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Teaching Our Students to Fly Dr. Richard Larson





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.

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One Random Event

Building Ships

Pi Day Kay Howard



Game Changer

Living Green Contributor Welcome to the March issue of Georgia Pathways STEM Magazine. STEM education and careers continue to be a priority for TAG and TAG-Ed throughout 2021 and far into the future. It's not an overstatement to say the Georgia economy depends on it. Every career field in Georgia, from agriculture to aerospace uses STEM skills on a daily basis to some degree regardless of your education.

With this in mind, I'm please to remind Georgian's of the 2021 Georgia STEM Day scheduled for this coming May 7th. STEM Day serves as both an opportunity for students, families and teachers as well as a reminder to previous participants and the Georgia business community of how vital STEM is for Georgia. Along with participation, corporate support is a vital component for its continued success.

The importance of STEM and the associated skills as they apply to careers here in our state is best understood as we are reminded of what STEM actually means. STEM is of course an acronym for science, technology, engineering and math. Acronym's need to be defined individually for a complete understanding and applications. Science is defined as the systematic accumulation of knowledge. I cannot think of a single career field that does not require the daily and continued accumulation of knowledge for function and success.

Technology is defined as the practical application of science (this accumulated knowledge). From cell phones to fintech and banking security, technology as defined here certainly applies to thousands of Georgia careers. Engineering is a method: a step by step process of solving problems and making





decisions. I have no doubt that you have daily problems to solve and decisions to make. You've been using the engineering method for years and may not have realized it. Of course, there are dozens of distinct careers that require a formal education in a specific engineering field, but the process is much the same daily.

Mathematics is commonly under-estimated in our chosen professions, but is defined as the science of numbers and their operations, interrelations, combinations, generalizations, and abstractions.

Once again, there is not a single Georgia career that does not use math within this definition. From cashier to co-pilot, math is a daily part of our lives. You use it, you need it...so you might as well embrace it. In a sense, everyday is STEM day.

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.

Teaching Our Students How To Fly

Richard C. Larson

Institute for Data, Systems, and Society Massachusetts Institute of Technology

"An investment in knowledge pays the best interest" – Benjamin Franklin

Seems like yesterday, but it was 1993 when my oldest son Erik was in middle school, in our home town of Lexington, Massachusetts. One night, as I was going to bed, I wished him a Good Night, as he was seated on the couch doing something on his color Apple Macintosh IIci. The next morning, I came downstairs and was surprised to see Erik where I left him, on the couch with the computer.

"Erik, you're up early today!"

"No Dad, I never went to sleep! Been here the whole night!"

"That's crazy! What have you been doing?"

"With two friends, I'm doing a project called 'Mammals and Birds.' Want to see what I did during the night?"

"I can't wait!"

Erik then proceeded to show me on the Mac screen animated African birds (correctly drawn) flying through the forest and making native screeching sounds. I was stunned. Flabbergasted. Erik had never before stayed up late for school homework. The idea of an overnighter on homework was inconceivable. And yet it happened, and for his two email-connected collaborating friends as well. They were completing a computer-based project that I did not even know was possible with the technology of the day.

This event changed my life, as a faculty member at MIT who for many years focused on traditional teaching and research, to education as a process of active student engagement. What gets young people truly engaged in learning, especially STEM learning? (STEM = Science, Technology, Engineering and Math).

Our country depends on a growing pool of STEM-educated professionals to help catapult us in new discoveries in all aspects of society: medicine, environment, transportation, housing, and much more. As an MIT "lifer" who entered as a freshman at a time long ago, I began reflecting on the way we taught most of our STEM courses: Stand up chalk-and-talk lectures, with students dutifully taking notes. The professors were content deliverers and the students were the content recipients.

In using blackboard pedagogy, MIT was no different from other universities, no different from most high schools and middle schools. This old-fashioned teaching model has been likened to the mass production process introduced by Henry Ford in 1908, building Model T Ford cars. All "work-in-progress" (cars or students) proceeds at the same pace, with the eventual finished product being clones of those who have gone before. Mixing metaphors, the content-delivery model can be likened to Mother Bird shoving partially digested food down the throats of her chicks. Students, having digested the content, may spit it out the next week on a written test, and then forget it all soon thereafter.

How do you get students to become engaged in their own learning? To pull voluntary all-nighters? To discover and "own" the science and math on the way to something bigger, more important than a grade on the next test? Or the score on a standardized test? Isn't it most important to have Mother Bird teach their chicks how to fly?



