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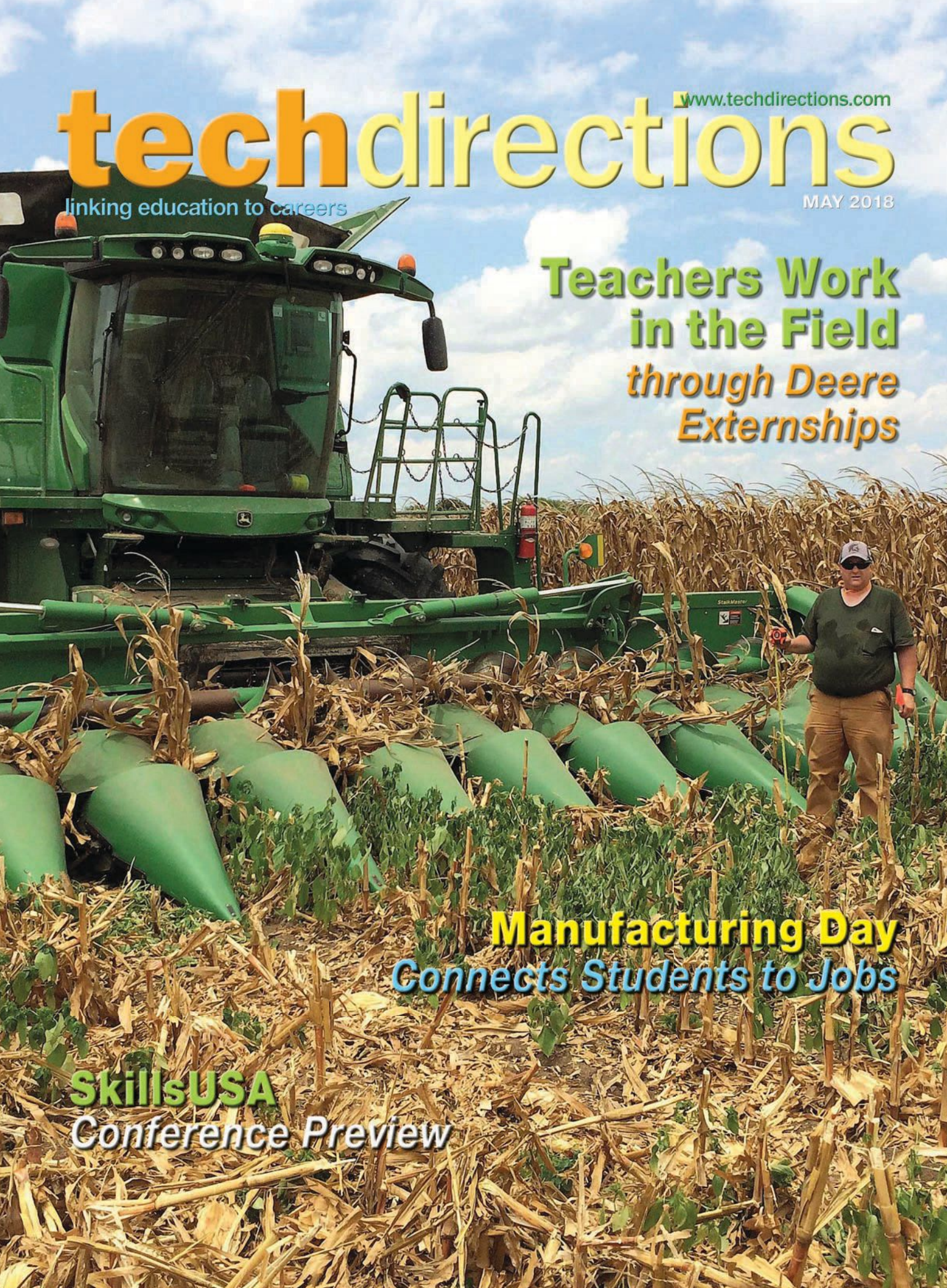
linking education to careers

MAY 2018

**Teachers Work
in the Field
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technically speaking

Vanessa Revelli vanessa@techdirections.com



My column this month explores the approach my home state of Michigan is taking to combat the skills gap. Since all states are facing this issue, I'm hoping that this is useful information to help you when talking to other educators and members of your state government.

The Marshall Plan for Talent is a revolutionary partnership between educators, employers, and other stakeholders to transform Michigan's talent pipeline and redesign the ways they invest, develop, and attract talent in the state.

Employers look for a talented workforce when they consider places to grow and locate, creating more and better jobs. Michigan is facing a talent shortage across multiple industries. That shortage is the single greatest threat to the state's continued economic recovery.

