

GEORGIA PATHWAYS

M A G A Z I N E

स्टेम पत्रिका पढ़ने वाला है

Το περιοδικό stem είναι αυτό που

雜誌是一本值得閱讀的雜誌

What Does Language Look Like

தண்டு இதழ் படிக்க வேண்

استیم میگزین پڑھنے لاء آہ

Hydroponics

Making Dreams Tangible

The Technology Association of Georgia Education Collaborative (TAG-Ed) strengthens the future workforce by providing students with relevant, hands-on STEAM 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 STEAM 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>

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NISAN LEREA

Welcome to the December 2022 issue of Georgia Pathways Magazine.



December is Learn a Foreign Language Month, which means that this is the perfect time to discuss the importance of learning another language for STEM students throughout Georgia and beyond.

With the richness of diversity that we have here in America, with more than 65 million residents speaking a language other than English at home, language learning should be recognized as critical to producing a globally competent workforce. Personally, I used the Spanish language heavily throughout the first decade of my career, which had a profound effect not only on my worldview but also on my professional development.

As the internet enables the world to become increasingly interconnected, the ability to communicate in more than one language is more important to employers now than ever before, particularly in STEM industries. According to the American Council on the Teaching of Foreign Languages, a majority of employers report more demand for foreign language skills today compared to just five years ago. And the demand will only increase as we become more linguistically diverse at home and the international economy becomes further globalized.

Learning a second language has a whole host of other benefits, such as supporting academic achievement, increased cognition, reading abilities, linguistic awareness and appreciation for other cultures. For students today, language learning has evolved—it places greater emphasis on authentic, learner-focused, culturally-relevant activities.

Educators can now harness the power of technology to use as a complementary tool to gamify learning and better assess student progress.

Finally, there have been rising sentiments that coding is a language in and of itself. In 2014, Georgia passed a law allowing students to substitute foreign language requirements with computer science classes. The law was enacted in an effort to boost enrollment in high school programming classes to remedy a talent shortage for computer science professionals. Although STEM subjects are of critical importance for supporting the next generation of talent, the importance of a global perspective and the value of a second language should not be disregarded. At TAG, we don't think one has to choose. In today's world, both set of skills are equally important.

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.

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What Does Language Look Like?

by *Wayne Carley*

Language -

- the principal method of human communication, consisting of words used in a structured and conventional way and conveyed by speech, writing, or gesture.

Effective communications skills, specifically language and its facets, are critical to effective teaching and to any career our students choose. Is it a STEM skill? There is no doubt. In looking at the dictionary definition, let us begin with the importance of “effective” reading; reading for comprehension and application.

Reading

With virtually any new job comes the wide variety of forms, booklets, documents, company policies and procedures followed by work related reading of instruction manuals, schematic diagrams, procedures, blueprints, software usage PDF's, trouble shooting steps... the list goes on and on. Since we've learned in past issues of STEM Magazine that “every career” requires STEM

“19% of high school graduates in America cannot read. How is that even possible?”

skills, all of the above applies from secretary to scientist.

Approximately 32 million adults in America are considered to be illiterate; about 14% of the entire adult population cannot read. Nineteen percent of high school graduates in America cannot read. How is that even possible? To press the issue of reading importance, 70% of prison inmates are illiterate. How can a person be expected to hold a job and any kind without reading skills? I was shocked at these recent statistics but it does make the point.

Reading for comprehension and then application is a vital STEM skill without exception. The effective application portion is what keeps you employed. Drop the ball on following instructions accurately and you'll find yourself unemployed.

If you missed last issue, and a look at **computer languages**, how can we expect such a large portion of our graduates who struggle with reading to learn a completely new set of languages in the computer universe?

Actually, learning a very numerical computer language could be much easier for many students and graduates as a completely different part of the brain is in use within coding. The importance of exposing students and graduates to this opportunity becomes far more important as they seek their place in the workforce and digital market place.

Composition / Writing

The writing applications of language arts is slightly less necessary within the entire scope of careers, but the majority do require the ability to submit reports, requests, updates and so forth.

Spelling and grammar should not be an obstacle with current computer literacy correction features but you still need to have proficiency in their use....and use them. Some careers are very composition heavy such as this magazine, marketing, proposal submissions of all kinds, website construction, social



media, sales and more. The success and productivity of many companies relies heavily on accurate and compelling composition skills.

Through the artistic combination and composition of the written word we form very persuasive and compelling statements to sell products, pass laws and legislation, change peoples minds and alter the course of the present and of history.

Speech

The number one fear of Americans is speaking in public. Small groups or large, most people freeze up under those conditions....conditions necessary for many key STEM careers and communications roles. Speech is very powerful and very dangerous. Once a word is spoken you can't take it back.

The advantage of being an articulate, composed and effective speaker is a huge asset to every company I can think of. Poor verbal grammar, mispronouncing words, not expressing ones self effectively and failing to accomplish the end goals of speaking serve no good purpose other than making us look ill-prepared and irresponsible as speakers. This applies to every relationship we have at school, work, play and situations where it really counts.

Having to apologize for “mis-speaking”

or not making ourselves clearly understood takes much more time than doing it right the first time.