In 1993, when Erik pulled the all-nighter, I had not heard of "Project-Based Learning" (PBL). It turns out that's what he and his friends were doing: using science, technology, engineering and math in creative, non-textbook ways to construct something new, something that they invent, they own. They were flying beautifully without Mother Bird!

Today, Project-Based Learning is more matured, established and researched. Today's PBL usually requires the students to work for several weeks in and out of the classroom, collaboratively in small teams. But, unfortunately, PBL used in only some classrooms. The dominant teaching style remains the sitting-in-seats, passive-receiving, mass production model. Many students who could excel in STEM subjects become bored and internally "drop out." They are not engaged. This is a huge loss for them and for our country.

How do we get more PBL into high school STEM classes? Our 20 or so years of activity in this area, working with many STEM teachers, suggests that the biggest impediment to more use of PBL is lack of quality teacher training in PBL. They need to feel comfortable and competent to design and manage a multi-week PBL unit having small teams of students working together, in and out of the classroom.

During the weeks of the PBL exercise, all sorts of things can "go awry," and the teachers need to know how to manage these situations. Proper training, not traditional "Professional Development," is needed to make the teachers comfortable with such a semi-structured and complex learning environment, far from scripted lecturing.

In our work at MIT BLOSSOMS https:// blossoms.mit.edu, we have recently posted six PBL units with all the structural scaffolding a teacher would need to launch and manage a multi-week PBL exercise. These are described in a recent webinar: "Project-Based Learning, Allowing Every Student to Shine." https://opendoor.col.org/webinar-project-based-learning-allowing-every-student-to-shine/ As an example, one of the PBL units starts with an interactive video on "flaws of averages," and then suggests six different PBL units building from this video, each focusing on a safety issue in the students' community.

One, for instance, has the PBL student team identify the ten least-safe traffic intersections in their community; this requires them to create a methodology based on physics and math indicating how they assess safety of an intersection. When finished, they present their findings to a public audience. Such projects treat the student as emerging adults, giving back to the community.

We hope that PBL-focused teacher training is viewed as an important priority on the new Administration in Washington, DC. Thousands of young people, to be fully engaged in their learning, will be grateful -- as will our country. Let them fly high in the sky!

"Let them fly high in the sky!"

About Erik Larson: In 2002, Erik graduated from MIT, majoring in Electrical Engineering and Computer Science. He now is a Project Manager for a computer science firm.

About the author:

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Dr. Larson is Mitsui Professor, Post-Tenure, in the Institute for Data, Systems, and Society of the Massachusetts Institute of Technology (MIT). He is a member of the U. S. National Academy of Engineering. He served as founding director of MIT LINC https://jwel.mit.edu/ about-linc and is Principal Investigator of MIT BLOSSOMS https://blossoms.mit.edu . His career has focused on finding ways to improve services industries, including education, urban service systems, disaster response, disease dynamics, dynamic pricing of critical infrastructures and workforce planning.

At the MIT, for 25 years he has served as a leader for initiatives in technology-enabled-education, especially secondary and tertiary STEM education in the U.S. and in other countries. His research on the STEM workforce has been extensively cited, including, "STEM crisis or STEM surplus? Yes and yes," (with Ms. Yi Xue), Monthly Labor Review, U.S. Bureau of Labor Statistics, May 2015. Given Best-Paper-of-the-Year Award from the Lawrence M. Klein Fund.

One Random Event

By Jane Kellogg



Today, Natalie Shagun is a "Discipline" Flight Test Weapons Engineer for Lockheed Martin Aeronautics at Edwards Air Force base in the California desert working to improve the performance for the Air Force F-35, called The Smart Fighter for the Warfighter, the F-35 Lightning II.

She says she sometimes spends a lot of hours at work, "so with flight tests our work life balance can be crazy. The schedule changes and you have to adapt to it which I personally think is very intriguing and desirable as an early career engineer.

One thing that has been fun on the job is working a night flight. Since Edwards is in the desert you drive across two lake beds and 2 base boundaries to get to the office. Driving this at night somehow felt entirely different...it's exciting! It is kind of cool but at the same time it's demanding. Some days we work 10-11 hours but on other days we might not. We have the ability to flex our time depending on what the warfighter (fighter jet) needs and what our pilots need in order to fly and test our software. As discipline engineers (engineers in charge of a certain capability on the jet) we sit in a control room and observe the live telemetry/data given off from the flying plane as well as communicate to the pilot. Sometimes we can determine successful integration while in the control room in real-time, other times we have to wait for data collected for review."