The governor visited Ferris State University to participate in a workgroup with educators and business leaders to help them take the first steps in implementing a state-wide Marshall Plan for Talent.

Employers and educators discussed needs and possible partnerships, taking the first steps toward creating the talent consortiums necessary to apply for Marshall Plan funds.

"Employers and educators need to keep talking to each other and building strong partnerships," Gov. Snyder said. "The business community should connect closely with educators in K-12 districts, community colleges, and universities. Employers need to adapt to changes in the supply of talent by changing their requirements for hiring, recognizing many in-demand skills can be acquired through certificate programs and two-year degrees."

The plan, announced earlier this year, calls for invest-

ing \$100 million in innovative programs to revolutionize Michigan's talent and education system. It will support schools that want to transform education through programs like competency-based certification, world-class curricula, and classroom equipment, scholarships and stipends, and support for career navigators and teachers. The funding will complement the more than \$225 million in funding dedicated to ongoing talent development efforts in Michigan.

Michigan will have more than 811,000 career openings to fill through 2024 in fields that are facing a critical talent shortage. As the state considers talent preparation changes for these fields, demand is likely to be most severe in increasingly high-skill, high-tech fields such as in information technology and computer science, manufacturing, and healthcare.

"Let's partner to create the world's premier education and training system, transform our system to a competency-based model of any pace, any place, any time, any way, Snyder said. "Let's revolutionize education so learning is a lifelong achievement of knowledge and success."

Additional details about the Marshall Plan are available at www.michigan.gov/marshallplan.

Vanessa Revelli

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About the cover: Roy Shaft poses with a combine in a corn field as part of an externship with Deere. Article on page 12. Cover design by Sharon K. Miller.

Vanessa Revelli

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Initiative Seeks to Boost Education and Interest in Agri-Science

As the agriculture and STEM (science, technology, engineering and math) communities celebrated National Ag Day (March 20), a new study released the same day found that more than 80% of high school science teachers surveyed think agricultural science is important, but only 22% say it makes up at least some of their lesson plans. Sponsored by Bayer in collaboration with National 4-H Council, the survey found that fewer than half of the teachers surveyed felt qualified to teach agri-science. Some 48% believe there is less emphasis placed on learning this particular STEM industry today as compared to 15 years ago.

"Food security, reliable access to

safe and affordable food, is one of the most significant challenges of our time with most experts predicting that by 2050, population demands from nearly 10 billion people will require a 60% increase in global food production," said Jennifer Sirangelo, president and CEO of National 4-H Council. "Science matters now more than ever. We need to create educational opportunities that inspire a new generation of leaders willing to tackle this challenge."

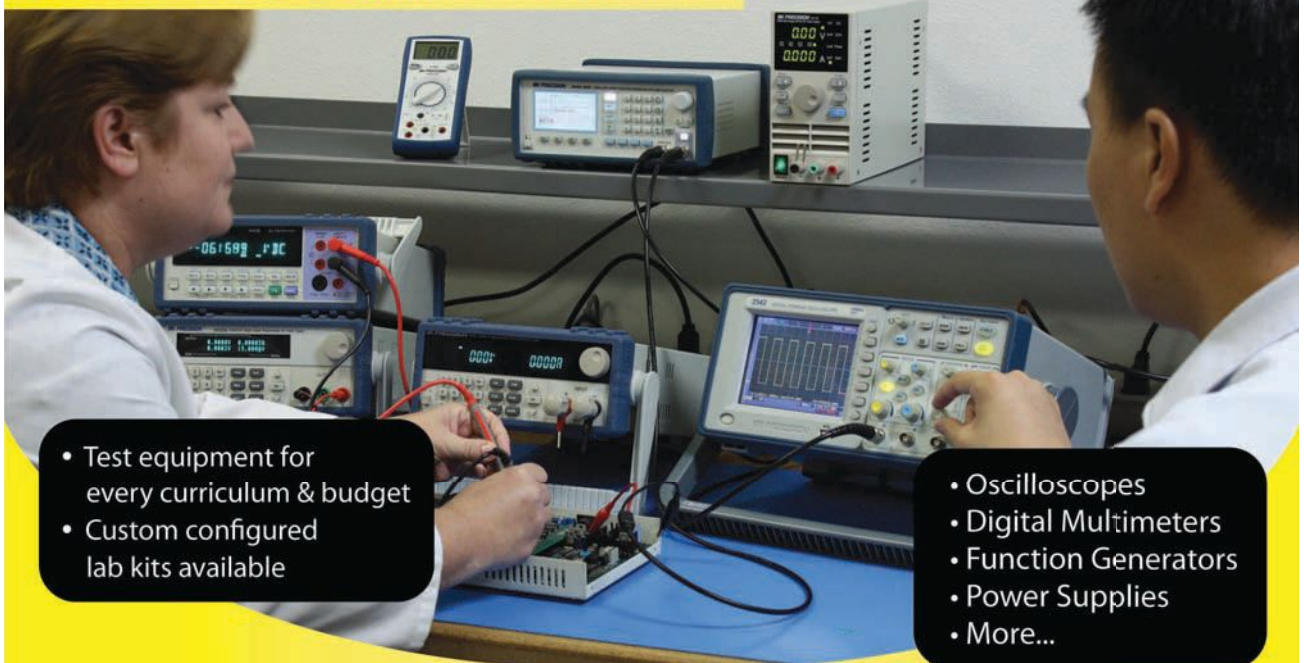
Bayer and National 4-H Council also conducted a survey of more than 1,000 parents of high school students. The survey found that 86% of parents agree it's important for the country's future success to encourage pursuit of careers in the agricultural industries, and 68% said