“Think before you speak”

1. Articulate:

(of a person or a person's words) having or showing the ability to speak fluently and coherently. “an articulate account of their experiences”

- *Eloquent, fluent, effective, persuasive, lucid, expressive, silver tongued;*
- *Synonyms: intelligible, comprehensible, understandable*

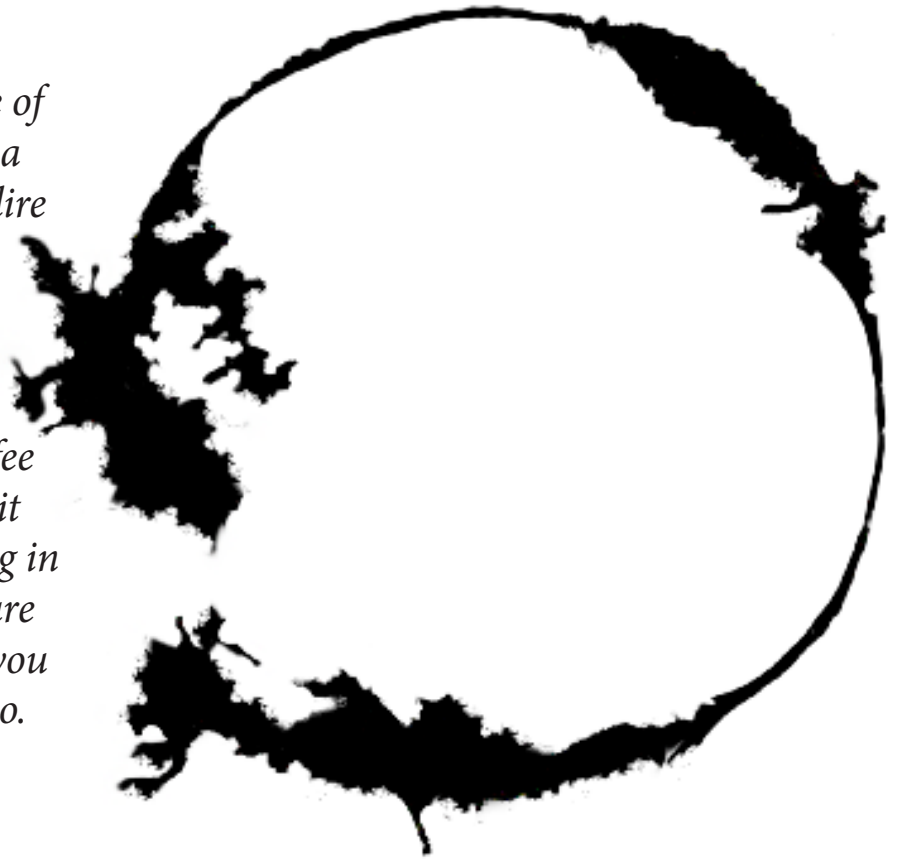
There is no question that speech can be very artistic as in the composition of a powerful speech spoken by an eloquent speaker. It's the combination of the words of the speech and then more importantly, the delivery or speaking of those words. One without the other is not nearly as powerful.

Why is this important for teachers and students?

We are all speaking....everyday. There is a saying that, “the more a person speaks, the greater the chance of saying something stupid”.

A recent movie “The Arrival” is an interesting and compelling example of how critical language can be. Even a slight misunderstanding can have dire and irreparable consequences.

*The symbol here means.....
.....absolutely nothing. I put my coffee cup down on a napkin and just let it bleed coffee. Could I give it meaning in some sort of alternate language? Sure I could, and if you saw the movie, you may have jumped to conclusions too.*



To teach effectively, articulate and persuasive language is a potent combination. This requires us to think before we speak, but on a daily basis, that's not our experience and is a real challenge.

Verbal teaching isn't a "speech" as much as a rapid fire, shoot from the hip, respond as necessary fluid experience. That is where we usually make our mistakes. Being human means we can lose our temper, say things we don't mean and create regrets. In the course of an entire semester I just don't see a way to prevent that.

Students will need these speaking skills for a variety of uses, usually for their own ends. A persuasive conversation with my teacher may result in a better grade on that report, or a second chance. Students will have to apply for work or college someday soon both in writing and verbally and yes, it will determine if I hire you or not or allow you into my University.

Now is the time to address these skills, both the art of language and the art of composition.

“We can create new meanings by putting two words together. Instead of writing about an event, we can describe and stimulate the details and feelings under which that event occurred. You can experience what it was like to feel, see or be part of something—with the simple use of words.”

Language is an art. You have to learn to hold a paintbrush before you can paint. And from there, your possibilities are endless.”

Camila Martinez-Granata

Regardless of the class you teach, here is a great, brief exercise to make the point to your students. (count how many times you say “Ummmm” and “You know.”)



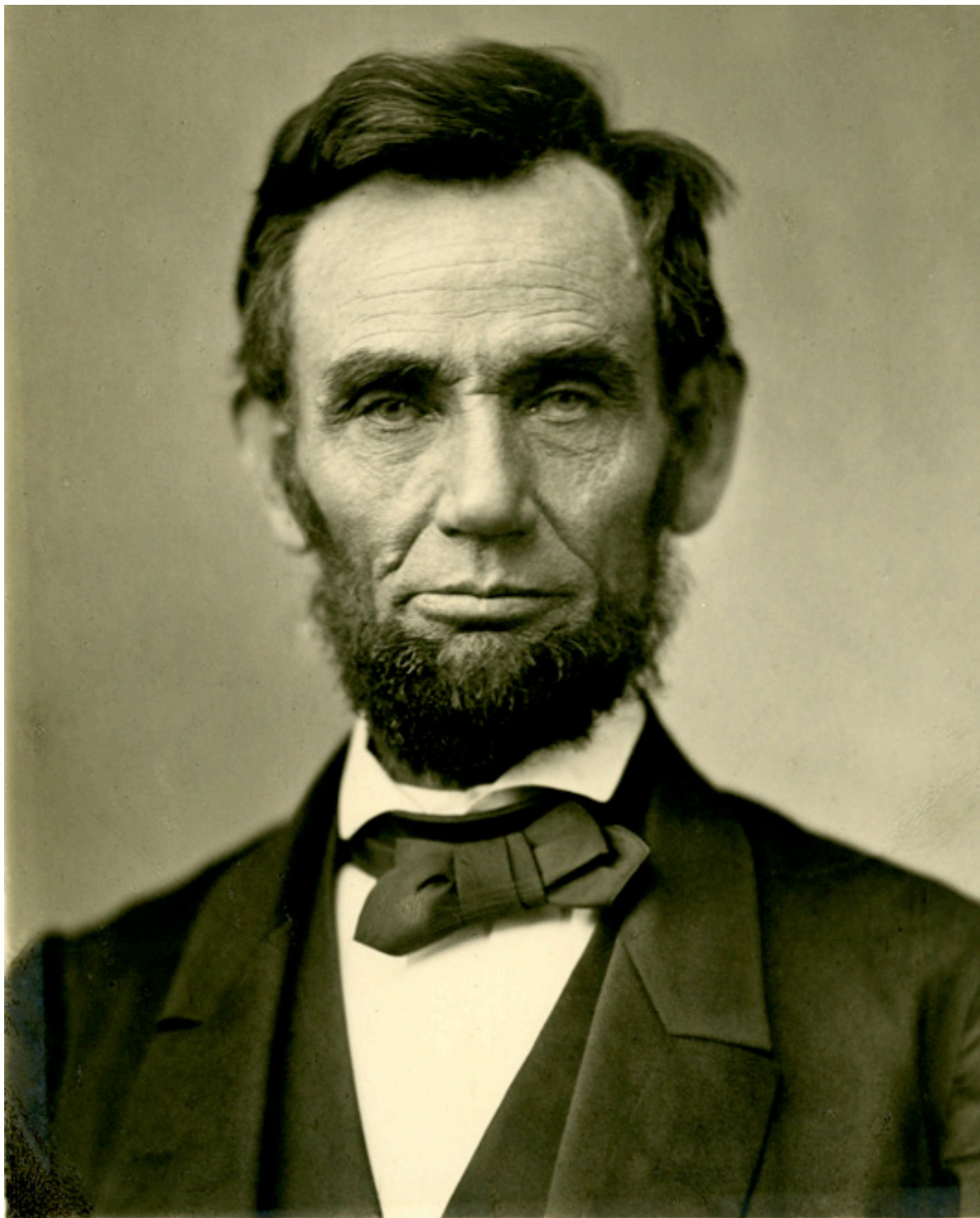
Exercise:

