May 2018

GEORGIA PATHWAYS
MAGAZINE

Georgia STEM Day 2018
Dr. Reginald H. Turner

STEMpower for *Girls*

COMPUTER Science for Georgia

TAG Technology Association of Georgia
TAG TAG-Ed Education Collaborative

For sponsorship information, email us at jeffrey@honorcodeatl.org

<honorCode> | 2018 Future Workforce Conference at EMORY GOIZUETA BUSINESS SCHOOL

The 2018 Future Workforce Conference aims **to bridge the gap between K12 education and the local business community**

De-Siloing K12 Education and Business

GOALS

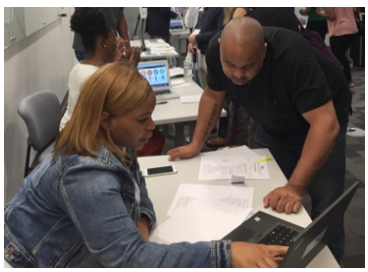
Connect K12 educators with industry professionals to further align education to future workforce needs

Promote inclusivity and equity in education and tech

Support innovative educational programs building skills for the future workforce

Explore existing industry-education partnerships

Establish new partnerships across the workforce-education gap



OUTCOMES

***Every educator** leaves with **at least**:*

- **Connections** in growing industries
- **Opportunities** for teacher and student professional development
- An **understanding** of future workforce needs and practices
- **Examples** of how industry skills can be woven into the K12 classroom
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Where: **Emory University's Goizueta Business School**

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Bryan Cox

Computer Science Specialist

GaDOE Georgia Department of Education

To register, visit tinyurl.com/y8wsz7v7

TAG
Technology Association of Georgia

Thanks for visiting another edition of Georgia Pathways STEM Magazine. We thank you for your support and continued readership. And in this edition we're truly excited to share the success of Georgia STEM Day on May 4th! Our sincere thanks to Governor Deal for his annual support of and leadership on this day by proclaiming it to be a statewide initiative.

This year, through the support and engagement of educators, community partners and corporate leaders we reached practically 2 million constituents across the state. These numbers are a testament to the critical importance Georgia places on STEM education. We are fortunate that our leaders, educators and businesses understand the value in making STEM education opportunities easily and widely available to all students.

As you read, enjoy and share this latest edition of Georgia Pathways STEM magazine you will find inspiration for the activities and opportunities being created around STEM education every day for everyone across this state.

As we push forward into summer, we're looking forward to our internship experiences, coding camps and a professional development series that will enhance, and continue to develop, a variety of students for Georgia's future workforce.

That's the power of STEM!

Larry K. Williams
President
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.

The Technology Association of Georgia Education Collaborative (TAG-Ed) strengthens the future workforce by providing students with relevant, hands-on STEM learning opportunities and connecting them to Technology Association of Georgia (TAG) resources. Formerly the TAG Foundation, TAG-Ed is a 501(C)(3) non-profit organization formed by TAG in 2002. Later, the organization's name was re-branded to TAG Education Collaborative to facilitate our role as the leaders for K-12 STEM education in Georgia.

PRESIDENT/CEO
Larry K. Williams

PUBLISHER
Wayne Carley

EXECUTIVE DIRECTOR/EDITOR
Errika Moore

CONTRIBUTORS
Mary Kay Boler, TAG-Ed Staff
Shanice Saunders, TAG-Ed Staff
Dr. Reginald Turner, TAG-Ed Staff

The Technology Association of Georgia (TAG) and
TAG Education Collaborative
75 5th Street, Suite 625 Atlanta, GA 30308

http://www.tagedonline.org

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TAG | TAG-Ed Education Collaborative

From the Executive Director

As an engineering student at Georgia Tech I had the opportunity to not only evolve as an engineer…but to learn some of life's great lessons as I evolved into a "well-rounded" engineer. Why would I establish that there's a distinction? Well recently, I'd say that many who study the "trends" of the STEM industry might actually agree that this distinction is becoming more and more critical. In fact, Columnist Peter Coy stated in a Bloomberg Business Week article, "New research finds that from 2000 to 2012, jobs that require "non-cognitive" skills, such as the ability to communicate and work in teams, grew much faster than jobs mainly requiring skills measurable by IQ or achievement tests. " Not surprising at all. Most of my growth and "stretch" opportunities came from working in teams and presenting to professors, leaders or other students. Even serving as a national leader in an organization like the National Society of Black Engineers allowed me to develop "the whole person" and my "soft skills" to balance my engineering pedigree.

In a December 2017 Washington Post article, Cathy N. Davidson, founding director of the Futures Initiative, a professor in the doctoral program in English at the Graduate Center, CUNY, and author of the new book, "The New Education: How to Revolutionize the University to Prepare Students for a World in Flux" shared what she discovered at - of all places – Google. She wrote, "Sergey Brin and Larry Page, both brilliant computer scientists, founded their company on the conviction that only technologists can understand technology. Google originally set its hiring algorithms to sort for computer science students with top grades from elite science universities.