the industry provides exciting career opportunities. However, nearly 70% of respondents do not believe their children will pursue a career in agri-science, even though data from the United States Department of Agriculture shows tens of thousands of jobs each year in agriculture go unfilled by qualified candidates.

According to Dr. Mae Jemison, the first African-American woman to go to space and Chief Ambassador for Bayer's Making Science Make Sense initiative, the data for agri-science parallels an overall conundrum in science education and STEM careers. "When it comes to STEM education, studies have consistently shown our nation's youth frequently do not get the exposure to or experiences required to be successful nor are our expectations for them high enough," said Dr. Jemison. "If we are to meet the challenges facing humanity's future on this planet, such as meeting the nutrition and health needs of

Vanessa Revelli is managing editor of techdirections.

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an ever-growing population, we need new generations of STEM-literate leaders seeking creative and innovative solutions."

By launching Science Matters in August 2017, Bayer and National 4-H Council have committed to equip at least 25,000 students in urban, suburban, and rural areas alike with the tools and support they need to deepen their understanding of science. The multifaceted program includes:

- Hands-on curricula provided by 4-H to its network of local club leaders who work with kids in communities across America to demonstrate why science matters to all of us.
- Creating a nationwide photo contest to heighten young people's awareness of the role science plays in their everyday lives.
- Providing scholarships for hundreds of young people and leaders to attend the 4-H National Youth Summit on Agri-Science, which exposes young people to the variety of careers in modern agriculture through more than 30 hours of hands-on learning and problem-solving experience.
- Engaging with 4-H clubs across the U.S. through community grants and local volunteerism to enhance the STEM education experience.

For more information on Science Matters, visit 4-H.org/Bayer.

Agricultural Youth Opportunities: A Journey to Future Career Success

From ages nine to 99, the opportunities available in agriculture are endless—and ageless.

Few people know that better than the student leaders of the National FFA Organization or their fellow 650,000+ members. In a few years, they'll fill some of the most challenging and critically important jobs that keep America fed, fueled, clothed, and competitive.

FFA, formerly known as Future Farmers of America, helps the next generation meet those challenges by helping their members to develop their unique talents and explore their interests in a broad range of agricultural career pathways. What started as a simple farm organization in 1928 has evolved over time. They now represent

future farmers, researchers, chemists, veterinarians, engineers, entrepreneurs, and everyone in-between, because agriculture today is so much more than farming alone.

As a result, from collectively earning more than \$4 billion every year through hands-on work experiences, FFA members are doing some really cool things—all before the age of 18. From soil moisture mapping and precision agriculture using drones and other technology, to cutting-edge research, to inventing brand

new products that improve people's everyday lives, to wildlife conservation at an FFA chapter at a zoo, FFA members are making a difference in agriculture.

In honor of National Ag Day, they partnered with numerous organizations to gather a comprehensive roadmap of the diverse array of the opportunities agriculture and natural resources offers.

Check out their Agricultural Youth Opportunities roadmap at www.ffa.org/agyouth. 



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Alan Pierce

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The IBM Q is a Working 50 Qubits Quantum Computer

During CES 2018 I observed a beautiful gold-colored object that looked like it could hang in someone's dining room. It was hanging from a fixture above a mass of reporters busily photographing the object from different angles. Without yet knowing what I was looking at I joined in (Photo 1). It was clear from

tem that allows the computer's processor to operate at near absolute zero temperatures (-459.67°F). When the IBM Q is operational what you see is totally encased in the enclosure shown in Photo 2. This allows its cryogenic refrigeration system to keep the qubits processor at its working temperature. The cold



Photo 1—For this quantum computer to operate properly it must be cooled down to almost absolute zero.

