

June 2021

GEORGIA PATHWAYS

M A G A Z I N E

Georgia Museum
Awards

STEM Economist Careers

Failing Faster?

Robots With *Lasers*



TAG
Technology Association
of Georgia



TAG-Ed
Education Collaborative

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 2000. 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

TAG-Ed Executive Director
Heather Maxfield

Publisher
Wayne Carley
wayne@tagonline.org

The Technology Association of Georgia (TAG) and
TAG Education Collaborative
4400 North Point Parkway
Suite 155
Alpharetta, Ga. 30022

<http://www.tagedonline.org>

This magazine services the STEM education industry needs of the state of Georgia. This magazine is viewed by the consumer 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.

Georgia State Advances

JENNIFER RAINEY MARQUEZ

Can You Fail Faster?

RUSSELL MOORE

Georgia Museum Awards

SHELLY REDD

Economist; STEM Careers

WAYNE CARLEY

Augmented Reality & Autism

CIARÁN MATHER

Gaming With The FAA

FEDERAL AVIATION ADMINISTRATION

Robots With Lasers

CARBON ROBOTICS

Design Iterations

TOM ROBERTSON

As cybercrime heats up, TAG helps members defend against threats



More than ever, with the rash of ransomware attacks, cybersecurity is a top concern at TAG. With foresight and vision, TAG created the National Technology Security Coalition (NTSC) to bring a private sector perspective to influence the current national policy discussions about cybersecurity and our critical infrastructure.

Many people have asked me about the Biden Administration's Executive Order signed last month on improving the nation's cybersecurity. The order implements seven major cybersecurity requirements, beginning with certain mandatory breach reporting requirements for technology providers. You can find a brief guide to complying with the president's order, issued by the Cybersecurity and Infrastructure Security Agency (CISA). Major points include:

- facilitating information sharing with the private sector;
- modernizing federal security standards;
- improving supply chain security;
- improving incident detection on Federal networks; and
- creating a Cyber Review Board modeled after the National Transportation Safety Board.

All of these measures will impact our members in the private sector as they navigate the innovation economy, so we'll be watching closely as plans take shape. Another update of interest is the TSA's announcement of a Security Directive, following the ransomware attack on Colonial Pipeline that shut down energy supplies on the East Coast for a while. This directive increases accountability for pipeline operators everywhere in the country. That's not all that's happening on this busy front. The NTSC is tracking various measures in Congress to bolster cybersecurity and block hackers.



TAG is also partnering with the Georgia Cyber Center. We're enabling companies to secure their Cybersecurity Maturity Model Certification (CMMC) that the U.S. Department of Defense will require in the near future. Cybersecurity is an area where Georgia leads, and you can read more in our Ecosystem Report. Clearly, in the face of intensifying criminal threats, these actions are appropriate, and more is needed—the sooner the better. In the past few weeks, cybercriminals have attacked meat packing businesses, hospitals, insurers, a ferry system, and other critical enterprises worldwide.

Next week I look forward to joining our Board of Directors to welcome Dr. Joye Purser, the new Regional Director for CISA at the Department of Homeland Security. Dr. Purser has an important role and we'll work together to secure our cybernetworks and critical infrastructure. Rest assured; TAG is laser-focused on these developments in partnership with the NTSC and other groups. I'm encouraged to see the public and private sectors working together taking proactive and bold action to protect the innovation economy.

Larry K. Williams
President
TAG / TAG-Ed

Larry K. Williams serves as the President and CEO of the Technology Association of Georgia (TAG) and President of the TAG Education Collaborative (TAG-Ed). 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.



Georgia State Introduces Advanced Research Computing Technology & Innovation Core

By Jennifer Rainey Marquez

Associate Director, Communications and PR

Office of the Vice President for Research and Economic Development

Georgia State University has introduced the Advanced Research Computing Technology & Innovation Core (ARCTIC) to support research that would not be possible with standard consumer-grade computing, including analysis, modeling, simulation and the prediction of complex phenomena.

Now a resource for investigators at Georgia State, ARCTIC will soon be made available to scientists around the world. ARCTIC was developed using a \$1.2 million grant from the National Science Foundation and offers researchers advanced cyber infrastructure along with training and support.



The system includes high-performance computing clusters and data storage systems, research networking and cloud computing.

“We don’t just provide the hardware,” said Suranga Edirisinghe, associate director of ARCTIC. “We work hand in hand with investigators and guide them how to best use the resources.”

ARCTIC is particularly aimed at investigators who are not traditionally served by high-performance computing, such as psychologists, biologists, neuroscientists or public policy researchers. The team also builds scientific gateways — easily accessible Web portals — to allow the public to access a project’s findings.

“These days, researchers have more and more data, but they may not have the technology to process that data. We’re trying to fill the gap,” said Edirisinghe. “The goal is to reach out to people who don’t traditionally use high-performing computing and bring them into the community, so they’re not constrained by resources. That’s also why the support piece is so important.”

“Anyone who has said, ‘We can do this on my office computer with a small sample, but to really be representative, nail down the model and generalize what we’re finding, we need to be running this on millions of data points,’ that’s who this is for,” said Jessica Turner, professor of psychology and neuroscience and lead investigator on the grant.