But in 2013, Google decided to test its hiring hypothesis by crunching every bit and byte of hiring, firing, and promotion data accumulated since the company's incorporation in 1998. Project Oxygen shocked everyone by concluding that, among the eight most important qualities of Google's top employees, STEM expertise comes in dead last. The seven top characteristics of success at Google are all soft skills: being a good coach; communicating and listening well; possessing insights into others (including others different values and points of view); having empathy toward and being supportive of one's colleagues; being a good critical thinker and problem solver; and being able to make connections across complex ideas."

Now it's not to say that they're the ultimate benchmark…but pretty close. And I think it's impressive that they took the time to study, understand and realize that whereas STEM skills and proficiency are foundational elements, there's value in developing the whole person. Here at Georgia Pathways we value and encourage the discovery of "what's possible." And what's possible shouldn't be pigeon-holed to one lens. We commend thought leaders in the STEM industry who embrace the whole "360" that young talent brings to the table.

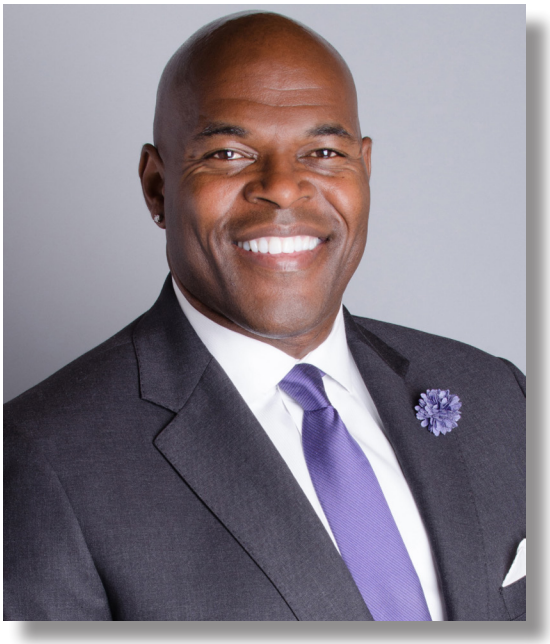
Sincerely,

Erika Moore

Executive Director
TAG Education Collaborative

Georgia STEM DAY 2018

"STEM is Everywhere and STEM Education is for Everyone"



Dr. Reginald H. Turner
Senior Director of Partnerships
TAG-Ed Collaborative

Every student in the state of Georgia should be given the high-quality Science, Technology, Engineering, and Math (STEM) education opportunities that allow them to join in the innovation economy, have the tools to solve our toughest challenges, and be active citizens in our increasingly technological world. In recognition of the vital importance of STEM education for the state of Georgia's future workforce, its economic growth and its overall competitiveness, Governor Deal signed a proclamation on May 3, 2013 declaring the first STEM Day for the state.

Six years later with thousands of participants in statewide programs and nearly 1,000,000 reached through this annual awareness effort, STEM Day continues to make an impact in Georgia through the efforts of TAG Education Collaborative, educators, community leaders and corporate partners. STEM is not just coding or for those who wear lab coats. It is the underpinning of manufacturing, food production, health care, technology and so much more that frankly, we might take for granted, but surely can't live without.

It is estimated that by 2020, Georgia will have approximately 250,000 STEM oriented jobs to fill, so it is crucial that our future workforce be prepared with the necessary STEM skill set. Further, Labor market data shows that the set of core cognitive knowledge, skills, and abilities that are associated with a STEM education are now in demand not only in traditional STEM occupations, but in nearly all job sectors and types of positions. (Carnevale, Smith, & Melton, 2011; Rothwell, 2013).

The state of Georgia, as well as other states across the nation, has persistent inequities in access, participation, and success in STEM subjects that exist along racial, socioeconomic, gender, and geographic lines, as well as among students with disabilities. STEM education disparities threaten the state and nation's ability to close education and poverty gaps and meet the demands of a technology-driven economy.

To address the widening skills and opportunity gaps in STEM, GA STEM Day is recognition of collaborative partnerships through organizations like the Georgia Aquarium, Atlanta Zoo, Girl Scouts and Barnes and Noble as well as individual efforts like Amana Academy, Kids-On-The-Move for Success or the American Heart Association. So we salute the hundreds of educators and organizations around the state that worked diligently to bring GA STEM Day to fruition prior to, on and after May 4th, 2018.

This year, TAG-Ed's GA STEM Day was powered by Learning Blade that provided more than 400 STEM career awareness interactive online sessions for 5th through 9th graders. Learning Blade pre-selected a variety of engaging lessons that highlighted a central

theme to demonstrate how "STEM is Everywhere."

Learning Bladed provided this program free of charge for all teachers and students across the state for practically two months. And as a result more than 102,000 minutes of student engagement occurred and over 10,000 lessons were completed.