In one paragraph, about seventy words or less, students must convince their teacher why they deserve a better grade in the class.

This has practical applications while making the point of how they may use language as an art moving forward in school and life. Skills used will probably include persuasive words, specific meaning, artistic composition by the best combination of words, and a brief length making it much more important to use language effectively.

They will have to really think about what to say rather than just blurt out a disorganized, random and messy bundle of words with no forethought or expectation of result.

When it's important to you, you may try harder.



Abraham Lincoln; One of Americas most **artistic** speakers and persuasive orators.
Read his work.



HYDROPONICS

Grow greens, herbs, vegetables and fruit all year long.

Hydroponics is not a new technology, but remains an important solution to current and future food shortages, infestation, lack of usable land and regional limitation of harvest.

Hydroponics is a type of soil-less gardening that can be done either indoors or outdoors. It's a great option for people with little or no gardening space, or who want to grow herbs and vegetables through the winter. Hydroponic gardening is space-efficient and takes less water than gardening in soil. Growing in water also means no weeds.

With artificial lighting, you can grow hydroponically all year long, anywhere in the world, or space.

Although almost anything can be grown hydroponically, short-season crops or crops that do not produce fruit such as herbs and leafy greens are great choices for indoor production in the winter. In the summer, strawberries, tomatoes, cucumbers and peppers are all great choices. It's becoming more common for commercial growers of these crops to grow hydroponically instead of in soil. The popularity of hydroponic pursuits in urban areas has become popular and productive.

The simplest hydroponic systems to use at home fall into a category of hydroponics called "Deep Water Culture."

- Plants are suspended above a tank of water and the roots hang into the container where they absorb water and nutrients.
- This is the most common type of hydroponic system for small-scale growers such as people growing for their own use and school demonstration gardens.
- It is also the least expensive and easiest to maintain and expand.
- Allows for "vertical farming".

You can buy premade deep water culture hydroponic systems, but it is more affordable and nearly as easy to build your own.

For this type of system, your container for holding water and plants can be as simple as a 5-gallon bucket or a plastic storage bin. Any kind of container that holds water will do for hydroponics, as long as it is clean and made of a material that is safe for food (a material that will not leach harmful chemicals into the water).

Consider the following when choosing a container for your hydroponic system:

Size

The size of the plants you'd like to grow should dictate the size of your container. For example, if you'd like to grow a tomato hydroponically, consider the size of the canopy of a mature tomato plant, and choose a container that is approximately the same size. The seed packet should tell you how large the plant will be. If you'd like to grow multiple things in one container such as multiple heads of lettuce, a wider container will be necessary.

Lid or flotation device

The container in your hydroponic system will hold the water and nutrients,



but something needs to support the plant.

When using a bucket, the most common support structure for plants is simply the lid of the bucket with holes drilled through it for the plants. If you do not have a lid, another common practice is to use extruded polystyrene (sheets of insulation). You can either rest the polystyrene sheets over the top of the container or float them directly on top of the water.

If you choose to float the sheets directly on the water, it's a good idea to provide some extra support (such as PVC tubes) to hold the polystyrene sheet as the plants become heavier.

Cost, aesthetic appeal, and space efficiency

If you would like your hydroponic system to look more attractive than just a bucket, an easy solution is to build a frame around it. If you're hoping to expand your system to have multiple containers in use at the same time, you can increase space efficiency with adjustable wire shelves, with plastic totes or buckets on each shelf.

These additional factors are not necessary and will increase the cost, but can make your set-up more efficient and attractive. Use your imagination and let nature take its course.



Lighting

The simplest option for hydroponic lighting is to grow outdoors in the summer. This is a great option for people who have access to a balcony or patio with sun exposure.

For indoor hydroponics, supplemental lighting is almost always necessary. While you may find success growing plants indoors if you have a very sunny south-facing window, you will likely need artificial lights in the winter.

The most common types of lighting available to small-scale growers include LED and fluorescent bulbs. There are pros and cons to using each type.