Photo 2—For the IBM dilution fridge to cool the qubits quantum processor to operating temperatures it is sealed into the container shown in this photo.



Photo courtesy IBM

its prominent location in an area reserved for the conference's award-winning technologies that this was something functional as well as beautiful to look at.

It turned out to be IBM's new Quantum Computer (IBM Q). Many of the systems that are visible in Photo 1 are part of a cryogenic cooling sys-

temperatures in combination with the vibration isolation stand that it is hanging from are necessary to keep the qubits in their quantum state.

The machine that was on display at CES 2018 was more than just a prototype—on March 6, 2018, IBM announced that production of the IBM Q will soon begin. It is not clear

if any of the actual machines will eventually be sold or if scientists will have to access the Q using IBM's Cloud Services.

The race for quantum computer chip supremacy is already heating up. On the same day that IBM made their announcement Google announced that their engineers had just created a 72 qubits quantum chip. This is a fast-moving story and companies such as IBM, Google, Intel, and Microsoft are feverishly working to create the fastest quantum computer.

The dream of building a new type of computer that harnesses the properties of quantum physics has been the dream of some scientists for at least 46 years; quantum theory itself is over 100 years old. This IBM Q has a processor with just 50 qubits; even with this low number it can run some simulations and break some "unbreakable" security codes that are beyond the capacity of a conventional supercomputer.

When a quantum computer qubits chip has enough qubits to surpass the processing power of a conventional supercomputer in every way, the dream of quantum superiority will be achieved. Exactly how many qubits it will take to reach quantum superiority is unclear but it is clear from my research for this column that it is still difficult to keep the quantum state of a qubits processor running error free.

The big problem is if there are undetected vibrations or if cooling is slightly off, referred to as noise, the calculations performed by a quantum computer could be riddled with errors. They now check the accuracy of a quantum computer by using problems that can still be solved on a

conventional supercomputer.

For a good explanation of the basic principles behind qubits and the differences between conventional

Alan Pierce, Ed.D., CSIT, is a technology education consultant. Visit www.technologytoday.us for past columns and teacher resources.

Quantum Computing 101

What does “quantum” mean?

Quantum theory, developed in the early 1900’s, revolutionized physics and chemistry by successfully explaining the weird behavior of tiny particles like atoms and electrons. In the late twentieth century it was discovered that it applied not just to these particles, but to information itself. This led to a revolution in the science and technology of information processing, making possible previously unimagined kinds of computing and communication.

What is a quantum computer?

A quantum computer is a device able to manipulate delicate quantum states in a controlled fashion, the way an ordinary computer manipulates its bits.

What is a qubit?

A qubit is the quantum version of a bit, and its quantum state can take values of $|0\rangle$, $|1\rangle$, or both at once, a phenomenon known as superposition. The half angle bracket notation $|>$ is conventionally used to distinguish qubits from ordinary bits.

What is a superposition?

A superposition is a weighted sum or difference of two or more states; for example, the state of the air when two or more musical tones are sounding at once. Ordinary, or “classical,” superpositions commonly occur in everyday phenomena involving waves.

How are quantum superpositions different?

Quantum theory predicts that a computer with N qubits can exist in a superposition of all 2^N of its distinct logical states $|00\dots 0\rangle$ through $|11\dots 1\rangle$. This is exponentially more than a classical superposition. Playing N musical tones at once can only produce a superposition of N states.

How is superposition different from probability?

A row of N coins, each of which might be heads or tails, has 2^N possible states, but it actually is in only one of them—we just don’t know which. For this reason, quantum superposition is a more powerful resource than classical probabilism.

Information courtesy of IBM Q Experience Documentation—FAQ for Beginners

computer processing and quantum computer processing, check out [youtube.com/watch?v=lypnkNm0B4A](https://www.youtube.com/watch?v=lypnkNm0B4A). IBM also offers detailed tutorials that explain quantum basics with hands-on activities, divided so it can meet the level of sophistication of the user. You will find it all online at: tinyurl.com/td-ibmq

The commercial viability of the IBM Q is significant because it has the computing power to solve some problems that are too numerically complex to be solved on a traditional supercomputer. Biotechnologists could use this computing power to run simulations on the possible positive or negative outcomes if certain genes in plants, insects, or animals are altered to suppress or enhance certain species features. Material scientists could use this computing power to run designer material simulations to determine what would be the physical outcome if one combines the atoms of different basic materials.