Below are some of the highlights from G.A. STEM DAY 2018:

- 1,954,264 Facebook Impressions
- 453,656 Twitter Impressions
- 66,991 Website Registrations
- 920 STEM Day table visit at Zoo Atlanta
- 2715 visitors for STEM Day at Georgia Aquarium
- 100 Female participants with American Heart Association
- 500+ at Amana Academy STEM Day Program
- 560 attended Kids on the Move for Success Program
- 1000+ at Tucker Middle School STEM Day school-wide program
- 100+ Teachers using Learning Blade for professional development at Georgia Southern University

As we celebrate the awareness and impact of STEM DAY 2018, we know that there is much more work to do. For STEM Day to have the desired effect of developing a student's lifelong learning skills, as well as the potential for sustained interest in STEM occupations and STEM related competencies, we all must continue to foster and forge meaningful partnerships and collaborations. This coordination should include learning experiences as early as possible through students' educational pathways, integrated into every curriculum, and occurring both inside and outside of the school and classroom.

In turn, this process will stimulate action among key stakeholder groups and help identify what we know currently, what needs to be discovered, and what needs to be developed to achieve the goal of creating equity of opportunity in STEM Everywhere and STEM Education for Everyone!

Submitted by:
Dr. Reginald H. Turner.
Senior Director of Partnerships
TAG-Ed Collaborative

Reginald Turner, PhD is senior director of partnerships for TAG-ED, responsible for building relationships and developing partnerships to expand STEM related programs for K-12 throughout Georgia.

References:

Carnevale, A., Smith, N., & Melton, M. (2011). STEM. Washington, DC: Georgetown University Center on Education and the Workforce. Retrieved from http://cew.georgetown.edu/stem

Rothwell, J. (2013, June). The hidden STEM economy. Washington, DC: Brookings. Retrieved from https://www.brookings.edu/research/the-hidden-stem-economy/

The STEM of Soccer *(Futbol)*

Soccer is a popular STEM sport and very heavy in physics. Once again we see the human brain is already wired for the physics of soccer and other sports, therefore we don't actually have to "learn" it.

Aside from rules and guidelines of the sport, participation if a ballet of science, technology, engineering and math.....***lots*** of math.

The purpose of this article is to simply make you aware of what you're already doing in a practical application, and reverse educate you about the math that is used.

The Engineering of Soccer (decisions)

The engineering method is a decision making and problem solving process we use dozens of times daily as we are constantly choosing from a variety of daily life choices.

In soccer, there are choices as to where to kick the ball, how hard to kick it, how high, to whom and what are all of the possible outcomes of those choices, then we choose in an instant. Sometimes it's a good choice, other times it's not. You win some, you lose some!

The Science of Soccer

Newton's Laws of Physics surround the soccer ball and all play. As a reminder, let's take a quick look at them.

Law 1

The first law of motion is called the Law of Inertia. It states that "**any object at rest, will tend to stay at rest, and any object in motion, will tend to stay in motion unless acted on by an unbalanced force.**"

In soccer however, this unbalanced force is usually the soccer player's foot. Players will use muscles in the body to create a force to move the leg and foot and kick the ball. Because the ball is at rest, it will continue to stay at rest.

But once kicked, it will keep moving without any intent of stopping. The reason the ball will stop is because of friction with air resistance and Earth's gravitational pull bringing the ball back to the turf or the interruption in flight by another players decision to stop its flight path. This happens hundreds of times per game and is a major factor in winning and losing. It's your decision.

Law 2

"The change in velocity (acceleration) with which an object moves is directly proportional to the magnitude of the force applied to the object and inversely proportional to the mass of the object."

This can be explained by the equation F=ma. The acceleration of the ball (a) is determined by the force applied (F) divided by the mass of the object that is being moved (m). This simply means that if the ball has a lot of mass, it will require more force to accelerate. If the ball has little mass, it will require a different amount of force.

In soccer, it is important to know this law because if you want the ball to be moving fast, you must apply more force. If you want the slow down more rapidly and allow gravity to affect ball flight sooner, you apply less force.

The artful dance of ball control is an amazing thing to watch as players constantly make adjustments in force and acceleration to weave the balls path through opposing team players toward their intended target, either another player or the goal itself.

Allie Long of Sky Blue FC is defended by Cat Whitehill (4) of the Atlanta Beat.
(Photo Credit: Howard C. Smith | isiphotos.com)

Law 3

Newton's final law of motion states that

"..for every action, there is an equal and opposite reaction."

This literally means that if you kick the soccer ball, it will kick back at you just as hard. You usually don't realize this because your leg doesn't seem to move, but this is because your leg has more mass, meaning it has more inertia, which is the resistance to move.

This isn't a law, but we need to mention momentum. When a soccer player kicks a ball, they transfers their momentum to the ball. Momentum is the velocity of object times its mass. Also when players pass the ball to each other, they use their feet to slow the momentum of the ball by moving with the ball and resisting it slowly. This way, they can have more control over the ball. This is also an engineering method application.

The Math of Soccer

Physics uses a lot of math of course, but consider your decision making (engineering method) about how hard and high to kick the ball to reach its target, the angle needed to get by the opponent, or the spin you want to "shape" your shot.

Geometry (angles), basic multiplication, trigonometry, calculus.....did you have any idea? You are so much smarter that you know and whether you like it or not, you actually enjoy math in a very practical application.