Turner is among more than 300 Georgia State faculty who have begun using ARCTIC to conduct their research. She is testing whether an algorithm can predict depression in various racial groups by analyzing brain scans. Faculty can also use the resource in the classroom to teach students about data mining or big data analysis approaches.



Jessica Turner

“I am investigating the genetics underlying brain structure changes in chronic schizophrenia, as well as the genetic influences on functional and structural neuroimaging measures in other neuropsychological diseases. The first research program includes the extraction and understanding of multivariate patterns within the combined methods of neuroimaging and genetics, as applied to clinical populations. I primarily use independent component analysis (ICA), as well as its extensions into multi-modal datasets. My background is in psychophysics and MRI methodology as applied to a range of clinical populations, with secondary experience in the analysis of genome wide scan (GWS) data. I collaborate closely with psychiatrists, computer scientists, geneticists and neuroscientists in research on the genetics of brain function and dysfunction.”



Can you fail fast enough? Be agile!

By Russell Moore

How often have you heard the following:
“Failure is not an option.”

Just the other day on a call with two of my colleagues the topic of failing fast came up. They stated “The fact is that most groups in most environments do not have the ability to fail fast.” The excuse in this case was, “due to the number of clients I have, there is no way we can fail fast or at all.”

In any industry where failure is not an option - failing faster can still be the best way to succeed. We have come to an age of compute where 100% uptime is financially guaranteed to the clients we support.

Yes! We all know, it’s impossible to be up 100% of the time, but due to the demands of our largest smartest clients, we must support them through any means necessary. Does failing fast actually mean you are failing at all? In the world of agile mindsets the faster you can move off a topic the faster you can solve other problems, and support your client.

Experiment time! Google “failing fast.” How many articles come up for you?

The interesting part of the search is that of the articles found, most were not related solely to agile principles, but are more geared towards leadership. Failing fast is

not just an agile concept but a concept of well thought out business principles. Call it “intelligent failure”, if it makes you feel better than “failing fast.” These are concepts and thoughts that are now driving us to the future with an intelligent and logical design theory.

With the churn of technology reaching breakneck speeds, the design theories and practices for development are evolving right along with them. These concepts come up in both an industry where we are building out new products with the newest technologies, as well as industries where there is a precedence for established technologies which doesn't mean we are still not trying to innovate and develop new things.

With emergent technologies it is important to fail fast, with the onus on doing this through iterative development that is constantly moving the project forward.

Iterative development will be full of opportunities to fail, through issues in product development, differences in opinions from a vision perspective and market demands. Simply put, failure is inevitable, but the faster we fail the quicker we can change and get to the desired end goal. Having a well-oiled machine doesn't happen overnight. It takes a proper balance of skills and relationships to make it run smoothly. Failing fast and Intelligently is no different.

As agile leaders we have to empower our teams to succeed. Sometimes succeeding means that we fail first; a concept that would drive most programmers or developers insane. This is not a new concept. We are so anti-failure that just saying the words makes us uncomfortable.

“Failing fast is not a crime but a nuance of time in the process of success.”



GEORGIA

MUSEUMS, INC.

Two Cartersville Museums receive awards from the Georgia Association of Museums.

Shelly Redd

Tellus Science Museum Director of Marketing

Booth Western Art Museum



Booth Western Art Museum and Tellus Science Museum, each programs of Georgia Museums, Inc., received awards at the most recent Georgia Association of Museums (GAM) conference held in Statesboro in April 2021.

Lynnette Torres Ivey, Program Manager of Special Projects at Booth Western Art Museum, received the GAM 2021 Emerging Museum Professional Award. Lynnette was nominated by Booth Museum's Director of Education Patty Dees and Lynnette's previous supervisor at the Zuckerman Museum of Art, Katie Ericson. Patty says, "Lynnette provides an enthusiasm for learning and art that is infectious! FB Live! Art Lessons with Ms. Lynnette is one program in which she connected with participants of all ages from all areas of the country throughout the pandemic.

Tellus Science Museum



During these weekly lessons, Lynnette encouraged the audience to follow along with her to create their own unique art; all while learning about color, shading, line, shape and information on the artists themselves."



The Tellus Science Museum received the award for 2021 Education Program for its Madd Scientists demonstrations. The Tellus Madd Scientists engage learners of all styles with live science demonstrations for school groups and museum event attendees. Nominated by Tellus's former Director of Education Cantey Smith, she says the Madd Scientists, "encourage participants' learning while having fun. Through these types of demonstrations we aim to provide education and entertainment – we call it 'edutainment' – by presenting science using all types of props and antics to encourage audience interaction. Guests learn fun and fascinating science concepts from the states of matter, how magnetism works, to the basics of electricity."

Tellus Science Museum Volunteer Bill Montante received the 2021 Volunteer of the Year Award. Bill started contributing volunteer hours to the museum before it even opened to the general public. He has assisted in developing and influencing Tellus Science Museum's programs and exhibits.

He has donated a dozen specimens which are on exhibit in our Fossil Gallery and used in our educational research study collection. Additionally, he does fossil restoration for the museum.

When Bill volunteers, he can often be found in our Fossil Gallery where he sets up a kiosk loaded with specimens, maps, photographs, and tales of his amazing adventures. He has also been very generous with tangible bits and pieces of the past as he gives chunks of dinosaur bones to attentive children and their parents. Bill has begun many a child's (and adult's) fossil collection with his sharing of prehistoric fossils and nurtured their fascination with the topic as he shares his amazing stories.