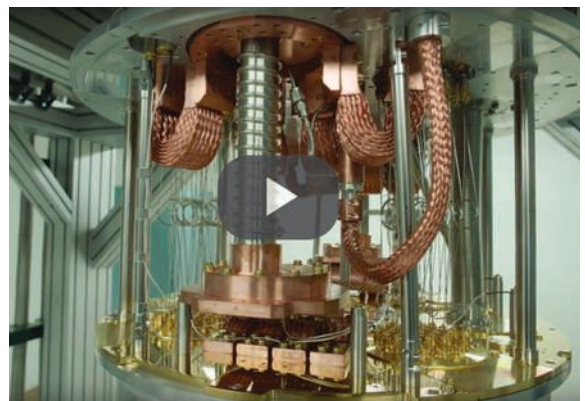
My March 2017 column “Material Science Breakthroughs” described how scientists have already accom-

plished this type of atomic structure merging. The column is available online at www.technologytoday.us/columnPDF/Recent_Material_Science_Breakthroughs.pdf.

It is fascinating to ponder what new medicines, chemicals, artificial intelligence breakthroughs, improvements in the logistical movement of people and materials, and even the optimization of all kinds of systems that might be possible, in the near future, using the processing power of quantum computers. This computer power also has a dark side since it could be used to break all current security codes that our society uses to protect us from hackers trying to gain access to government, banking, manufacturing, public utilities, and consumer computer systems to disrupt society or just steal our identities.

Taking It a Step Further

IBM invites you to explore the world of quantum computing! Visit <https://quantumexperience.ng.bluemix.net/qx/experience> to check out user guides and interactive demos to learn more about quantum principles. You can also create and run algorithms on real quantum computing hardware, using the Quantum Composer and QISKit software developer kit. 🍷



Video courtesy of IBM

To hear The Sounds of IBM: IBM Q, go here: <https://www.youtube.com/watch?v=o-FyH2A7Ed0#action=share>

Dennis Karwatka

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Amanda Jones: America's Unlikely Technologist

Early American technologies such as bridge building, blacksmithing, and steam engine construction required great physical strength. That was one reason men dominated those fields. But women began making inroads during the 19th century. The most direct path to technical recognition was to develop a worthwhile product. In 1873, Amanda Jones patented a method for preserving food by removing air from glass storage jars. Jones was also one of technology's more unusual personalities.



Amanda Jones, at age 44

Jones was born in 1835 in East Bloomfield, NY, which is near Rochester. Her father was a successful master weaver and her mother a homemaker who raised 12 children. The family moved to Buffalo in 1845 to provide better educational opportunities for the children.

Jones had been attending elementary school with an older brother who unexpectedly died of a heart ailment. She was greatly affected by his death and it encouraged her to investigate communication with spirits, a popular pursuit at that time.

Following high school graduation, Jones taught elementary school and found she had a flair for poetry. She supported herself for the next 15 years with writing and editing for various publications. She also earned income by conducting séances for people interested in the spirit world.

Dennis Karwatka is professor emeritus, Department of Applied Engineering and Technology, Morehead (KY) State University.

Jones was living in Chicago in 1872 when she dreamed that a man told her to invent a vacuum canning process. She had no technical background and had never before been involved with food preservation, so this new interest puzzled her friends.

Factory canning developed around 1810 but the food intended for canning had to be cooked first and was generally tasteless. The prime markets were the military and for emergency use. Jones considered a method that

called for putting uncooked food in glass jars that were then vacuum sealed. She had no idea how to accomplish her objective and contacted LeRoy Cooley, a trusted distant relative.

Jones and Cooley devised a system using specially made jars (Photo 1, Fig. 1) and a hand pump to remove air from them. Hot syrup then filled the empty space in the jars, and they were then quickly sealed. An early test batch of fruit was preserved for five weeks.

Jones and Cooley received a total of nine patents for various aspects of their process. Some were under her name and some under his name. The idea was successful enough that Jones es-

tablished the Woman's Canning and Preserving Company on Dearborn St. in Chicago in 1879. To raise the necessary capital for the company, she worked on developing a safety burner for steam boilers that used fuel oil.

Jones said the invention was brought to her by a Pennsylvania oil dealer. It is not known how the two met. Oil burners were new devices at the time and early ones were dangerous to use.

Jones's 1880 patented unit controlled the amount of oil released from storage tanks on ships (Fig. 2). She obtained two more related patents and wrote a detailed article in *The Engineer* titled "The Liquid Fuel Problem." Jones was promised production assistance from an investor who soon went bankrupt. Already having financial problems, Jones was unable to capitalize on her new invention.

Jones returned to her canning business and received an order for 24,000 cases of preserved fruits and vegetables. It was a large request and she borrowed money for plant expansion. The loan required her to sign an agreement that ultimately caused

her to lose control of the company in 1893. She then left Chicago and moved in with her sister in Junction City, KS.