LED (light emitting diode)

- Very energy efficient
- Long Lasting
- Wide spectrum of light
- Do not produce too much heat
- Wide variety of styles and sizes
- Higher up-front cost

Fluorescent

- Moderately energy efficient
- Cheaper up-front cost
- Some only produce light in the blue-green spectrum, but others have a wider spectrum that includes red light; check label
- Do not last as long
- Use more energy than LEDs

Incandescent

- Cheapest up-front cost, but inefficient
- Do not last as long
- Narrow spectrum
- Could produce noise
- Higher electric use



NASA astronaut and Expedition 64 Flight Engineer Kate Rubins checks out radish plants growing for the Plant Habitat-02 experiment that seeks to optimize plant growth in the unique environment of space and evaluate nutrition and taste of the plants.

Consider the cost

A small hydroponics system with 1 or 2 5-gallon buckets, you would need a single 9-Watt LED grow light with a PPF of 16 micromoles per second (\$15 plus \$10 for a work light to mount the bulb).

LED lights have a lifespan of about 25,000 hours. If you run that light for 14 hours per day, every day of the year (5110 hours per year), it should last about 4 years and 10.5 months. For approximately 45,990 Watts of electricity per year (9 Watts x 5110 hours run time).

At an electricity cost of 12 cents per kilowatt hour (a common price in 2020), you can expect to pay about 45 cents per month or \$5.44 per year in electricity. Add to that \$15 every 5 years to replace the bulb.

Other considerations

This is a fun and interesting hobby and for some, a meaningful source of food. It does get more complicated and expensive when you consider the following:

- Passive aeration (Kratky method)
- Active aeration
- Ebb and flow (moving water)
- Nutrient film

- Drip systems
- Plant selection / duration of season
- How to start seeds
- PH balance of water source
- Nutrients

There are 17 nutrients that plants require to grow and develop properly. Only carbon, hydrogen, and oxygen are naturally available to plants in a hydroponic system.

Nitrogen, phosphorus, and potassium are considered macronutrients because plants use them in large quantities. If you have gardened outdoors, you are likely familiar with adding these nutrients to your garden via commercial fertilizer or compost.

Other nutrients are often not a concern in traditional soil-based gardening systems because the soil naturally contains many of these essential nutrients. However, in hydroponics, you need to supply not just the nitrogen, phosphorus, and potassium, but also calcium, magnesium, sulfur, manganese, iron, molybdenum, copper, zinc, boron, chlorine, and nickel.

The good news is, there are many pre-made fertilizers available that have been specially designed for hydroponics.

- Water maintenance
- Insect management
- Food safety (research this well)

Over time, growing plants in a small container of water can lead to the formation of biofilms on the hard surfaces in your system. Think of a fish tank and how it can become slimy on the slides if not cleaned regularly; the same thing can happen to your hydroponic system. These biofilms actually protect and harbor bacteria, some of which might be pathogenic and could cause food-borne illnesses if the bacteria are transferred to the produce via the water in the system.

"Do your homework, be smart with food growth, and enjoy the fruits of your labor."



Making Dreams Tangible



“Women in Engineering” Battles Underrepresentation and Encourages Early STEM Education

by Mary Wissinger

If you take a look at all of the items in your home, classroom, or office, most of them were developed with the help of an engineer. Engineering is a huge field that consists of many branches and career options. It is constantly growing and expanding. Yet, according to the U.S. Census Bureau, women make up only 13% of engineers in the country, which is the lowest amount of female representation out of all the major STEM fields.

Female role models in engineering are absolutely vital for helping young girls feel confident in pursuing STEM education. There are plenty of engineers, now and in the past, who are living proof that women can not only become engineers, but can also have an important impact in a field dominated by men.

All children need to be taught that a career in engineering can be both viable and incredibly meaningful. So how do we share and celebrate what women engineers have achieved and encourage the next generation to pursue this field?



“It’s a joy to learn how women have, throughout time and place, used innovation to change lives for the better! With a charming protagonist and biographical snapshots, this book masterfully shows the relevance and beauty of engineering.”

—Ashley Raynal, Ph.D., Instrument Scientist,
Brandywine Photonics



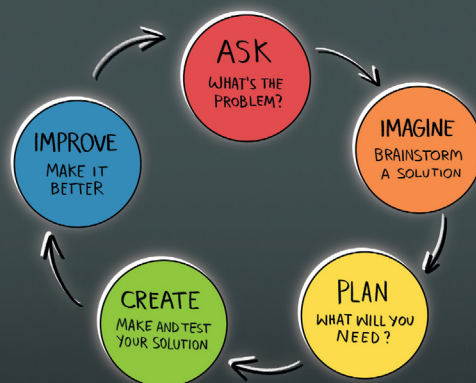
A picture book, perhaps?

Women in Engineering tells the stories of inspiring figures from around the world, breaking down the engineering process with charming illustrations and informative graphics. Reviewed by real scientists, this book explores the fund-

amentals of civil, chemical, mechanical, biomedical, aerospace, and electrical engineering, plus concepts like bridge construction, frequency hopping radio signals, space expeditions, biomaterials—and much more! Women in Engineering introduces children to the complexities and endless possibilities of engineering.



What is engineering?

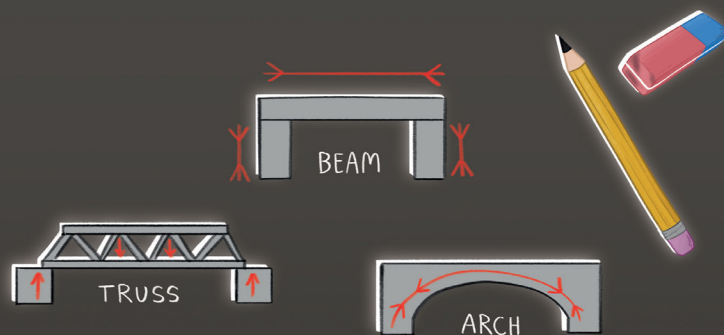


At its heart, engineering is solving problems. To do this, engineers use science, math, design creative thinking and persistence.

Engineers do many different types of work, from building bridges to solving health problems. They also create and improve things that we use every day.



Who builds bridges?