"Life is all about discovery," said Montante, who described his life's role as, "planting knowledge seeds in fertile minds. When I place a piece of dinosaur bone in the hand of a curious child or adult, it often has profound changes



Lynnette Torres Ivey
Program Manager of Special Projects at
Booth Western Art Museum

in their lives. No telling what that small relic from the past will inspire. I encourage children and adults to be life-long learners. There is so much to discover out there, regardless of the path taken; a whole universe of discovery.”

Booth Western Art Museum and Tellus Science Museum are programs of Georgia Museums, Inc., which also includes Bartow History Museum and Savoy Automobile Museum. The Smithsonian Affiliate museums are located in Cartersville, just north of Atlanta. For more information about Booth Western Art Museum, call (770) 387-1300 or visit www.boothmuseum.org and for more information about Tellus Science Museum, call (770) 606-5700 or visit www.tellusmuseum.org.

If you would like more information about this topic, or arrange a press visit, please contact Sandy Scott, Booth Western Art Museum Director of Marketing at (770) 387-2833 or email at sandys@boothmuseum.org or Shelly Redd, Tellus Science Museum Director of Marketing at (770) 606-5732 or email at shellyr@tellusmuseum.org.

Tellus Science Museum



Become an Economist

A STEM career field with a variety of choices

By Wayne Carley

Once you understand what economists do from day to day, you quickly understand why economics is certainly a varied skill field using an unexpected level of STEM skills daily.

If the workforce and investors of tomorrow are expected to embrace and expand upon financial innovation, they must be exposed to and begin to understand where we are with FinTech, Blockchain and Crypto-Currency.

ec•o•nom•ics

/ek-nämiks,-ēk-/nämiks/

noun

noun: economics; plural noun:
economics

1. the branch of knowledge concerned with the production, consumption, and transfer of wealth.
2. the condition of a region or group as regards material prosperity.



Economists study the production and distribution of resources, goods, and services by collecting and analyzing data, researching trends, and evaluating economic issues.

Job responsibilities

Economists typically do the following:

- Research and analyze economic issues (science)
- Conduct surveys and collect data
Analyze data using mathematical models and statistical techniques (math)
- Prepare reports, tables, and charts that present research results (creative)
- Interpret and forecast market trends (technologies)
- Advise businesses, governments, and individuals on economic topics (the decision making process of the engineering method)
- Design policies or make recommendations for solving economic problems (creative process and engineering)
- Write articles for publication in academic journals and other media sources (language arts, creative)

Economists apply analysis to issues within a variety of fields, such as education, health, development, and the environment. Some economists study the cost of products, healthcare, or energy while others examine employment levels, business cycles, or exchange rates. Economists often study historical trends and use them to make forecasts. They research and analyze data using a variety of software programs (tech), including spreadsheets, statistical analysis, and database management programs.



Almost 50% of all economists work in federal, state, and local governments collecting and analyzing data about the U.S. economy, including employment, prices, productivity, and wages among other types of data.

They also project spending needs and inform policymakers on the economic impact of laws and regulations.

Corporate economists and help them understand how the economy will affect their business, specifically consumer demand and sales to help a company maximize its profits. Economists also work for research firms and think tanks, where they study and analyze a variety of economic issues. Their analyses and forecasts are frequently published in newspapers and journal articles.

This is a very influential career field that is vital to deciding how money and resources are distributed, strategically placed and effectively used. The analysis provided to companies, government and firms could determine the success or failure. Using the engineering method to make such important suggestions and decisions is a critical skill set for success.

Whether it is the economics for a department in Washington D.C. or the economics for your personal life, these skills may determine someone's financial future.

Types of economists:

Econometricians develop models and use mathematical analyses to test economic relationships. They use techniques such as calculus, game theory, and regression analysis to explain economic facts or trends in all areas of economics.

Financial economists analyze savings, investments, and risk. They also study financial markets and financial institutions.

Industrial organization economists study how companies within an industry are organized and how they compete. They also examine how antitrust laws, which regulate attempts by companies to restrict competition, affect markets.

International economists study international trade and the impact of globalization. They also examine global financial markets and exchange rates. Labor economists study the supply of workers and the demand for labor by employers.

Specifically, they research employment levels and how wages are set. They also analyze the effects of labor-related policies, such as minimum wage laws, and institutions, such as unions.

Macroeconomists and monetary economists examine the economy as a whole. They may research trends related to unemployment, inflation, and economic growth. They also study fiscal and monetary policies, which examine the effects of money supply and interest rates on the economy.

Microeconomists study supply and demand decisions of individuals and firms. For example, they may determine the quantity of products consumers will demand at a particular price. Public finance economists study the role of government in the economy. Specifically, they may analyze the effects of tax cuts, budget deficits, and welfare policies. **(creative financing and imagination is a valued asset in this industry)**

Education requirements

A master's degree or Ph.D. is required for most economist jobs. Students can pursue an advanced degree in economics with a bachelor's degree in a number of fields, but a strong background in math is essential. A Ph.D. in economics requires several years of study after earning a bachelor's degree, including completion of detailed research in a specialty field.