Jones never married. She resumed her work as a poet and lived a quiet, uneventful life until her death in 1914.

During its first 200 years (1790-1990), the U.S. Patent Office granted women less than 2% of its patents. Amanda Jones was a member of that elite group of patent holders. ©



Photo 1—A canning jar similar to the ones used by Amanda Jones

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- Cefrey, Holly. (2003). *The inventions of Amanda Jones*. Rosen Publishing Group.

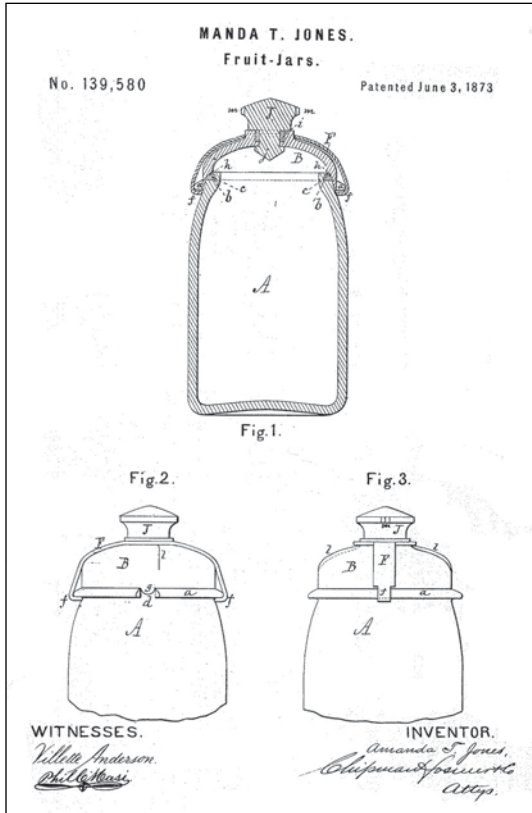


Fig. 1—Patent for Jones's storage jar

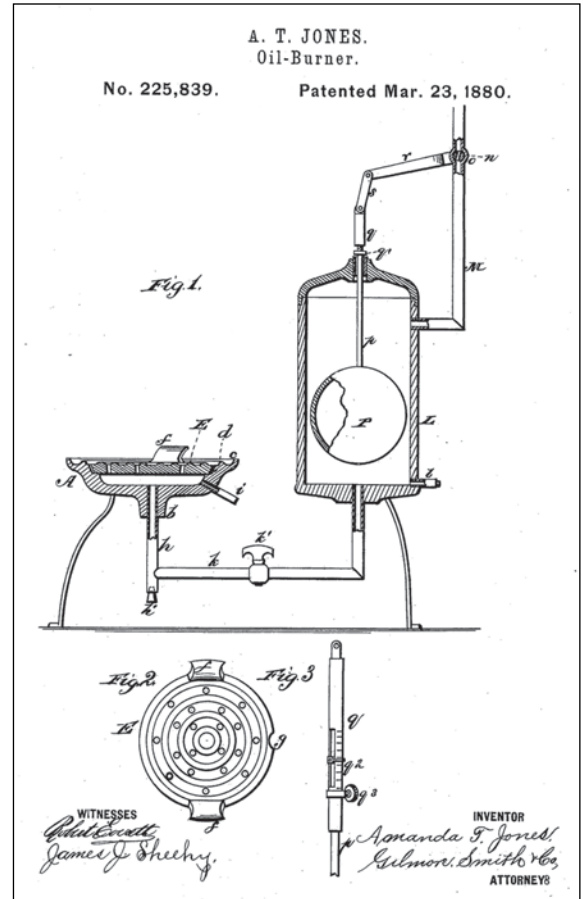


Fig. 2—
patent for
Jones's
oil burner



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KALA Miller, a science teacher at Fairfield High School in Fairfield, IA, stood on the roof of John Deere's Ottumwa Works building, the wind and view grabbing equal parts of her attention.

"That's when it hit me," she said. "I was working in the real world."

For Roy Shaft Jr., an industrial technology teacher at Camanche High School, in Camanche, IA, it happened when his boots sunk into the hot Texas dirt.

"I was doing tire testing, and when they said I was going to the field I thought they meant out the front door and into a corn field," he said. "No, John Deere sent me to Texas to conduct the study. The real world aspect of this program is amazing."

Real world. Two words easily understood and often used when describing the STEM (science, technology, engineering and mathematics) Externship Program.

The State of Iowa program—born from the governor's STEM Advisory Council—takes teachers and pairs them with up to 50 statewide busi-

nesses for a six-week project over the summer. The program completed its ninth season in 2017, having created the "real world" experience for nearly 420 teachers over that span.