Say it...."***I enjoy using math***".

Use your "Laws", be safe and enjoy your STEM.

The STEM of soccer is the appl

ication of scientific and mathematical principles to practical ends.

Georgia Tech Students Develop **Stempower** to Mentor Fourth and Fifth Grade *Girls* in STEM.

Stempower Becomes New Outreach Initiative of the Center for the Study of Women, Science, and Technology.

Partnering with the Girl Scouts of Greater Atlanta, two Stempower mentors meet bimonthly with fourth- and fifth-grade girls in a given troop. Stempower has become one of the outreach initiatives of the Center for the Study of Women, Science, and Technology (WST), with eight Tech mentors and 100 Girl Scout mentees in the U.S. When five Georgia Tech students — Brenna Fromayan, Natalie Leonard, Wendy Ng, Anokhi Patel, and Kaitlin Rizk — co-founded Stempower in 2014, they wanted to boost the flagging self-confidence of young women in science, technology, engineering, and mathematics (STEM) fields, despite their natural interest and ability.

"As women pursuing STEM degrees from Georgia Tech, Stempower was personally relevant to all of us from the beginning," remarked Leonard, an undergraduate in the School of Psychology. "The majority of the co-founders had a role model who provided direct encouragement. Yet for girls growing up without a role model, where can they turn for support?

Annette Filliat

We knew that we needed Stempower to fill this gap."Stempower is a mentoring program offered by Georgia Tech women students that encourages girls to explore STEM and learn key character values. Partnering with the Girl Scouts of Greater Atlanta, two Stempower mentors meet bimonthly with fourth- and fifth-grade girls in a given troop. Each meeting is comprised of a different STEM activity — building rockets, making circuits, or learning to code — paired with a character lesson like encouraging questions and valuing mistakes.

“Research shows that young women start losing interest in math and science during middle school. We created Stempower to mentor elementary school girls in STEM, thereby increasing their self-confidence and providing relateable role models,” said Rizk, an undergraduate in the H. Milton Stewart School of Industrial & Systems Engineering.

Three years later, after initial support from the Grand Challenges Living and Learning Community, Stempower has become one of the outreach initiatives of the Center for the Study of Women, Science, and Technology (WST), with eight Tech mentors and 100 Girl Scout mentees in the U.S. Stempower was also launched at Uganda’s Makerere University after Rizk witnessed similar women’s empowerment issues during a service project a few years ago. In fact, now since 2016, the program has had more than 200 girls participate. Eighty percent of the girls are now more interested in STEM, and 63 percent have higher self-confidence.

“After mentoring for years, I still clearly remember my first meeting with a troop,” Leonard reflected. “The meeting opened with a broad discussion about women scientists and engineers. Upon mentioning Mae Jemison, the first African-American woman astronaut, girls raised their hands and jumped up

and down for the opportunity to tell me what they already knew about her. After this first meeting, I walked away impressed by their knowledge and energy and encouraged that supporting these girls through Stempower would help each of them thrive."

According to Carol Colatrella, professor in the School of Literature, Media, and Communication, assistant dean for graduate studies, and co-director of WST, "We are excited to support Stempower as their efforts align with WST's mission and goals to promote the recruitment, retention, and advancement of women students and faculty in STEM fields."

Stempower has expanded to now provide summer camps at Georgia Tech. Stempower Summer Camps expose girls to real-world STEM concepts in a fun supportive atmosphere! Our day camps take place at Georgia Tech and will center around a hands-on project that teach tangible skills and connect their work to cutting-edge research that's done on campus. June 11 – 15 campers will design their own website using HTML code and July 16 – 20 campers will learn about sustainable technology and design their own light-up circuits using Chibitronics!

If interested in becoming a mentor, contact stempower.gt@gmail.com or to learn more about Stempower, visit www.stempowerinc.org

Annette Filliat, APR serves as Communications Manager for Institute Diversity at the Georgia Institute of Technology. To learn more about **Institute Diversity**, visit www.diversity.gatech.edu.

Stempower co-founders from left:
Brenna Fromayan, Anokhi Patel, Kaitlin Rizk, and Natalie Leonard (not pictured - Wendy Ng)

Computational Thinking:
A Hidden Hero in Early STEM Learning

By Dr. *Cory* A. Bennett and Dr. *Beverly* Ray

STEM teaching and learning often focuses on the four main areas within STEM—namely science, technology, engineering, and mathematics—with a heavy emphasis in science in many schools. However, one critical area of STEM that is often overlooked is computational thinking, which is part of the skill set necessary for coding.

According to one of the experts in the field, Jeannette Wing, computational thinking "involves solving problems, designing systems, and understanding human behavior, by drawing on the concepts fundamental to computer science." The ways of thinking about and doing mathematics, not simply calculating solutions to exercises, are similar in many ways to computational thinking and provide a great place to introduce computational thinking into the early elementary curricula.