Candidates with a bachelor's degree qualify for some entry-level economist positions, including jobs with the federal government while an advanced degree is sometimes required for advancement to higher level positions.

Most who complete a bachelor's degree in economics find jobs outside the economics profession as research assistants, financial analysts, market research analysts, and similar positions in business, finance, and consulting.

The salaries are great of course, but it doesn't matter how much money you make if you hate your job! Here are some of the best qualities you would need to be the best economist possible:

Analytical skills. Economists must be able to review data, observe patterns, and draw logical conclusions.



For example, some economists analyze historical employment trends to make future projections on jobs.

Communication skills. Economists must be able to explain their work to others. They may give presentations, explain reports, or advise clients on economic issues. They may collaborate with colleagues and sometimes must explain economic concepts to those without a background in economics.

Critical-thinking skills. Economists must be able to use logic and reasoning to solve complex problems. For instance, they might identify how economic trends may affect an organization.

Detail oriented. Economists must pay attention to details. Precise data analysis is necessary to ensure accuracy in their findings.

Math skills. Economists use the principles of statistics, calculus, and other advanced topics in mathematics in their economic analyses.

Writing skills. Economists must be able to present their findings clearly. Many economists prepare reports for colleagues or clients; others write for publication in journals or for news media.

Employment of economists is projected to grow 14 percent from 2012 to 2022, about as fast as the average for all occupations, with the exception of the federal government which is filled to capacity with young economists looking at another 15-20 years of employment, limited new positions availability.

This is one of those STEM career fields that will NEVER go away, regardless of innovation, and if it's just for you, your personal finances will certainly need an effective economist.



A photograph of four children in a classroom setting, focused on a science experiment. A girl with long brown hair in a pink shirt is on the left, looking intently at a test tube. A girl with long brown hair in a purple shirt is in the background, also looking down. A boy with short dark hair in a green shirt is in the foreground, leaning over the table and looking at the test tubes. A girl with long blonde hair in a green shirt is on the right, looking at the test tubes with an open mouth. A hand in a blue sleeve is holding a test tube. There are four test tubes on the table with colored liquids: red, yellow, orange, and blue. The background shows bookshelves.

Curiosity

Augmented Reality & Autism (AS)

and how it helps support students of all abilities

By Ciarán Mather



It should go without saying that having an education is a fundamental right for everyone regardless of their age, gender, race or ability. With the rise of technology in education, or EdTech for short, it is now easier for students to access and avail of the best possible resources that the world has to offer.

Firstly, why is education important? Education is important as it effects all aspects of our lives. According to Habitat for Humanity of Broward, being educated allows for us to:

- Live in harmony together
- Break down barriers associated with race, class, culture etc.
- Build more interconnected communities
- Make informed choices
- Nurture and learn from each other
- Turn dreams into reality
- Be secure and improve on our self-confidence and self-worth
- Ensure economic growth

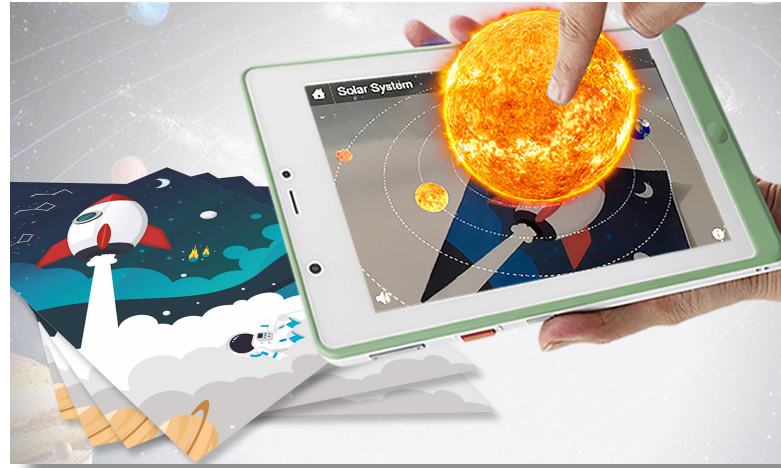
The list goes on — however, most of all, it gives us the necessary skills to become good citizens.

Making the impossible possible:

From an early age, children's brains are developing and changing incredibly fast. Their brains are like sponges: they absorb information and this information in return spurs on their curiosity and their explorative minds, which in turn allows them to open up, engage and ignite their passions.

The earlier a child is stimulated with education, and their senses become receptive of their environment, the better their outcomes. Researchers now suggest that children between the ages of 7 and 11

years old already have perceived ideas and grassroots of the kind of job choices they may make in the future which require STEM Skills.



Classroom diversity:

According to the World Health Organization (WHO), around 15 percent of the world's population lives with some form of disability or special educational needs—and of that 15 percent, 2 to 4 percent experience significant difficulties in functioning.

However, the global disability prevalence is thought to be higher than previous WHO estimates, which date from the 1970s. Instead, data from last year suggests a figure of around 10 percent is more accurate, with 190 million (3.8 percent) who are 15 or older and have significant difficulties in functioning.

Above all else, diversity in the classroom (both racial diversity and neurodiversity) needs to be addressed. Delivering lessons that are informed and engaging across all

Students and educators alike are breaking down barriers. Technology in the classroom is opening the doors to social inclusion for all, with Augmented Reality (AR) in particular providing a means to converse with the world and enable teachers to deliver captivating and engaging lessons.