She primarily runs live missions dealing with weapon integration while the plane is being flown. Sometimes they are integrating a weapon from scratch and run live flight environmental tests. At other times they are verifying new capabilities with new jet software. Sometimes the engineers in the lab can verify that independently, but most times they re-verify with live flight tests.

And to think it all started way back in High School at Southwest Independent School District located in the far southwest corner of San Antonio, Texas, when a friend stopped her in the hall and said, "oh man we need a passenger for our car and you're tiny, would you want to come in and see if you fit in the seat?"

Never had she heard that anyone at the school was building a solar car, so she was somewhat skeptical, and she said, "oh I don't know' this sounds like a commitment. Then she asked if she had to show up some days just to get fitted in the seat and stuff, and he was, 'don't be crazy just come in,' and so she did and was "dumbfounded." She had no idea that the Southwest Engineering Team (SWET) even existed much less that they were designing and building a full-sized Solar car to compete in the 2015 Solar Car Challenge events.

"You never know when one random event can set you on a trajectory that leads you to a career you did not even know existed."



When she saw what they were doing she saw it immediately as an opportunity to be a part of the team and do something more than just be a passenger. While she hadn't known about SWET she was interested in engineering and had taken a lot of STEM classes which enabled her to start working with design right away.

She drafted the rear suspension part of the car with another student. When the entire car team completed the design of the car, it was time to build and implement and test. Since the rear suspension was her design, she was tasked with overseeing and participating in the build. The team put something together, it was approved, and they installed it, then tested that it was operational at the school.

When they got to the Challenge, the suspension collapsed. The original plan was to have two bars and they only put one in for weight reduction. They realized then "we need to fix this now." They felt like a real-life shuttle launch or problem with an immediate need to be repaired. Instead of just hanging out relaxing or turning on the TV in that evening they realized the need to fix the now, so they all put their heads together and literally just did what they needed to do in order to get that car on the track, testing their solution by driving around in the parking lot of the hotel it. The car ready to go first thing the next day.

If it were not for her friend needing her as a passenger in the car, she said she would never have known about the program,



and she definitely would not be where she is today without that experience. She would not have had the confidence that SWET gave her in those classes that made her feel she belonged. She noticed that a lot of people in her classes did not feel they had the skills to be where they were in college, but she did.

Being involved in that competition was quite the experience because she does not think, even now at her job where their work hours are so intensive, that she has ever been through that much duress or stress. Just seeing what they could do in a day was awesome so from her experience of doing this for a long time, with a lot of students, it was a real confidence builder.

With the positive solar car experience, she knew she wanted to get an Aerospace Engineering degree, and it would take funding from scholarships to do so. She found several and submitted applications to each including her experience with the Solar Car Challenge.

In her first intro class of an aerospace engineering program, along with speakers from the corporate world came to the class to talk about their company, a guest from Lockheed-Martin Skunkworks talking about the development of stealth Aircraft. She decided right them that was where she wanted to work someday. She said the solar car project helped her in her intro classes because she was familiar with the machine shop and being familiar with general design because they touch on it in the beginning classes, but then they focus, and use those skills a lot more their senior year with the senior project when they had to build a plane, basically a drone that had autopilot.

She mentioned SWET in both her college applications and in her job interviews. In both the university and the companies asked her to "talk about a time when you experienced xyz." She said she felt every single question that they asked kind of fell into her four-day race experience with SWET.

Jane Kellogg has a MS Degree from Oklahoma State University with 15 years' experience teaching science in public schools and as an Adjunct Professor. She is a retired CEO of Kellogg & Sovereign[®] Consulting, LLC, a company she founded, an Instrument Rated Pilot, and Board Member of EAA Chapter 35.

She donates her time now mentoring students in an exciting Aviation STEM Program in the southern U.S.

Building Ships

STEM the GAP Between Schools and the Aerospace Industry

By Gregg Cannady

Relationships

Mentorships Partnerships Internships Apprenticeships Friendships Sponsorships

LOCKHEED MARTIN

Perhaps the most appealing part of the aerospace industry is solving the unknown. The gleam in the eyes of aerospace engineers trying to solve the unknown is much like the gleam in the eye of a kindergartener. Students who are allowed to, discover, create, and innovate with an unstoppable energy.