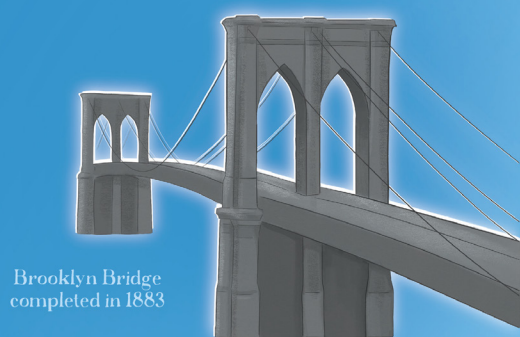


Building a bridge is a balancing act. It takes many people, lots of equipment, and a talented engineer to put it all together.

As Kelly Dooley, the Executive Director and CEO of International Technology and Engineering Educators Association (ITEEA) says: “Children with different backgrounds and interests will be excited to learn how impactful a career in this field can be. What an inspiring way to discover that engineers transform ideas into reality!” Written for readers ages 7–10, *Women in Engineering* is the perfect pathway to

help young engineers, not just girls, understand the power of curiosity and resilience. It’s the fourth book in the Science Wide Open series, with each title centering on a conversation between a spunky, inquisitive young girl and a knowledgeable narrator.

These two explore some of the basics of science together, and their curiosity-driven dynamic makes learning new



Emily Warren Roebling didn’t set out to be an engineer, but she helped build the Brooklyn Bridge. The suspension bridge was over a mile long, making it the longest suspension bridge in the world at that time.



Emily Warren Roebling
(EM-i-lee war-en ROH-bling)
United States, 1843–1903

Civil Engineering

vocabulary and intimidating concepts an effortless outcome of enjoying the story.

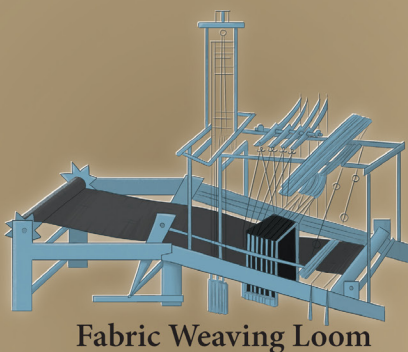
In *Women in Engineering*, a variety of countries, eras, and languages are explored through snapshots of compelling female scientists. Readers learn about groundbreaking scientific discoveries and the real-life trailblazing women who made them possible.

Follow the story of Emily Warren Roebling, who took over her husband's role as chief engineer of the Brooklyn Bridge. Learn about radio signals and the origins of Wi-Fi from movie star and inventor Hedy Lamarr. Reflect on how engineering can make people's lives easier, taking inspiration from Huang Daopo's cotton spinning machine, and the water bath designed by Mary the Prophetess.

Discover the applications of engineering in medicine and biology through Dr. Treena Livingston Arinze's work with adult stem cells, and take a look behind the curtain at NASA with Sandra Cauffman, who works on satellites and space missions.

These engineers, and so many others, have faced countless obstacles in their education, in their workplace, and in their everyday lives. Yet women throughout history have tenaciously continued to follow their passion, making world-changing contributions to the scientific community.

Even so, there is still much work to be done. Only 23 out of the 631 total recipients of STEM-related Nobel Prizes are women—that's just 3.6%!



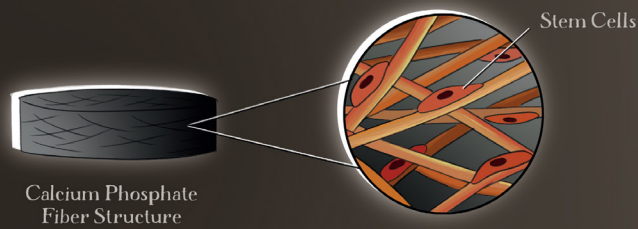
Fabric Weaving Loom

Huang Daopo returned to Songjiang as an adult, using her knowledge to help the town. She created a machine to clean raw cotton quickly and build a spinning wheel. She invented these revolutionary machines 500 years before anyone else figured it out. Here town became known for weaving beautiful cotton fabrics, quilts and mattresses.



Mechanical Engineer

Huang Daopo
(huahng dow-poh)
China, 1245–1330



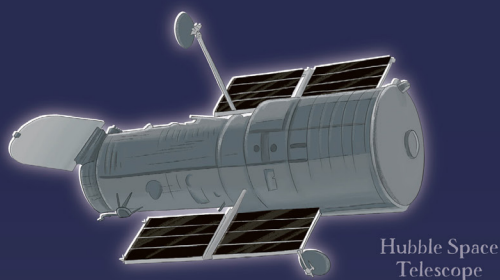
Hoping to help bones heal, Dr. Treena found a way to transplant adult stem cells into the body. But to heal severe injuries and disabilities, Dr. Treena knew a structure was needed to help the cells grow.

After many experiments in her laboratory, she discovered that she could build a structure for growing bone cells out of a material called calcium phosphate.