Simple apps that can provide students with ‘see, feel and touch’ technology allow for effective, blended learning. These applications allow users to effectively communicate with the outside world in real time.

The introduction of these innovative teaching methods aims to increase cognitive interest amongst students. This in turn allows for both greater academic motivation and social expression, as well as a calmer classroom environment.

AR's benefits for AS, Dyspraxia and Dyslexia:

Many students with learning difficulties (and those on the Autism Spectrum) struggle with the constant flow of stimuli that they intake. It is for this reason that keeping lessons engaging and fun is a huge priority for educators. Finding ways to stimulate and motivate AS pupils while addressing and incorporating interactivity can be frustrating, but AR can make this easier.

Communication is vital for students with AS so that they can feel a sense of belonging in their community. The reported benefits of AR in helping those on the spectrum include:

- The ability to teach facial expressions and what they mean.
- It provides an outlet for students to improve basic social interactions, such as eye contact and asking questions, as well as non-verbal social cues.
- The ability to teach students simple but essential tasks, such as brushing teeth, through a step-by-step guide.

- Helping those on the spectrum to create task tables and to-do lists to aid their routine and measure progress, as making lists serve as a great coping mechanism. Scheduling is also important, as many young people with AS dislike sudden changes to their schedule.

In the case of Dyspraxia, one study that was unveiled at the 2018 Fifth International Conference on eDemocracy & eGovernment, investigated how AR could help students with the condition to improve their balance and motor skills. Researchers used a game known as ATHYNOS and found that it was able to help children with the condition 'to be more engaged in physical training and improving their bodily-kinaesthetic intelligence, taking into account that children are digital natives.'

To elaborate, areas in which dyspraxic students greatly improved in included: motor skills, hand-eye coordination, bilateral integration, and sequencing.

As for helping students with Dyslexia, some of the benefits reported by users with this learning difficulty include improved language skills, pronunciation and literacy rates. AR apps that contain STEM-based lessons, such as those provided by the EdTech company CleverBooks, may also appeal to those with dyslexia. In the case of a similar learning difficulty, Dyscalculia, students can break down complex 3D concepts and mathematics into simpler forms in a step-by-step manner.

It should be noted that each diagnosis of the above conditions is unique to each student, and overlaps of, for example, Autism and Dyslexia, are not uncommon. However, having these easily-accessible tools provide a richer learning approach across subjects, especially STEM, geography and language-based ones.

In the case of a geography app that utilizes AR, it would allow them to interact with other countries that they may not feasibly have a chance to access or visit. To give another example, these apps can also enable them to take part in a virtual archaeological expedition.

Regardless of the learning condition, the advantages reported among students with additional needs that used AR were increased motivation, interaction, an engaging the student – all of which are criteria that help inclusive education.

The close bond between STEM and AR: As one study by The European Journal of Special Needs Research from last year explains:

“The results showed that the AR applications had a large effect across the 16 single-subject studies. The effect of AR was the largest in promoting an individual’s learning skills, followed by social skills, physical skills, and living skills.

This study offers an important insight into the relative success of AR in promoting academic and functional living skills to individuals with special needs.

It also offers research-based guidance to decision-makers for supporting adolescents with special needs, such as autism spectrum disorders and intellectual disabilities.”

In addition, more girls than ever before are pursuing STEM-based careers. This is a very important development, as the STEM workforce is still mainly male-dominated. Their different approaches to problem solving, combined with their male counterparts’ methods, creates a valuable insight into problem solving.

AR’s future in education:

The benefits of AR apps for students means that ordinary textbook learning can now be brought to life thanks to the gaming elements present. Apps have a huge scope to expand in the future, and eventually may include AR-enabled worksheets, which should be welcomed across the board, especially in regards to remote-learning settings.

Research now suggests that combining AR technology in the classroom is highly beneficial. Positive implications include:

- Allowing one to experiment and subjects more.
- Giving instant feedback.
- Increasing participation amongst all students.
- Allowing you to monitor students’ performances and tailor the lesson to suit their needs.

- Making learning and role-play more fun and engaging, while also allowing for healthy competition.
- Strengthening one's memory and allowing them to retain information easier thanks to its engaging nature.

Tech replacing teachers?

The inclusion of technology in education has called into question if it could ever replace humans. In a classroom setting, this is highly unlikely to happen. Children will always respond to a teacher in the classroom; an app could never replace a teacher's unique insight into a student's welfare and social/educational needs. Teachers would also be able to pick up on eye contact, would have the ability to listen, and would provide a shoulder to cry if needed. Human interaction is invaluable, but most of all, it is the teacher's ability to inspire children — sometimes even with just a single lesson — giving them the edge over technology.

AR apps are purposely designed to be fun for all users, but imagine the fun that could ensue if the teacher gets the instructions wrong while trying to work it out. Not only could this be funny, it could be the best lesson learned, as it shows that it is alright to make and learn from mistakes, and to have fun whilst learning.

Navigating our futures:

STEM subjects provide openings across all career sectors, but they also cross over

into our everyday lives in cooking, building, gardening, shopping, home-making and much more.