• They enjoy risk and working on the unknown rather than memorizing the known.

• They are not afraid of technology.

• They have great solutions that often go unheard.

In an initiative called Building Ships, we are bringing together local, national, and even international communities to discover how to empower students via simple relationships and collaborations with industry and subject matter experts. What we are finding is that Building Ships is essential to facilitating the infinite potential for ALL students.

Simple connections to aerospace employees and other caring adults can lead to a culture of learning so urgently needed for students, schools, and the future of the aerospace industry. This can only be accomplished if we ALL work together. (Community, Industry, Students, Parents, and Schools).

Lockheed Martin is a leader in Building Ships through their direct involvement in sponsoring robotics clubs, creating internships, mentoring students, and pioneering the future of learning with the same passion they have for deep space exploration and other aerospace innovations.

Vision: Students who are connected to an entire community feel supported and will thrive in joyful learning opportunities.

Mission: We are inviting industry, community, and businesses to join us in making sure every student has the kind of ships that promote kindness, readiness for future careers, and passion for infinite opportunities to help humanity.

I was reading my local newspaper, The Daily Camera, and this quote resonated with the quest to Build Ships.

"There are all kinds of challenges these days that people are trying to solve, and we're done with the easy problems. We're entering grand challenges that aren't going to be solved by a person or company, they're going to be solved by a community."

- Scott Sieke, (Science Discovery)



In 35 years of teaching, you see it all. You see happy students skipping through the hall, excited to learn. You see students going far beyond the lesson you prepared; so far beyond that you realize they are smarter than you. You see students that inspire other students and lift the spirits of everyone surrounding them.

However, you also see students who are withdrawn, suicidal, and even violent. You see students with great potential who hate school and complain that they are bored. You see inequality as some lack access to learning, technology, qualified teachers, and caring adults.

Can simple connections to subject matter experts in K-12 learning help? How can Building Ships inspire, inform, and bring hope? The Georgia aerospace industry is the nation's top sector, and as of a 2019 report on the industry showed there are hundreds of aerospace businesses in Georgia and dozens of companies and suppliers providing space-related products and services.

With Georgia education being interrupted by school closure due to the pandemic, the pipeline workforce is being affected. It's overwhelming to know how many in aerospace are thriving while at the same time billions of students are struggling to learn. The number of relationships that could connect the strength, inspiration, insight, and stability of the aerospace industry to students, teachers and schools provides hope. Together, we can build multiple ships.

Just as overwhelming can be the gap between opportunities for rural and urban students. One approach to STEMMING the GAP between rural and urban schools involves Collaboration, Communication, and 21st Century Skills.

A few years ago, our school invited industry leaders to share with us what industry wants from our students. Another aha moment!

What if we found more ways to connect the industry advice given above to the learning strategies used in schools? Who is best qualified to inform this?



The mentorships, internships, apprenticeships, and relationships that I've witnessed often end up in discussions that emphasize the need for students to excel in 21st-centurey skills. (soft skills). Advice on 21st-centurey skills directly shared from industry leaders seems to resonate deeply with students.

In a recent mentorship, Calvin Craig, (Director: Systems Engineering Team, Human Landing System, Lockheed Martin Space) led one of our STEM students in a discussion of leadership. He called this



"Leaders of Leaders." I was amazed at the message Calvin Craig so easily shared.

Students and teachers often struggle to find that kind of clarity. Teachers and parents may lack the aerospace knowledge and high-level leadership experience to effectively guide students to succeed in the skills they will need to achieve their dreams and conquer the aerospace problems of the future.

Teachers need mentors as much as students do. We need industry-informed mentorship to better prepare our students; not just to be us (teachers) but to be leaders in multiple industries and communities. We need to find an equal balance of "teacher-made-up" stuff with real-world insight from real-world leaders. Another balance to be achieved is the balance between required curriculum and the infinite knowledge and skills needed to thrive in the future of the aerospace industry.





Some of the advice students have shared is that they would like more research-based learning. Applying the process of research and solving the unknown in every subject could be helpful.

Deploying industry and business partners; not to teach content or their industry, but to inspire and inform things like leadership, systems thinking, project management, and 21st-century skills will honor the students' requests. Having subject matter experts as mentors ameliorates this fail-fast, high-risk adventure.

Some industry partners are telling us that education has it backwards.