At its core, computational thinking is centered in 21st century values such as using technology to create and innovate, collaborate, and become adaptive when using tools to analyze, understand, and solve societal and global problems. We know from research that students across grade levels learn and retain more when they are exposed to, and engage in, authentic and relevant experiences. Coding is all that and more.

Teaching and Learning STEM in Early Elementary Grades

For younger students, meaningful learning experiences with coding will feel like "play" despite being a rich and complex cognitive process. These complex or technical opportunities to play forces students to consider the ***why's*** of dynamic situations while allowing them to emulate STEM behaviors and develop cooperative problem solving social skills. When the experience is right, even the youngest students can effectively think and behave like young STEM "experts."

For teachers, this means facilitating STEM learning rather than leading or directing learning as STEM ways of thinking requires students to learn to ask questions and interact as a member of a group of learners. However, many teachers think that coding is an advanced skill that is more appropriate for the later elementary grades. Nothing could be farther from the truth.

There is an overwhelming amount of digital and virtual resources available for learning computational thinking through coding. So much so that the use of technology for technologies sake will not be an issue. As such, we are sharing one way of introducing computational thinking in the early grades, through the use of coding with micro -robots, which could be helpful for those stepping into the world of teaching it to young students for the first time.

Overview of the Ozobot Micro-Robot

Ozobots are tiny "smart robots" about the size of a golf ball that use colored markers to move across a 2-dimensional plane, like a piece of paper. By creating a sequence of different colored lines, with varied patterns drawn a student programming the Ozobot begins to learn the basics of coding. For example, a student might draw a black curve or a line with a marker and then embed the following sequence—short red, short black, short red—to make the robot speed up.

Using black, blue, green, and red markers (we have found that any marker that makes about a 1 cm wide mark will work) various code can be "written" to make the robot perform different actions. In working with students one of the fun aspects is to have them figure out what combination of commands create a particular action and then have the one who "discovers" the command name it.

For example, some student names for commands include slow snail, speed up, whirl wind, tornado, or jumping lines. When you purchase the Ozobots, a printed guide for all of the commands is provided as is access to additional resources such as free introductory and advanced lessons and a teacher's guide. These materials can be found on line at www.ozobot.com/education.

Notes for Teaching

Effective use of any new instructional tool or technique, such as micro-robots, requires pre-planning and a commitment to creating interdisciplinary learning experiences. Without that commitment, including careful alignment of use to regional, national, and/or international standards for learning, use may not go beyond play. And while play can be an important avenue to couch learning, it needs to be deliberately aligned to learning outcomes.

Additionally, do not hesitate to let students teach you what they have learned about coding. From our experiences, the best classroom applications come from teachers who professed to not being an expert but were willing to put these and other coding tools in students' hands and learned from them, too.

In early elementary settings, using age-appropriate technology, like

Ozobots, to develop computational thinking can create opportunities to support or introduce critical ways of STEM thinking. Through such interactions, even students in early elementary grades can become more interested, motivated, and curious about coding. Learning while using robots might feel like play to students but watch as they engage in problem solving, participate in rich technical discussions, and carefully critique and analyze the tasks in front of them. You can create opportunities for students travel beyond the four walls of the classroom and participate in meaningful STEM learning by thinking computationally.

COMPUTER SCIENCE for GEORGIA

Georgia Department of Education

Computer Science for Georgia (CS4GA) Provides Information to All

by *Errika* Moore

Computer Science for Georgia (CS-4GA) is a collective impact effort by diverse stakeholders to bring quality CS education to all children in K-12 systems throughout Georgia's 182 school districts. CS4GA has utilized the collective impact model to bring together stakeholders from all relevant sectors: school districts, industry, universities, philanthropy, state government, and others. CS4GA will ensure that underrepresented groups in particular receive the support they need to fully participate in CS education.

CS4GA will be working with its partners to expand quality teacher professional development to as many schools as possible. There current focus is to define what 'quality CS education' means and to determine which current professional development opportunities can help achieve 'quality'. Based on the demand for teacher PD from around Georgia, they are working collectively to raise funds to provide teacher PD to as many teachers and school districts as possible.

They are particularly focused on ensuring that children who traditionally have not had access to a quality CS education will benefit from the CS education initiatives. They are inviting individuals and leaders from all sectors to help them deliver quality computer science education to students throughout the state of Georgia.

To ensure synergy, Georgia's Department of Education (GaDOE) is providing leadership as the 'anchor' institution for the CS4GA collective impact initiative. Dr. Caitlin Dooley serves as the lead GaDOE representative for CS-4GA while Mr. Bryan Cox, GaDOE's Computer Science Specialist, assists Dr. Dooley in coordinating the CS4GA initiative. Mr. Khurram "Ko" Hassan of Advantage Consulting, LLC is assisting

GaDOE with facilitating CS4GA meetings and providing the collective impact planning leadership necessary to engage all interested CS4GA members.

Sound interesting? Would you like to know who can be part of CS4GA and its structure?

Anyone wanting to ensure that all of Georgia's students have access to quality computer science education can join CS4GA. Simply click here to join or here to learn more about CS4GA in general.