This past summer nine Iowa teachers worked at John Deere facilities. Since 2011 there have been 46 Iowa teachers involved in Deere's externships.

Garrick Herbst, a John Deere staff engineer who worked with Shaft, said the program's payoff is immediate.

"The externs utilize their unique knowledge and experience to develop innovative solutions to projects where a summer intern might struggle," Herbst said.

The focus of the program is left up to each participating facility.

Miller helped Ottumwa's environmental services team with a variety of projects, with tasks ranging from checking flammable cabinet inventory to measuring the stack height for air permits on the roof.

"I've not been in the workforce since college," Miller said. "I tell my kids that Dad goes off to work and Mom goes off to school. This summer I got to tell them that Mom is actually going to work."

Laura Evans, environmental manager at Ottumwa Works, said the program proved to be mutually beneficial. The John Deere facility manufactures balers, mower conditioners, windrowers, and pull-type forage harvesters. Ottumwa is located in southeast Iowa about 30 miles north of the Missouri border.

"Kala executed environmental projects while also learning about Deere's industrial environment. It was really a win-win situation—our work at Deere got completed, and



Roy Shaft Jr., teacher at Camanche High School, said the externship program will keep giving back to his students as Deere employees participate in a job fair later in the school year.

Article reprinted from The John Deere Journal, www.JohnDeereJournal.com.

she took a wealth of knowledge back to future generations,” Evan said.

Shaft was in Silvis, IL, at Deere’s Global Crop Harvesting Product Development Center, an engineering and testing facility. Camanche High School, where Shaft teaches, is located along the Mississippi River, about 30 miles northeast of Moline.

“I absolutely loved the program,” he said. “We were there to work, not

clability calculator that would be used to figure what percentage of any product’s parts—from a planter to a tractor when stripped down—could be recycled.

“We didn’t get the entire project completed in the time I was there, but we were able to make a smaller version that I can use in my classroom and show my students,” he said. “This helps take the sustainability message back to the school. It shows how important treating the environment is on a global scale.”

“There were multiple benefits of having Clint in the group,” Andy Greenlee, senior staff engineer for product sustainability, said. “Two that stand out are that Clint was able to help move a few projects toward completion. The other is that Clint, as a teacher, is able to drive the sustainability mindset beyond Deere to younger generations.”

Education’s foundation may be built on the three R’s, but the externship program had its participants raving about the two C’s—constant collaboration.

“It was obvious early on that communication is the key. I think there are a lot of things you can teach yourself or learn to do, but you have to be a communicator to expand that message,” Miller said. “Learning different systems—and the different people I needed to interact with—that all was communication. You have to be able to know what to ask for to be successful.”

Shaft liked having bright minds to lean on. “Perhaps the most attractive piece to the whole thing was the collaboration and partnership with Deere. There are so many smart people that if you didn’t pick their brains you were wasting an opportunity,” he said. “Not only will I take those things back to my classroom, but they are also following me back to the classroom. This spring we will have a job fair and I’ll be able to lean on Deere to show my students all the

career paths that are available in a company like that. Really, the practical application to all of this is off the charts.”

For Van Fossen it was the soft skills that sold him.

“Seeing all the communication and collaboration—and why they are important in selling ideas—is something I can apply back in my classroom. Teamwork, problem solving, explaining an idea is so key,” Van Fossen said. “Where I was at you needed to show the progress and vision for the future and then report that and sell that presentation. And, you didn’t do it alone.”

Learning was certainly front and center for the participants. Van Fossen said he never realized how important a program like Excel was until his externship.

“Even PowerPoint, from a communication standpoint. Just understanding how to use the tools to get a message across is so important,” he said.

But, they are also called teachers for a reason.

“By working with Clint through the summer, we learned that we have



Kala Miller, Fairfield High School teacher, helped Ottumwa Works monitor its flammable cabinet inventory.

just observe. I talked to the tire manufacturer, worked with a laser mapping system, created a wear chart for the tires ... it’s just such a global company that there are so many experiences you get to have and there are always opportunities from those experiences.”

Clint Van Fossen, a physics and biology teacher at Davenport West High School in Davenport, IA, agrees. “The thing that impressed me a lot was how much the whole world is engaged,” Van Fossen said. “From the first day I was in meetings where we were working with people in Brazil, Germany, India—this was every day. Our school system is a real world for what we do. But, we’re insular. At John Deere there is constant collaboration. You’re always going outside the walls of the business. Even all the windows in the building give the feeling of being beyond the walls.”