• Current Educational Systems: 85% Content and Curriculum / 15% Applied (research, solving the unknown)

• Industry and Business Recommendations: 15% on Content and Curriculum / 85% Applied (research, solving the unknown)

Problem-based learning in schools to solve the known are less effective than PBLs that work on solving the unknown. Learning activities that are not connected to the real world of research, leadership, project management, and systems thinking lack meaning. Our students know real, and they urgently need real-world learning to thrive in their future careers and lives. Combining Carl Wieman's active learning theories with relationships extending across every age and subject might STEM-the-GAP.

Sue Linch, Engineering Lead for the Janus Program, one of NASA's Small Innovative Missions for Planetary Exploration (SIM-PLEx), and I, recently presented a workshop at ASCEND 2020. We were going to talk about the kinds of ships used to connect students to industry leaders. How do internships, mentorships, apprenticeships and other ships promote meaningful learning that prepares students to thrive in the future of aerospace and in their personal lives?

Instead of describing ships, we decided to stress the importance of the people who are building ships. They are the Ship Builders (shipbuilders). It's time to recount stories from those who are making a difference for students by Building Ships. We hope you will be inspired to become a ship builder for K-12 students in your community.

Sue Linch, Sharon Usher, and Jenny Herbaugh have been leading high school internships with Lockheed Martin for several years. Normally their students would be on site at the Waterton campus of of Lockheed Martin for a combination of job shadowing and working with mentors assigned to them. Their program is called the Executive High School Internship Program EHSIP). Middle school students are usually deciding what they like and what they are good at. Connecting elementary students and middle school students to a community of subject matter experts has the potential to inspire who they will become and give them the confidence that they will be supported.

We understand that elementary and middle school teachers are building ships. An important next step would be to tell their stories and cultivate relationships that are meaningful to both the students, and the industries who build ships with them.

When students are fully engaged in learning and so excited to discover, innovate, and create, it feels like you're watching a miracle.

Here's what you can do:

It's going to take everyone pouring everything they have into our most precious resource -students!

Look at schools in your community. Get to know what students and teachers need and help them get it. Inspire them with your expertise, stories, and mentorship. When you see joyful students learning together, figure out how to support it. There are multiple ways to support the joy of learning for all students. Each ship you build will be an opportunity.



By Kay Howard



Pi Day

Why is March 14th so special? It's Pi Day! Pi Day is celebrated on March 14th, 3/14, around the world.

Pi, (Greek letter " π "), is the symbol used in mathematics to represent a mathematical constant, the ratio of the circumference, C, of a circle to its diameter, d. π = C/d. This is approximately 3.14159.



Pi Day is an annual opportunity for math enthusiasts, like me, to recite the infinite digits of π , talk to our friends about math, and to eat pie.

As an irrational and transcendental number, π will continue infinitely to the right of the decimal point without repetition or pattern. While only a handful of digits are needed for typical calculations, π 's infinite nature makes it a fun challenge to memorize, and to computationally calculate more and more digits.

While π 's digits to the right of the decimal point do continue infinitely, π is actually a very small number. It is between 3 and 4. Closer to 3. Very close to 3.

Pi has interested people around the world for over 4,000 years. Many mathematicians, from famous ones such as Fibonacci, Newton, Leibniz, and Gauss, to lesser well-known mathematical minds, have toiled over π , calculated its digits, and applied it in numerous areas of mathematics. Some spent the better parts of their lives calculating just a few digits. Early decimal approximations for π were obtained in a number of different ways. E.g.; in ancient Babylon, rope stretchers, marking the locations of buildings and boundaries, estimated π to be 25/8 = 3.125.

The ancient Egyptians determined $(16/9)^2 \approx 3.16$. The earliest calculations of π were largely based on measurement.

Archimedes, a Greek mathematician, was the first to use an algorithmic approach to calculate π . He drew a polygon inside a circle and drew a second polygon outside of the circle. Then he continuously added more and more sides of both polygons, getting closer and closer to the shape of the circle. Having reached 96-sided polygons, he proved that 223/71 < π < 22/7.

With modern technological advances, π has now been calculated to 50 trillion digits, that's 50,000,000,000,000 digits. However, only the first 39 or so digits are needed to be able to perform all calculations in our observable universe with virtually no error. Though it is news every time the digit record is broken, we can now use technology to explore other aspects of π .