CS4GA's structure:

- CS4GA's members determine its goal and strategies.
- There are three Work Groups that are developing its strategies.
    - Professional Development Group
    - Industry/Philanthropy Engagement Group
    - Policy Education Group
    - Data Committee (part of GaDOE but supported by CS4GA
- There is a Steering Committee made up of CS4GA members that ensures the coordination work being done by GaDOE on behalf of the initiative is overseen by a representative group of CS4GA members.
- Dooley, Mr. Bryan Cox, and Mr. Khurram "Ko" Hassan are the lead individuals providing the 'backbone' to the CS4GA collective impact effort.

Through resources provided by GaDOE and funds raised through grants, CS4GA is able to support and coordinate the members, the planning efforts and to begin implementing initial strategies.

This is a monumental step for Georgia in mitigating disparities, providing equitable access and ensuring we

enhance the workforce and thus the economic competitiveness for the state of Georgia. This is a critical success factor in setting up for the workforce of tomorrow. CS4All launched in September 2015 by the U.S. Department of Education.

At that time, Megan Smith, the U.S. Chief Technology Officer stated that the goal of this initiative is "to empower all American students from kindergarten through high school to learn computer science and be equipped with the computational thinking skills they need to be creators in the digital economy, not just consumers, and to be active citizens in our technology driven world.

Our economy is rapidly shifting, and both educators and business leaders are increasingly recognizing the computer science (CS) is a "new basic" skill necessary for economic opportunity and social mobility." Since then states around the country are individually identifying their own unique or tailored initiatives that are specific to their region. And CS4GA is no different. It is an opportunity to meet the specific needs of the students in Georgia.

Aligning for Impact (A4I):
Aligning Data, Resources, Efforts + Equity

OUTSIDE High School: "A New World of Science"

By Joseph "JJ" D'Alessandro / student

One year ago, when I started my first year of high school, I was excited to think about a new school, new people and new levels of study. During middle school, I discovered that I had a passion for science and math. My favorite television shows were "How It's Made," "MythBusters" and "How the Universe Works."

So when I enrolled in my new high school courses, the three classes that I was most interested in were Earth Science, Algebra and Computer Literacy.

In Computer Literacy, we learned mostly about Microsoft Office and Internet security. In Earth Science we had a "lab period" every other day where we would take what we learned in class and apply it in small experiments.

Some of the topics we learned focused on calculations, such as carbon-dating and nuclear half-lives, but other topics had a visual concepts such as plate tectonics and astronomy. The courses were interesting and challenged me. But despite the things I learned, I felt myself wanting more.

I have always wanted to be a scientist or an engineer. Whenever I talked about my dreams, my parents talked about extracurricular activities at school that focused on STEM. There were such activities – Science Club and Robotics, for example – but these clubs either met infrequently or were dominated by seniors. I didn't feel like I got as much from them as I would have liked.

My parents noticed my disappointment, so as freshmen year ended, we looked to see if there were any summer programs that focused on STEM. Then one day, we discovered an internship for high school freshmen at the Brookhaven National Laboratory called the STEM-Prep Summer Institute. It was a four week program made up of weekly modules dedicated to Physics, Biology, Chemistry, Scientific Computing and Environmental Science.

This was exactly what I wanted to do, but I had to go through a formal application process. There was an application to fill out and an essay to write about my interests in STEM. Then I had to be invited to the Laboratory for a formal interview. Dressed in new suit that my parents bought for the occasion, I was interviewed by Dr. Robert Palomino, who is one of the scientists working on Brookhaven's new National Synchrotron Light Source II project.

He was very kind. We discussed our mutual interest in science and what I wanted to do in the future. Then Dr. Palomino gave me some advice. He described how the STEM profession can unfold in different ways for people.

He shared how even though he earned his Ph.D in physical chemistry, when he was in high school, he didn't like chemistry at all. It wasn't until he was in grad school when he discovered his love for the subject. So he advised me

to be open to all STEM subjects even if I don't enjoy a particular subject in high school.

The day after the interview, I received an email from the program director, Dr. Aleida Perez, informing me that I had been accepted and that I had to complete training modules before Day 1 of the program. When I logged on and saw all the training I had to complete, I thought to myself, "Boy, these people are serious."

I had to complete (and be tested on) Cyber Training, OSHA's Laboratory Standard, Chemical Hazards, Controlling Exposure, Handling and Storing Chemicals as well as a training on how to avoid Ticks and Lyme disease. If I didn't pass these courses, I wouldn't be allowed to start the program.

"I made sure I passed."

The first week of our internship began

with Environmental Science.

We spent two days building Remotely Operated Vehicles that would collect DNA samples from a lake. We then spent the two days on field trips, including a major hike to four different ecosystems where we learned about the local wildlife as well as the history of the landscape and by extension Long Island.

Our second field trip was spent canoeing where we studied different plants and took samples for our upcoming activities. I had no idea Environmental Science was so exhausting!