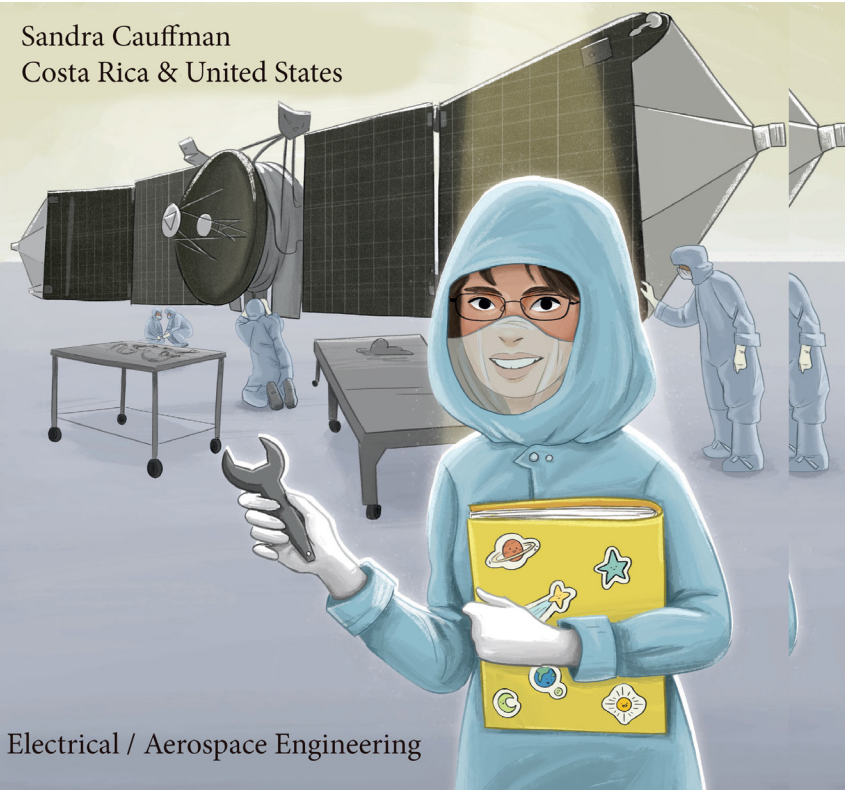
The author of *Women in Engineering*, Mary Wissinger, is a mom and former teacher in St. Louis, MO. She motivates kids to ask questions and dream big, emphasizing the importance of learning from history, digging for truth, understanding the natural world, and striving for positive change. The fun Disney-esque art was created by talented Brazilian artist, Danielle Pioli, whose

mission is to inspire others to create. Together, they created the Science Wide Open series with the hope of raising a generation of kids who feel that their future is unlimited, and their ideas really can change the world. With this new addition to the series, they aim to ignite a passion for engineering in people of all ages, genders, and backgrounds.



Sandra also worked on the Hubble Space Telescope and helped lead a team that sent a spacecraft to Mars. Sandra coordinates the many engineers, scientists and specialists who work together to give us a glimpse into outer space.

Sandra Cauffman
Costa Rica & United States



The first three Books in the Science Wide Open series are currently available in English and Spanish: Women in Biology and Las mujeres en la biología; Women in Chemistry and Las mujeres en la química; Women in Physics and Las mujeres en la física.

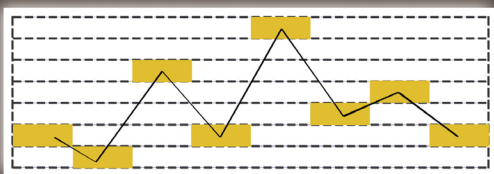
Simultaneously being released with Women in Engineering are Women in Medicine and Women in Botany, coming September 2022. Spanish editions of these three titles will be released in Spring 2023. The publisher, Science Naturally, values the importance of combining STEM topics with elementary literacy. All of the books in the Science Wide Open series have free Teacher's Guides to encourage parents and educators to expand the content of the books. These Guides extend the topics through additional vocabulary, hands-on activities, and discussion-based worksheets and Women in



games—all perfect complements to educating the next generation of STEM readers.

The Guides can be downloaded from the Science Naturally webpage.

Engineering can be purchased directly from the publisher and is available at bookstores and libraries everywhere. Schools and organizations who work with underserved children should contact Science Naturally directly for their special Literacy Organization pricing.



Frequency Hopping

Hedy Lamarr learned that important radio messages sent during World War II were being blocked. It wasn't long before she came up with an idea for a secret communications device. Her device could send the radio messages, hopping around to different frequencies, making it impossible to find them and block them.



Electrical Engineering

Hedy Lamarr
Austria & United States, 1914-2000



All engineers use the most powerful tool: imagination. They have an idea and strive to make it happen. When faced with challenges, they problem-solve again and again until they achieve their goals. It's not so different from when you use your imagination to tell a story, draw a picture, or do an experiment. When you think creatively to solve a problem, you are using the skills of an engineer.

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Engineers bring dreams into the world.

They build bridges from imagination... to reality!

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Is Engineering Too Complicated for Kids?

There are many different branches of engineering. Most of them require extensive knowledge of both science and math, as well as costly materials and equipment. However, engineering can be broken down to a very basic process that kids can easily understand and use in their daily lives, whether or not they aspire to be engineers: (The Engineering Method)

- 1) Identify a problem
- 2) Brainstorm a solution(s)
- 3) Plan what you need to make it happen
- 4) Create and test your solution(s)
- 5) Think about how it can be improved

Teaching young kids about engineering is more about sparking imagination, practicing problem-solving skills, and opening up a world of possibilities to explore in the future, as well as solving everyday problems right now in their lives.

[ScienceNaturally.com](https://www.sciencenaturally.com)

Match the engineer to her incredible scientific contribution!

Dr. Treena Livingston Arinzeh

Hedy Lamarr

Huang Daopo

Sandra Cauffman

Mary the Prophetess

Invented a machine to clean raw cotton quickly, used for fabric weaving.

Invented her own tool to purify liquids for alchemy experiments.

Designed and patented the first frequency-hopping device to protect radio transmissions.

Created a calcium phosphate fiber structure to help bones heal.

Directed the team that launched a spacecraft to study the atmosphere of Mars.

Answers:

Huang Daopo - Invented a machine to clean raw cotton quickly, used for fabric weaving.

Mary the Prophetess - Invented her own tool to purify liquids for alchemy experiments.

Hedy Lamarr - Designed and patented the first frequency-hopping device to protect radio transmissions.

Dr. Treena Livingston Arinzeh - Created a calcium phosphate fiber structure to help bones heal.

Sandra Cauffman - Directed the team that launched a spacecraft to study the atmosphere of Mars.



TELLUS SCIENCE MUSEUM acquires recently fallen Meteorite from Junction City, Georgia

Shelly R. Humble

Director of Marketing

A meteorite exploded over south Georgia during the overnight hours of September 26, 2022, spraying fragments across the small town of Junction City, GA, and Tellus Science Museum has already acquired a piece of the space rock.