So far, the last known 10 digits of π have been calculated as 0640849268. The digit, 8, is the last digit of π know, for now (a common trivia question among we mathematicians). Someone will find the next one soon. I guarantee, several are calculating it right now. Pi Day is the birthday of 3 of my favorite famous people.

Physicist Albert Einstein was born on 3/14/1879. The Austrian waltz composer, Johann Strauss, was born on 3/14/1804. The comedian, Billy Crystal, was born on 3/14/1948.

Are any of your favorite famous people born on Pi Day?

Does anybody like Raspberry pie, I mean Pi? Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation in association with Broadcom. The Raspberry Pi project leans toward the promotion of teaching basic computer science in schools and in developing countries. Many computer enthusiasts use Raspberry Pis to build home projects using it as a dedicated computer.



For all of us π and pie lovers, this is my pie dish. I make pie in this for every holiday, including Pi Day. (There is a rumor that there are no calories in any pie if it is eaten on Pi Day.) And remember that when you're making pies for Pi Day, think inside the circle, not outside the box. Here is a way to memorize the 1st 6 digits of π ? Try this football game cheer:

Sine, cosine, Cosine, sine. 3.14159

"Probably no symbol in mathematics has evoked as much mystery, romanticism, miscon-ception and human interest as the number pi."

~William L. Schaaf Nature and History of Pi 1967





Use it in class. Send it home. Curiosity and learning are ageless.

Please enjoy this issue and share across Texas, reminding them that STEM skills apply to them and any career field you can name.

Game Changer!

The Value Of Co-Sponsoring Relationships For Women In The Workforce

by Julie Kantor



Jayla, age 15, needs role models to show her viable career options and visions of what she can become. She would like to job shadow a successful woman who came to speak at her school to learn how she started her own technology firm.

Margaret, age 20, needs both role models and mentors to really talk things through, set some plans in motion, and help her understand her own leadership capabilities and where she needs to grow.

Margaret has engaged in her third internship as she understands it is one of the best ways to actively learn, network, and crucial to her workforce prospects. Interning, whether you are in school or a graduate, is a time that Millennials and GenZ heavily rely on mentors and colleagues to teach them the ropes, nuances, politics, and the hard skills.

As Shana, 36, rises through the ranks of corporate America, she might not have the nomenclature but she starts understanding that she needs something else... sponsorship. She needs internal champions to make it as a Partner or to the higher floors. She might see others who started with her going up the escalators at faster rates, and become disillusioned that her superior work doesn't just speak for itself. She might quit or go to a new firm that she feels will value her more. Since starting my own company that focuses on mentorship and sponsorship to elevate women in the workforce (especially in STEM fields), I have learned some valuable lessons and garnered some new insights to share with you.

I have learned that:

- Millennials want to be mentored, and they value it. In fact, Millennials view it as so crucial to their professional success, they will leave a company with a bigger name to find a company that will invest in their learning and development. I often tell my clients 'Mentor them or lose them.'

- Millennials also want their managers to be mentoring managers. They are looking for transformational managers, not transactional managers.

- Men are naturals when it comes to Sponsorship (to clarify, a mentor speaks to you and advises you, a sponsor is someone who speaks about you behind closed doors. A sponsor will often champion you for promotions, stretch assignments, and might offer air coverage when the going gets tough). When we discuss this topic, so many high-powered women shared with me that they were championed by a male leader. - Today, women have networks and power. I'd argue that we are incredibly well poised for game-changing breakthroughs in the sponsorship arena, once we better understand it all. In fact, according to economist Sylvia Ann Hewlett, men are 46% more likely to have a high-powered sponsor. In her research, 83% of women do not have sponsors.

I read a piece in Harvard Business Review questioning if we are mentoring women but sponsoring men more in the workforce. While discussing this phenomenon, one tech leader said to me, 'Silicon Valley is built on sponsorship.' ... Fascinating perspective, and if you think about it, the entire "old boys network" is actually built on sponsorship. But ladies, it's our defining moment to join the party and make things happen for ourselves and others.

As an entrepreneur who is especially passionate about female entrepreneurship, I want to see you succeed at new heights and consider taking the elevator if the escalator has been a total drag. I want to encourage here a "stretch assignment" for you and your close networks to try on for size: Co-sponsorship. I have found that men have been willing to sponsor us (women entrepreneurs) at higher rates, but that Co-Sponsoring with other high potential women is a great way to go. In my experience, it has been so mutually valued and has yielded all kinds of incredible opportunities including client relationships, new jobs and more.