The second week was dedicated to Biology and Chemistry where we spent a great deal of time barcoding the DNA of our samples. When we weren't working on that, we were working with (safe) E Coli samples and changing the bacteria's genetics to make them glow under UV lights and make them immune to medications. We also studied Chemistry where we learned how to change the pH values of different substances, as well as watching chemical reactions.

Week three was dedicated to Physics, one of my favorite subjects. Every day we studied different types of energy as well as topics related to power sources. We studied static electricity, nuclear fusion and fission. We studied nuclear power sources and learned about stars, half-lives and nuclear decay.

My favorite topic was Particle Accelerators (Brookhaven National Laboratory has a Relativistic Heavy Ion Collider). What I enjoyed was learning about how they work and also about the different types of research that is taking place. This week was special to me because it covered real-world applications that interested me the most: electricity and power.

Our final week at Brookhaven was dedicated to Scientific Computing. It was nothing like the Computer Literacy class I took in school. We created simulations by calculating various mathematical equations. One of the most notable activities we did was creating a maze in a computer. Our objective was to make it so complicated that the computer would have to exceed 200 steps trying to solve it.

This program was a wonderful experience for me because I learned many things that I hadn't been exposed to before. I even learned how to design and create a professional science poster, which we all presented on the final day of the program.

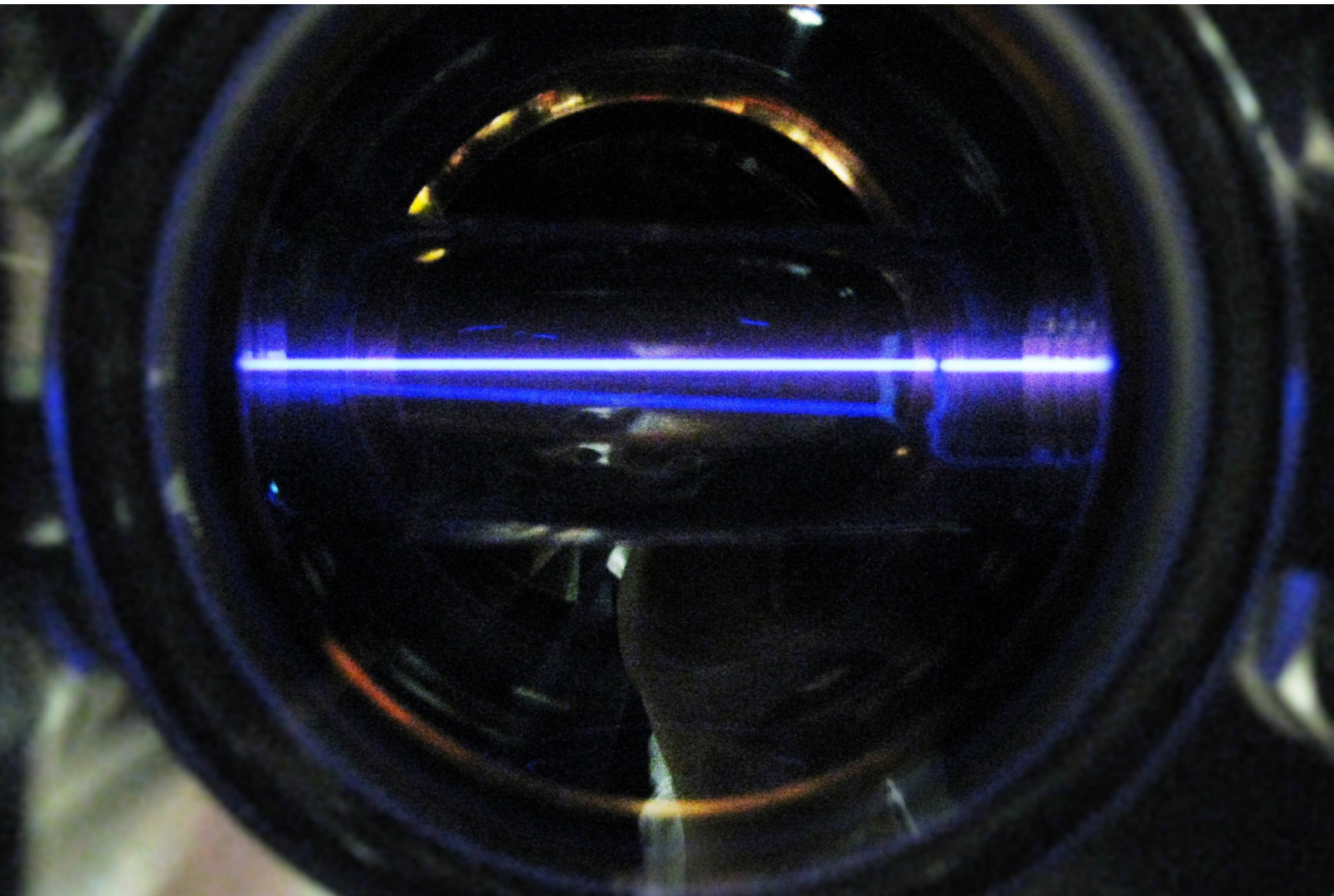
While I still have a great deal more to learn in high school, I am so fortunate to have access to programs like the ones offered by the Brookhaven National Laboratory. They have their own Office of Educational Programs for students and also for teachers who want to incorporate current research topics into their curriculum.

