoting empathy, responsibility, and ethical thinking. This deeper understanding can help mitigate behavioral issues by fostering a more respectful and considerate school environment.

Fostering Empathy in the Age of AI

In a world increasingly influenced by AI, the role of empathy in education cannot be overstated. AI can handle many tasks, but understanding and responding to human emotions is a uniquely human capability. By emphasizing precepts that promote empathy, we help students develop the emotional

intelligence necessary to navigate a technologically advanced world with compassion and ethical awareness.

For instance, the precept “Treat others with kindness and empathy” goes beyond the rule “No bullying or teasing.” It encourages students to understand the impact of their actions on others and to act with compassion. Similarly, “Respect others’ opportunity to be heard” complements “Raise your hand to speak,” promoting active listening and consideration for others’ perspectives.

Precepts and a STEM-Driven Future

Integrating precepts into the educational framework is particularly beneficial in preparing students for a STEM-driven 21st-century future. STEM education emphasizes critical thinking, problem-solving, creativity, and innovation—all skills that are enhanced by understanding and internalizing precepts.

- **Encouraging Innovation:** Precepts such as “Take responsibility for your learning” and “Uphold honesty and integrity in your work” inspire students to take initiative and pursue innovative solutions. By fostering an environment where ethical considerations are paramount, students are more likely to develop creative and

responsible approaches to problem-solving.

- **Promoting Collaboration:** Precepts like “Respect others’ opportunity to be heard” and “Treat others with kindness and empathy” emphasize the importance of teamwork and communication. These skills are essential in STEM fields, where collaborative efforts often lead to groundbreaking discoveries.
- **Fostering Ethical Thinking:** As technology advances, ethical considerations become increasingly important. Precepts guide students to think critically about the implications of their work and to prioritize ethical solutions, ensuring that technological advancements benefit society as a whole.

Rethinking Behavior During Summer

As summer approaches, teachers and administrators are given a valuable opportunity to reflect on and rethink their approach to student behavior. This period of planning and preparation is the perfect time to consider integrating precepts alongside traditional rules. By doing so, educators can ensure that the upcoming school year is grounded in both discipline and empathy, setting the stage for a more supportive and understanding school environment.

Conclusion

Integrating rules with precepts provides a balanced approach to education that fosters both discipline and empathy. This framework helps students understand the reasons behind their actions, promoting intrinsic motivation and ethical behavior. As we prepare students for a future intertwined with AI and technological advancements, it is essential to cultivate empathetic, responsible, and thoughtful individuals. By embracing this holistic approach, we can create a more compassionate and understanding world, one student at a time.

Shelly A Muñoz is an award-winning educator, 20 year veteran of the classroom, staff development instructor, and university professor. Her numerous recognitions include being named Teacher of the Year twice and California Golden Bell award winner twice.

She has been privileged to teach science from 5th- 10th grades and has been chosen for many prestigious opportunities such as Space Camp for Educators (Honeywell) Zero G’s (Northrop Grumman) NASA Ambassador and MAVEN ambassador, EarthWatch Ambassador, National Geographic Educator, just to name a few.



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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.





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