To get started, you do need to be fairly confident with your own network. You need to have clear goals personally or professionally that you feel others can help you with. So skip the escalator, hit the Penthouse floor button and embark on a three month 'Co-Sponsoring' Experiment Plan...



WEEK ONE (The Ground Floor): I want you to find 2-3 other women (you can pick a man to!) who are networked and who you really respect. People you already know pretty well. Pick people you feel will make a good impression on others as they have made on you. Perhaps they are doing work or started a company that you really feel has high potential. Perhaps they are a past colleague or you currently serve on a board together. Schedule calls with them or plan a lunch meeting.

THE FIRST MEETING: Listen for what your colleague needs, where they are at in this stage of their professional lives, and assess if you can truly help them somehow. Could you be a champion for Tanya who wants to speak at the major women's conference you spoke at last year, or Cynthia who just left her COO job at a major bank and needs access to recruiters and CHRO's of major companies? Could you advocate for Lynette who is starting a cause to teach tech skills to middle schoolers in your city?

While they are talking, jot down 2-4 action items you could take on their behalf and envision introductions you could make or opportunities you could create. You have so much more to offer than you realize, just listen and you will begin to connect the dots. Next, I want you to SHARE what you are building professionally, what you are most passionate about. Discuss what your needs are, types of companies or people you aspire to work with or be connected with. If necessary, you can add that you are part of this Co-Sponsor experiment and are looking to build a few relationships where "we help each other formally to make things happen!"

Leave the meeting with a game plan on what you each are comfortable doing. There is nothing wrong with starting with small steps. Keep things low-pressure and have fun with it. Schedule an appointment to follow up and discuss the next leg of the Co-Sponsorship journey within the next 3-4 weeks. So many meetings lose their potential due to lack of follow-up or follow-through.

THE SECOND MEETING (You are Riding Up): Are there any early fruits from your labors? Did you make introductions? If not, do it together while you are on the phone. Remember, you are also accountability partners as you climb together. If you followed up on your meeting one commitments which I hope you did, how did it go? Track carefully what you each agreed to do and where things stand. Feel free to start a shared Google Doc. Often, I will ask my Co-Sponsor(s) to send me some solid wording for how they want to be introduced, and then write to people within my network asking if they are open to an introduction. People really do value being connected to other great people. It's been actually quite heartwarming and fun to be the connector. The middle woman.

At this stage, you might want to map out a few more action plans and understand any new needs your Co-Sponsor might have. One amazing woman leader I met on Linkedin is speaking at a major conference in Silicon Valley this Spring. After we spoke she contacted the conference organizers and created an opening for me to speak as well... Many entrepreneurs also offer each other financial incentives if business comes in from each others connection. I do, and that creates another level of WIN/WIN in these crucial championing relationships.

THE THIRD & FOURTH MEETINGS : Are you both rising and stronger because you came together? Why not meet somewhere where you can introduce your Co-Sponsor to people or invite her to join a key conference call. Get her a seat at a table that she will benefit from. Bring her to an open board meeting. Introduce her to other key leaders you socialize with. Goodwill begets goodwill. If the relationship is feeling lopsided, think about how you might remedy this and continue tracking and following up.

So many people don't read emails, follow-up in a timely manner or check their Linkedin— Not a problem, just circle back politely. With one of my Co-Sponsors, I received a wonderful client contract immediately from a connection he made but it took three more months until one of my connections became lucrative for him. I sent him 10% of the contract I received to say thanks, something he never asked for, but is part of our business model @ Twomentor.

Send a plant, a Starbucks card, plan a spa day, show gratitude and continue to keep the ball rolling toward mutual gain. Keep advancing each other, and keep building Co-Sponsorship relationships that focus on abundance, not scarcity. Enjoy your new views and vistas.

Good luck!

Julie Kantor is CEO of Twomentor LLC. She works with major corporations and organizations to build mentoring cultures that retain a diverse skilled workforce. She can be reached through info@ twomentor.com



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Balloon Engine Experiment

Materials needed:

- Balloon
- Drinking Straw
- Fishing Line
- Tape



Directions:

- 1. Thread the fishing line through the straw and tie the ends of the fishing line (or string) to 2 chairs or door knobs.
- 2. Blow up the balloon, but don't tie off the end.
- 3. Tape the balloon to the straw. (or, you can attach balloon, then blow it up)
- 4. Let the balloon go to see how far and fast it travels.
- 5. Try different types of balloons and different distances.