Education empowers our citizens to build their futures. Planning now is crucial. The pandemic has shown us that we need to value our educators, students and parents, as they are building the future for tomorrow's world. This past year, AR/VR showed an increase in usage across all sectors. Strategic planning (especially in the context of STEM) that is implemented now will benefit the economy and workforce. Many people with STEM qualifications are highly sought after by various employers, such as many of those located in Silicon Valley. These often include students with the aforementioned conditions AS, Dyslexia and Dyspraxia, due to their natural diligence, unique perspectives and attention to detail.

The main priority of education is to arm students with the bare necessities to advance forward and be the best version of themselves; regardless of their challenges.

About the Author:

Ciarán Mather is an Irish journalist and author. He is a regular contributor to Newsday.ie as well as The Kildare Nationalist newspaper. He has also written for Evoke.ie and worked as a former Marketing Intern at CleverBooks AR. He has a vested interest in science, tech, entertainment, mental health and additional needs awareness.

MINECRAFT



Play **Minecraft** With The FAA!

With the help of gaming technology, the FAA's Southwest Regional Office in Fort-Worth, Texas inspires young students to explore their interest in the aviation community.

On January 21, 2021 the FAA recognized more than 1,200 students that enrolled in the agency's STEM AVSED Airport Design Challenge through two virtual awards ceremonies. The challenge aimed to educate and inspire K-12 students by having them build a model airport in the virtual world of Minecraft. The challenge taught students about airports and the role they play in the National Airspace System. Over 360 teams from across the world, many of which reside in Texas, developed their projects for approxi-

mately six weeks; ultimately pouring over 5,000 hours into the project. During this time, students received individualized instruction from FAA staff who specialize in specific areas of the airports each team worked on.

The Airport Design Challenge allowed students to engage in aviation and aerospace activities even after the cancellation of many in-person events due to COVID-19. Every student walked away from the program with STEM-based applied knowledge in math and engineering and career development skills.

At the project's conclusion, a panel of FAA staff assessed and scored each entry. Considerations for winning entries

included:

- Technical accuracy
- Creativity
- Innovation and
- demonstrated knowledge

All of the winners received medals, and all students who finished the challenge received certificates and a lanyard.

During the two ceremonies, FAA Administrator Steve Dickson congratulated all of the Challenge participants and winners. Dickson noted the dedication, focus and attention to detail students put into their projects. He said those skills are critical to the aviation industry and encouraged students to consider future careers in this sector.

FAA Southwest Regional Administrator Rob Lowe and FAA program analysts Blair Hess and Chuck Tackett led the award ceremonies. Hess and Tackett are team members from the FAA's Southwest Regional Office who helped conceptualize and execute the Challenge.

“This challenge was intended to be a pilot and early on, we tried to determine what success would look like but we had no way of knowing how far reaching it would grow,” said Hess. “Every day we would talk to people about what we were doing and immediately, they would want to be involved. Employees wanted to help, teachers and students wanted to play. It was incredible and the momentum never

slowed down. It was a virtual outreach experiment that was a tremendous success which may have pioneered a new way of looking at how we engage students at all levels.”



The two ceremonies were split by age group; the first included participants in grades K-6 while the second included grades 7-12. A review of each team's work on building primary and non-primary airports in Minecraft determined the winners from each grade range. Each ceremony streamed videos of the winner's and finalist's Minecraft airports.

In the K-6 non-primary airport category, the team Sound Pride from Greencastle, Indiana won. The team of three elementary students built Putnam County Regional Airport, replicating every aspect of the airport and adding new features such as a control tower and an underground luggage delivery system. Their detailed video showed the airport at night and at sunset. The Crafters, a brother and sister duo, won the K-6 primary airports category. They built Trenton-Mercer Airport in New Jersey, going into great detail to show elements of the airport including the control tower and various hangars around the field.

In the 7-12 non-primary airport category, Team BASA from Boca Raton, Florida won for their depiction of the Boca Raton Airport. Their recommendation for future airport innovations included buildings and ramps for cargo and passenger drone activities.

Finally, Oklahoma's Solo Block Innovations won the 7-12 primary airport category for building Will Rogers World Airport in Oklahoma City, Oklahoma. Some of the unique additions recommended for the airport include a solar panel farm and a heliport.

"People keep asking if we plan to do it again and we would love to," said Hess. "Like the conclusion of all good programs, however, we have some work to do in identifying lessons learned, what worked and what didn't, and how we want to take the Airport Design Challenge and

future programs like it, to new levels."

Learn more about the STEM AVSED Airport Design Challenge. A library of finalist's airport entries is also available for public viewing.