At 12:04 am EDT that morning, the meteorite burst into a bright fireball that lit up the sky over Talbot County. The meteor was captured flying across the sky by a camera operated by planetary astronomer Dr. Ed Albin. After analyzing radar data and watching the captured video, Dr. Albin and fellow meteorite hunters Pat Branch and Carl Dietrich determined the location of the fall.

Being the first to arrive on the scene, the three saw a small impact crater on a road and scoured the area to find any fragments of the fallen meteorite. After intense searching, the three hunters



were all able to collect pieces of the meteorite. The second largest, a 219-gram specimen found by Dietrich, was acquired by Tellus. “I got lucky,” said Dietrich, who wanted the meteorite to be displayed in a Georgia museum.

“This is very exciting, because finding a meteorite soon after it falls is a very rare occasion, and it fell here in Georgia,” said Tellus Executive Director Jose Santamaria. “And to think – this rock was in space a little over three weeks ago!” The meteorite has been tentatively identified as a chondrite, commonly known as a stony meteorite. Further classification is under way.

“I am thrilled that Tellus Science Museum is able to further preserve Georgia’s meteoritic heritage with the acquisition of this specimen,” states Tellus Curator Ryan Roney.

Since the finding of the original fragments, Albin has returned to the site numerous times and has been greeted by many meteorite hunters from across the nation. So far there has been about a dozen fragments found. “I’m sure there are many pieces still to be found,” said Albin. “It was estimated that the meteor coming through our atmosphere was maybe the size of washing machine or a small refrigerator.”

Tentatively called the Junction City

Meteorite, it marks the 27th Georgia meteorite, the 11th Georgia meteorite in Tellus Science Museum’s collection, and 6th witnessed fall in our state.

To learn more about meteorites, visit the Weinman Mineral Gallery at Tellus Science Museum where the meteorite will be on display soon. Follow Tellus Science Museum on Facebook @tellusmuseum to stay up to date with the installation of this piece and to see images of the meteorite, including the pictures and video captured by Ed Albin.

Tellus Science Museum is a program of Georgia Museums, Inc., which includes Booth Western Art Museum, Savoy Automobile Museum, and Bartow History Museum. The Smithsonian Affiliate is a 120,000 square foot science museum located in Cartersville, just north of Atlanta.

For more information about Tellus Science Museum call (770) 606-5700 or visit www.tellusmuseum.org or www.facebook.com/tellusmuseum.



TOURO COLLEGE OF PHARMACY

Empowering the Next Generation of Pharmacists

By **Martin Patrick**

Student Pharmacist, Class of 2023

Touro College of Pharmacy, New York



We all have a purpose. Often, life comes back full circle. I remember back in 2003, my senior year in high school, all I could think about is, “Where am I going from here? What will I do after graduation?”

There were many fears that ranged from financial burdens, recognizing my personal strengths and abilities and where those skills would be best beneficial, the unknown or what’s to come that all factored into my uncertainty, especially the pressure of knowing that this often is one of the most important decisions that we must make in our lives.

My decision was to serve our country and join the United States Navy as a Hospital Corpsman. I was 17 years old when I made this choice and still to this day, it is one of the best decisions I've made. Throughout my 10-year career in the Navy, I was afforded the opportunity to travel to many countries and experience the diverse cultures that I would have not experienced otherwise.

I worked with people from many races, cultures, creeds, and ethnicities as part of a humanitarian mission called Pacific Partnership. This is where I realized that healthcare would forever be a part of my life, and the impact that we make as healthcare workers on the frontlines fighting for our country. Each time I put on my digital cammies, laced up my boots and assured that my battle dress uniform (BDU) pants were properly bloused, I knew I was making a difference.

After leaving the military, I decided that I wanted to continue my journey in the healthcare field and began my advancement towards becoming a pharmacist. I wanted to emulate my experience of being on the frontlines for our country, and chose to attend Touro College of Pharmacy as my vessel to transition to the frontline of healthcare. Sitting in that seat as a first-year pharmacy student, I was equally scared

and unsure of how exactly the 4 years ahead of me would play out; the same familiar feelings I had when I graduated high school. As a third-year student, I have already learned the foundations of how to become a good pharmacist and now, as I continue my journey through clinical rotations I am focusing on how to apply them to patients.

This time, my battle gear looks different. I'm no longer dressing in the battle dress uniform, but instead, I am knotting my tie with the perfect knot, donning the white coat with honor and pride, and knowing what role I play in the society as a pharmacist.

The role of a pharmacist is unique, and it continues to expand beyond the traditional functions of dispensing medications and healthcare supplies that many are familiar with. The pharmacists' services of today include responsibilities such as patient consults and conversations, contribution to public health functions, and vast amounts of medical research.

There are many functions of public health that can benefit from pharmacists' unique expertise. These include medication management, ensuring access to care, and disease prevention services, like the immunizations and vaccines as we have seen during the global pandemic.



I have learned that we are often the mediator between the physician and patient, and often the first point of contact. Therefore, it is critical to develop a sense of trust and positive rapport with the patients with which we interact. As a pharmacist of color, I recognize that trust is even more crucial when speaking to minorities who are seeking healthcare and services, or those who wish to become healthcare providers.

Unfortunately, we know that healthcare disparities exist. We know there is a vast difference between the care, knowledge, and health risks that minority individuals with a low-socio-economic status experience than those who are middle or upper-class citizens.

Therefore, we need more health professionals to break through these disparities. My hope is to establish more connections to decrease these healthcare barriers. In doing so, I will continue to be the example that you can do anything that you want to, regardless of creed, gender, race, or ethnicity.

While the pharmacy profession is unique, it can also open many different routes or opportunities. For me specifically, I hope to work with veterans and become a clinical pharmacist in a Veterans Affairs hospital.

Other pathways include an integration



with business, where pharmacists assist with creating commercials, ads, or marketing for specific medications. Some pharmacists become subject matter experts on new medications or specific therapeutics. There are educational opportunities that would result in molding prospective pharmacists that will change the future of healthcare. Additionally, it is evident the role that pharmacists will continue to play in the prevention and preparedness for pandemics like the COVID-19 virus.