I know that not everyone lives near a national laboratory, but anyone interested in STEM (students and teachers) should look at the Ga. Tech. STEM Teacher Leadership Program at this web address:

https://www.ceismc.gatech.edu/community/stlp

Taking advantage of what is around you is a great way for aspiring scientists and engineers to learn about their careers options and get a head start on their future.

When the program ended, I again had the feeling of wanting more. But that feeling was not out a sense of not learning enough, it was out of sense of excitement that ***there is so much out there to explore.***



To understand STEM...

...you must DEFINE STEM, but you cannot define an acronym using the words it stands for; you must define the words the acronym stands for.

Universities and organizations around the world continue to debate what a STEM career is. There is no doubt that "every career" uses STEM skills and this observation remains the focus of STEM Magazine.

Science: "The systematic accumulation of knowledge" (all subjects and careers)

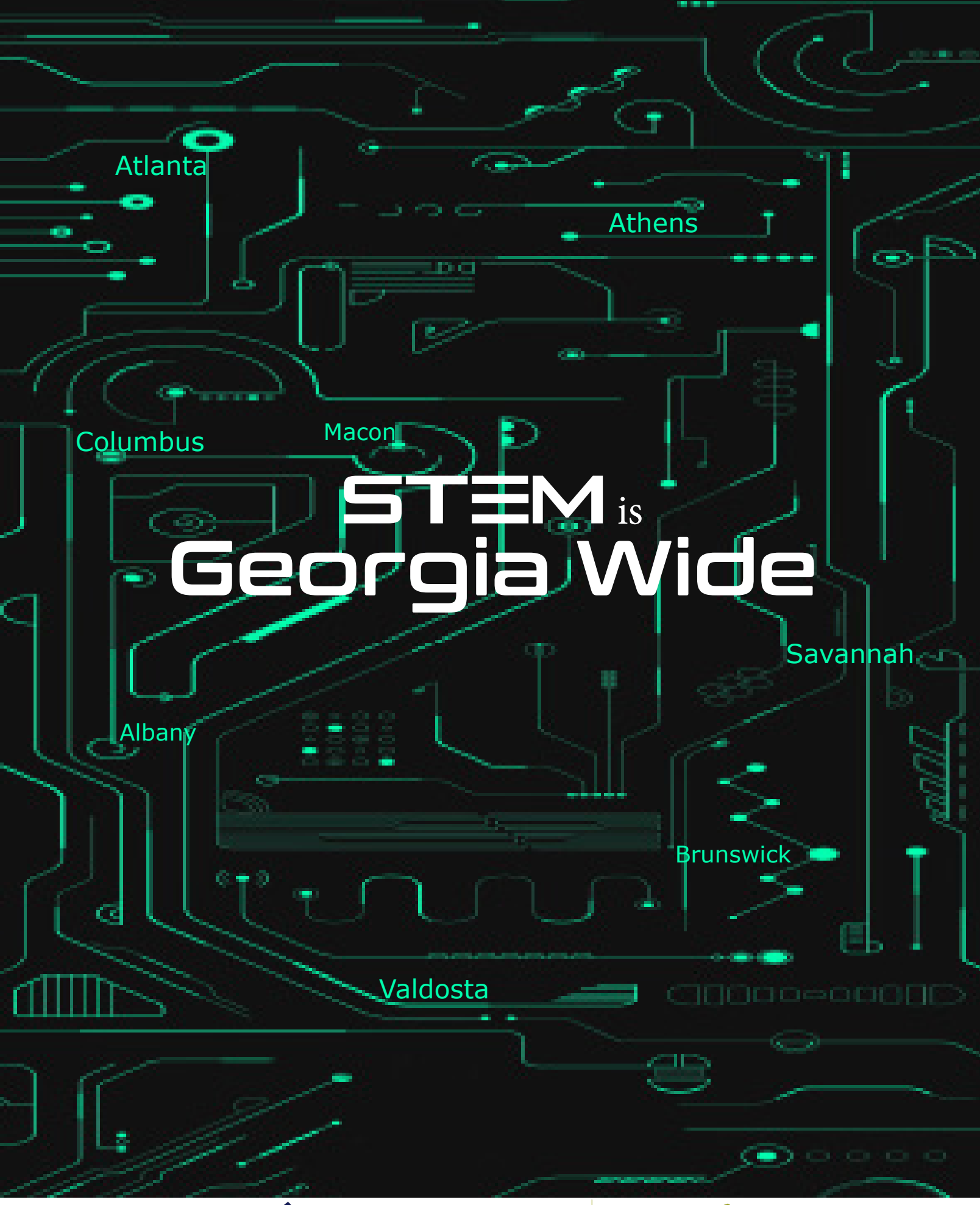
Technology: "The practical application of science" (all subjects and careers)

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

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

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

These definitions are the "real" meaning of STEM skills and STEM careers.



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