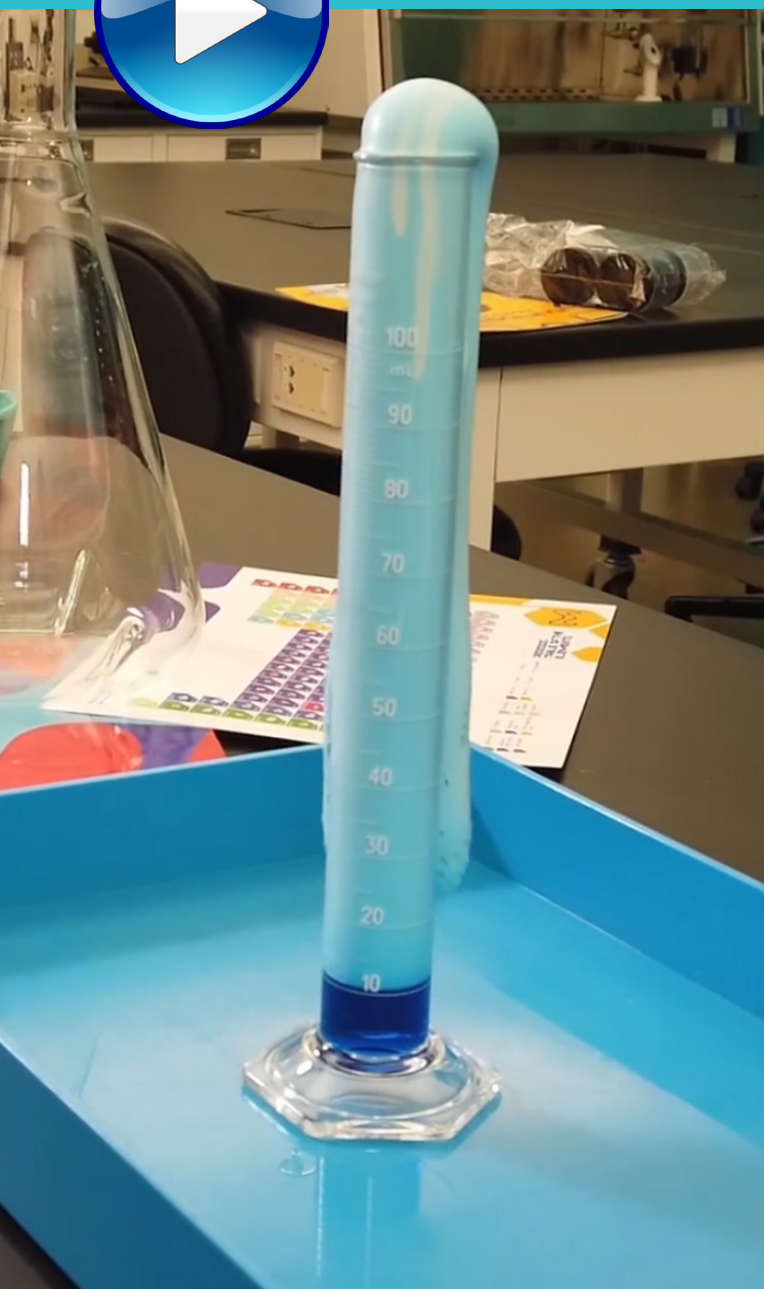
https://www.faa.gov/education/virtual_learning/airport_design/





ELEPHANT TOOTHPASTE

Home and school experiment



This fun and easy experiment in chemical reactions uses safe household ingredients and teaches an engaging lesson in science.

Watch the video at the left and download the lesson plan as well as the lab report for reference.

Lesson Plan: [Click Here](#)

Lab Report: [Click here](#)

Millipore
Sigma



Farming Robot Kills

By Carbon Robotics



100,000 Weeds Per Hour With Lasers

A person can weed about one acre of crops a day.

This smart robot can weed 20 acres / day.

Carbon Robotics, an autonomous robotics company, today unveiled its third-generation autonomous weed elimination robots. The Autonomous Weeder leverages robotics, artificial intelligence (AI), and laser technology to safely and effectively drive through crop fields to identify, target and eliminate weeds.

“Farmers, and others in the global food supply chain, are innovating now more than ever to keep the world fed. Our goal at Carbon Robotics is to create tools that address their most challenging problems, including weed management and elimination.” Unlike other weeding technologies, the robots utilize high-power lasers to eradicate weeds through thermal energy, without disturbing the soil.

The automated robots allow farmers to use less herbicides and reduce labor to remove unwanted plants while improving the reliability and predictability of costs, crop yield and more.

“AI and deep learning technology are creating efficiencies across a variety of industries and we’re excited to apply it to agriculture,” said Carbon Robotics CEO

and Founder, Paul Mikesell. “Farmers, and others in the global food supply chain, are innovating now more than ever to keep the world fed. Our goal at Carbon Robotics is to create tools that address their most challenging problems, including weed management and elimination.”

By deploying robots created by Carbon Robotics, farmers will experience the following benefits:

- A significant increase in crop yield and quality: Lasers leave the soil microbiology undisturbed, unlike tillage. The lack of herbicides and soil disruption paves the way for a regenerative approach, which leads to healthy crops and higher yields.
- A reduction in overall costs: Automated robots enable farmers to reduce the highly variable cost of manual labor as well as reduce the use of crop inputs such as herbicides and fertilizers. Labor is often farmers’ biggest cost and crop inputs account for 28.2% of their total expenses. Reducing costs in both these areas is a huge benefit.
- Adoption of regenerative farming practices: Traditional chemicals used by

farmers, such as herbicides, deteriorate soil health and are tied to health problems in humans and other mammals. A laser-powered, autonomous weed management solution reduces or eliminates farmers' needs for herbicides.

- An economical path to organic farming: One of the largest obstacles to organic farming is cost-effective weed control. A solution to weed management that doesn't require herbicides or an increase in manual labor provides farmers with a more realistic path to classifying their crops as organic.