I still think back to 2003, when I graduated high school and the emotions and thoughts that were going through my mind, reluctantly not knowing my purpose.

Martin Luther King once said, “Faith is taking the first step even when you don’t see the full staircase.” We often hesitate when we don’t know what the future holds. This feeling of uncertainty is normal. I experienced it when I was a senior in high school taking that step towards what has now become the best career choice for me. I know my purpose as a pharmacist is to advocate for the profession and contribute to making healthcare better and accessible for all.

This is my purpose.

What is yours?





Small-format water jet machine cutting a custom aluminum sprocket

Desktop Digital Manufacturing is Revolutionizing STEM Education for the Better

By Nisan Lerea

Co-Founder and CEO of WAZER

During the summer before my senior year of high school, I built a 20-foot tall trebuchet (a medieval siege weapon, cousin of the catapult) to compete in the youth division of the Punkin' Chunkin', the now defunct annual pumpkin hurling competition in Delaware the weekend after Halloween.

The trebuchet was effective: its 24-foot throwing arm, supported by 1,000 pounds of counterweight, threw a 4-pound pumpkin 531 feet - a length

of almost two football fields. It was the first significant hands-on project where I built something functional. We designed the entire machine using pencil and paper - at that time I had no idea that powerful, 3-dimensional computer-aided design (CAD) software existed - and we built it using handheld tools:

- A drill
- A jigsaw
- A tape measure and wrenches

Despite the rudimentary fabrication methods, the trebuchet inspired me to study mechanical engineering in college where I was exposed to the burgeoning world of affordable digital tools, including both hardware and software, that were available to designers and engineers. I was amazed by the power and precision of these tools. I took every digital design and manufacturing course available to me and spent many late nights in the shop cutting and fabricating race car and robot components using the CNC machines.

Unfortunately, I was not exposed to this technology back when I was in high school.

The 21st Century Version of Shop Class

Fortunately, nowadays, makerspaces are much more common in colleges, high schools and even middle schools, equipped with a suite of affordable digital manufacturing tools, including 3D printers, laser cutters, CNC routers, CNC mills and increasingly, water jet cutters. Schools used to have required shop classes as part of Career and Technical Education (CTE) where students learned hands-on skills like carpentry, metalworking, welding and drafting.

But CTE became a track for students who would pursue careers in traditional



My trebuchet competing in the youth division of the Punkin' Chunkin'

trades, as opposed to college-bound students eager to become white-collar professionals with desk jobs. Since the 1980s CTE has experienced a significant decline, up until the last decade where we've started to see a resurgence - this time fueled by the emergence of affordable yet powerful desktop manufacturing technologies. Before they even become teenagers, students can now design robots using engineering CAD software and send digital part files to be 3D printed or cut in the same day, as if they were on the factory floor.

These affordable digital tools are now benefiting both CTE education for trade-oriented careers, as well as advanced college programs.

Why Teach Design and Manufacturing in School?

Teaching students digital design and fabrication prepares them for the modern industrial workforce by exposing them to the technologies they will need to use in their engineering and manufacturing careers. Manufacturing is now digital: parts and assemblies are designed in CAD software and then manufactured with digital tools. Students who use these tools in school will be better prepared and more productive when they enter the workforce.

When considering applicants for hire at our manufacturing technology company, we specifically look for experience



University fabrication lab with 3D printers and laser cutters



in digital design and manufacturing as evidence that the candidate already has the foundational knowledge needed to succeed as an engineer.


And whether or not students want to become engineers, having hands-on group projects in school also teaches important life lessons, such as teamwork, innovation and the ability to learn from prior success and failures, that are applicable to any career. Case in point: the popular FIRST Robotics Competition. Over 3,000 teams of 7-12th graders compete. They have only six weeks to build their robot, so they must work as a team, create a plan, and then coordinate to execute the plan under a significant time constraint.

To facilitate this execution, many teams utilize new affordable desktop digital tools to make the robot parts quickly

and in-house. These are functional robots that need to perform physical tasks, so they need to be made out of metal and other strong materials.

Whereas desktop 3D printers can only print parts in plastic, other digital tools can make parts in harder, stronger materials including metals. Water jet cutters, a technology that uses a high pressure stream of water mixed with abrasive particles to cut through virtually any material, used to be exclusively industrial machines that were too expensive for most schools.

The emergence of small-format water jet cutting machines means that they are now affordable for even middle and high schools. Today, in their own school shops, students can quickly cut brackets even in aluminum and steel, resulting in customized robots that are robust.



Hands-On Learning Nurtures the Creative Spirit in Students - ***And it Works***

In high school I had the perception that English and History were the creative disciplines, whereas Math and Science were “black and white”, with clear right and wrong answers. But STEM is arguably the more creative discipline. The “A” was added (now it’s STEAM of course) in recognition of the similarity between the creative arts and the creativity involved in Science, Technology, Engineering and Math.

Once you start making things with your hands, you become a designer. Like an artist, you create something new, such as a pumpkin-hurling trebuchet. You start designing. Hands-on projects teach students how to be creative. The rewarding experience of building something - having created something new in the physical world that lasts and endures. Exposing kids to digital design and manufacturing will make more students interested in pursuing careers in engineering and technology due to the creativity and fulfillment involved in these fields, even if they are not geniuses in math and science. The addition of affordable digital tools is an enabler for these programs to make the leap to fully hands-on student creativity.

Meeting the Challenge of the Moment

The world needs more designers and engineers to invent new technologies that will address the global challenge of our time: climate change. De-carbonizing our economy will require physical technologies made of atoms. We need means of energy production. We need green vehicles for transportation. These challenges won’t be solved sitting at a desk in front of a computer. They will be solved in the lab and in the field - in the physical world. So let’s give our students the affordable digital tools they need to change the world.



**Working with your
hands...**

...your design.

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