Lesson:

This balloon activity represents the rocket engine. The straw represents the fuselage of an aircraft and the balloon, its engine. Once the balloon is filled with air, there is a difference in air pressure between the inside and outside of the balloon. This is called compression.

The inside of the balloon has a higher air pressure than the outside room because the balloon is holding in the excess air. When the balloon is released, the escaping air of higher pressure in the balloon begins to become equal again with the room. This escaping air causes "thrust" and pushes the balloon down the string.

The balloon moves in the opposite direction of the escaping air; noted in Newtons third law of motion. *For every action, there is an equal and opposite reaction.*

- Try different amounts of air pressure and measure the results.
- Have balloon races.
- Try different sizes of balloons.
- Try "vertical" lines too.



Of all the career choices available and all of the articles we write on the subject of S.T.E.M., none is so vital, critical......desperate.....as this.

A career choice that promotes green energy and the conservation of our natural resources will actually change the world. More than simply changing the world, it will SAVE the world.

Why all the attention on green energy?

All current research suggests that the Earth is being destroyed to the point of ending human life. With the exception of extinction from a source outside of our atmosphere, like an asteroid or meteor, this is the first time the human race has reached a point of actually inflicting permanent damage to the planet.

To keep our planet livable, since past and present generations have and are still causing so much damage, *it will be up to our students to save us and their children.*

How are we killing the Earth?

Air pollution is the introduction into the atmosphere of chemicals, particles, and biological matter that cause harm to humans, other living organisms, or cause damage to the environment.



Depletion of our ozone layer that protects our planet in the stratosphere has long been recognized as a threat to human health as well as to the Earth's ecosystems.

The ozone layer extends from six to 11 miles (9.6 to 17.7 kilometers) up to nearly 30 miles (48.3 kilometers) above Earth. This range, or layer, is composed of oxygen gas and ozone gas. The ozone layer forms naturally, where the ozone and oxygen gases continually convert into each other. It serves as an effective barrier against the sun's ultraviolet (UV) rays that are very harmful. In the absence of ozone's protective shield, life as we know it on Earth would be extinct.

The Earth is capable of cleaning itself of a certain level of pollution, but man-made pollutant have become too numerous for the Earth's natural mechanisms to remove. We are seeing the results of this overload in the form of acid rain, smog, and the variety of health problems that can be contributed to our environment.

Why are adults allowing this to happen?

The answer to this question stings a bit, but you deserve an honest answer. Money is the reason: both the love of having more of it and the balance of our worlds economy that is dependent on it. It's ironic that money is green don't you think?

We already have the technology to save our world, but the consequences would change our way of living too fast and too drastically. Millions of people would be out of work, unable to buy food or have a home.

I remember a story about the company who invented a car tire that would never wear out.....50 years ago. The process and rights to that tire were bought by another tire company and locked away...never to be used.

Why? There is no profit. No one would every have to buy tires. No would have to make them. No factories would have to be built. No jobs would be available. Multiply this example by 20 other industries and you see how it impacts lives and making a living. How can we change this way of living in time to save our world?

- Make saving the world a profitable endeavor.

- Make "green" jobs so we can provide for our families.

- Change the worlds economy with these green jobs so green industries become what we depend on.

Green energy and conservation jobs will dominate our student's futures both as innovators, employees and consumers. The best start is to better understand our current definitions of Green Energy and the associated careers knowing full well it will change dramatically over the next several decades. The Bureau of Labor Statics has developed this definition of green jobs for use in data collection. Green jobs are either:

A. Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources.

B. Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources.



Here is the good news. You get to choose those jobs. You get to create new ones. Using STEM, you get to invent what we need to save our world.....your world.

Green Jobs in businesses produce goods and provide services that benefit the environment or conserve natural resources. These goods and services are sold to customers, and include research and development, installation, and maintenance services. Renewable energy creates electricity, heat, or fuel generated from renewable sources including:

Wind Biomass Geothermal Solar Ocean Hydro-power Landfill Gas and Municipal Solid Waste



Renewable energy sources also have a much smaller impact on the environment than fossil fuels, which produce pollutants such as greenhouse gases as a by-product, contributing to climate change.

Gaining access to fossil fuels typically requires either mining or drilling deep into the earth, often in ecologically sensitive locations. That's something we cannot afford.

"Green energy resources are renewable, meaning they're naturally replenished."





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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.

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