Carbon Robotics' groundbreaking technology is designed for row crops with 200 acres to tens of thousands of acres. A single robot will weed 15-20 acres per day and replace several deployments of hand weeding crews. Since its founding in 2018, the company has worked closely with farmers to develop its technology, which supports effective and efficient weed elimination for both conventional and organic farmers.

The robots have undergone beta testing on specialty crops farms, working on fields with a variety of crops, including broccoli and onions. "This is one of the most innovative and valuable technologies that I've seen as a farmer," said James Johnson of Carzalia Farm, who has utilized Carbon Robotics' technology on his farm. "I expect the robots to go mainstream because of how effectively they address some of farming's most critical

issues, including the overuse of chemicals, process efficiency and labor. These robots work with a variety of crops, are autonomous and organic. The sky's the limit."



Carbon Robotics' 2021 models have already sold out, but new models for the 2022 growing season are available for pre-order. Carbon Robotics offers a leasing option, which makes the robots more accessible to smaller farms with less acreage. The company will continue to explore new robot models and capabilities to help farmers improve efficiency and reliability across a variety of tasks.

About Carbon Robotics

Carbon Robotics is pioneering the next revolution in agriculture through the deployment of autonomous robots. Carbon Robotics' Autonomous Weeders are purpose built to tackle one of the industry's biggest problems: weed control. By leveraging artificial intelligence, robotic controls, and laser technology, Carbon



Robotics' revolutionary, high-precision approach improves crop yield, provides safer working conditions for farmers, reduces overall costs associated with modern farming, and creates sustainable paths to regenerative and organic produce. Carbon Robotics was founded in 2018 and is based in Seattle.

Editors comments:

A variety of challenging new STEM jobs will be associated with these innovative robots.

- They will need to be built (engineering)
- They will need to be programmed (computer science)

- They will need to be managed (science)
- They will need to be repaired and maintained (technology)
- They will need upgrades (software)
- They will need to be redesigned in the future (creative engineering)
- They will need people like you with the interest and skills to make these robots functional and in the process, reduce the amount of pesticides and chemicals dumped on our food.

Design Iterations:

Empowering Students to Work like Real Engineers



By Tom Robertson

Engineering is an iterative process in which engineers are constantly refining and tweaking systems until they are fully optimized. Providing students with the opportunity to participate in multiple design iterations – whether they are in the classroom or at home – helps replicate this process and is imperative to offering an authentic and engaging real-world learning experience.

That said, having students create multiple physical iterations can take time and be costly. Think about the common bridge-building exercise – typically students draft their bridge and truss design, build it, and test it out, after which the materials are destroyed. It's unlikely and often not possible for them to repeat this process five, ten, or fifteen-plus times in order to improve their design. By taking the design iteration process online, however, educators can provide students with

the opportunity to improve designs over time.

Here are three benefits of conducting design iterations virtually as part of the CTE and STEM learning process.

Teaching important math and science concepts. By having the opportunity to complete multiple design iterations – whether it is a bridge structure, glider, CO2 car, or other system – students have the opportunity to learn deeply about various math and science concepts, from force to fractions and more, in order to optimize their designs. Developing an understanding of these concepts is key in students' mastery of the NGSS and other state and engineering standards.

Motivates students in unique ways. Completing multiple design iterations leads to a higher likelihood of success, which helps boost students' confidence and ultimately their ongoing engagement. With programs like WhiteBox Learning, an online system that teaches middle and high school students about real-world design, students have the opportunity to test out their virtual models against the models of fellow students in their class, school, district, or even across the country.

This added competition element further motivates students to do their best as they work through multiple design iterations to potentially climb the leaderboard.

Enables students to take charge of their own learning. Having students complete the design iteration process online really puts them in the driver seat of their own learning and gives them ample opportunities to think critically and showcase their understanding. They can often complete the process – from research to design to testing to competing – by themselves, anywhere and at any time since the work is happening online.

With a CO2 dragster car for example, students can make specific improvements to the body of their virtual car or the positioning of the wheels based on their own knowledge and performance data and continuously work to improve their design – either in class or at home – before building a physical model under teacher supervision.

Providing students with real-world learning opportunities and experiences is so important in fostering their understanding and helping them to develop meaningful connections. Regardless of the learning environment, participating in online design iterations helps students develop and practice engineering skills and truly empowers them to work like a real engineer.

Tom Robertson is the founder of White-Box Learning. To learn more about this online program for CTE and STEM education, visit Flinn Scientific's website at www.flinnsci.com/whiteboxlearning.

Use it in class. Use the smart board. Use it at home.

Send this link home with your students so they can share with their parents, connect and talk about STEM careers and how best to prepare.....together.

Curiosity and learning are ageless.



Content Invitation

Georgia Pathways™ STEM Magazine requests the privilege of including your content or the content of your students in upcoming issues. This is a great opportunity for students to be published and for educators and industry professionals to share their insights and wisdom regarding careers across Georgia.

If you have questions, please contact the publisher at:

wayne@tagonline.org

770.370.1905

Content submissions:

- Word.doc format
- **Completely** revised and spell checked.
- Everything as an attachment.
- Unlimited electronic distribution to everyone in Georgia.

Advertising:

- Full page ads are available monthly at a very low cost.

Blue Ridge

Rome

Atlanta

Athens

STEM is Georgia Wide

Columbus

Macon

Savannah

Brunswick

Albany

Valdosta