Van Fossen’s focus as a member of the product sustainability team at the Moline Technology Innovation Center was helping create a recy-



Davenport West High School teacher Clint Van Fossen helped work on a product recyclability calculator during his summer externship for John Deere’s Moline Technology Innovation Center.

opportunities to expand the scope of product sustainability beyond the walls of John Deere,” Adam Flores, senior engineer in product sustainability, said. ©

TECH Center Provides Students a Jobs Pipeline

MANUFACTURING is alive and well in Lenawee County, MI! Like the rest of the nation, it is doing so well the local manufacturing companies are having a hard time finding the talent to keep up with demand. Gone are the days of 18% unemployment where every production-level job posting received a flood of applicants. Today, with unemployment hovering in the very low single digits, that flood has been reduced to a trickle and employers are having a hard time keeping their facilities adequately staffed.

It's not just skilled positions, the region's manufacturers are having a hard time filling even entry-level production positions. Seeing the need, the LISD (Lenawee Intermediate School District) TECH Center stepped in, and in partnership with Lenawee Now, the Southern Michigan Center for Science and Industry, and Michigan Works! Southeast, planned and hosted the first ever Manufacturing Day in Lenawee County.

Manufacturing Day, an event quickly spreading nationwide, was founded in 2012. It is a celebration of modern manufacturing meant to inspire the next generation of manufacturers. Manufacturing Day also addresses common misperceptions about manufacturing by giving manufacturers an opportunity to open their doors and show, in a coordinated effort, what manufacturing is—and what it isn't.

Manufacturing today is not what it was in the 1950's. Today is full of high-tech jobs, robotics, cleaner envi-

ronments, and a vast array of career opportunities. By working together during and after Manufacturing Day,

From a participating company:

"We currently have two employees who came right from the TECH Center and are working here today. They are obviously at the entry level of that, but the goal is within three of four years to have them running CNC."

manufacturers will begin to address the skilled labor shortage they face, connect with future generations, take



Students learn about the wide range of services offered by General Broach Co. to the automotive, aircraft, hand tool, and farm implement industries.

charge of the public image of manufacturing, and ensure the ongoing prosperity of the whole industry.

Lenawee County launched a first ever Manufacturing Day on October 7, 2016, sending hundreds of students to 13 area manufacturers. This year, we had over 400 students visiting 23 employers. Schools participating were the LISD TECH Center, Michigan Center for Science and Industry, and nine of the eleven

local districts served by the TECH Center. The students were put into groups of 15 and completed two tours around the county.

New in 2017 was the use of MI Bright Future, an online, interactive career exploration platform that con-

Article courtesy LISD TECH Center, Adrian, MI.

At Kamco Industries Inc., students learned more about the injection molding of components for the automotive industry.



a parade of school busses, heading for participating manufacturers throughout Lenawee County. Each student has the opportunity to visit multiple manufacturers during the event, seeing examples of local companies making products that are sold throughout the world.

At the LISD TECH Center, the emphasis on manufacturing is more than just a one-day event. They currently have four programs in their manufacturing cluster making them a central player in creating the next generation of skilled workers for regional manufacturers. They are also an active participant in Lenawee Now's ALIGN Initiative, a county-wide collaborative effort to create a consistent and reliable talent pipeline for Lenawee County employers, including their world-class manufacturers.

To see the LISD Tech Manufacturing Day video from 2016, visit www.youtube.com/watch?v=LxwSboxcE9k.



Students inspect pellets used for injection molding at Kameco.

nects students to employers and employers to their future workforce. Students used MI Bright Future to research the companies they were visiting prior to Manufacturing Day. After the event, they could pose career-related questions to company representatives. Companies were asked to supply volunteers to act as "Career Coaches" in the system to field student inquiries about their career interests.

The concept of Manufacturing Day is simple; get as many students as possible out to see as many examples of modern manufacturing as possible in

From a student:

"I'm hoping to be an engineer, making the designs and giving them to the people who will make them. I see myself working in one of these shops to get through college."

a single day. The logistics, however, can be quite the challenge. All Lenawee County School Districts are invited to participate and send students to the event. On the selected date, typically in the first week of October, students are transported to the LISD TECH Center where they are given their schedule for the day, safety glasses, and other necessary personal protection equipment. Students depart via

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- Explore talent pipeline strategies that will allow you to grow your own skilled trades talent
- Outsource most of the paperwork and tracking needed for Apprenticeships
- Explore state and federal funding sources that will help support Apprenticeships

Wednesday, October 4, 2017
7:30 a.m. - 9:30 a.m.
LISD TECH Center

Please RSVP by 9/29/17 to amy.hinkley@lisd.us or 517-265-1618













Another way the LISD TECH Center connects with companies and prospective employers is by assisting them in developing apprenticeships.



Raising Student Engagement through Helium Balloon Aircraft

By Daryl D Keesling

dkeesling@shenry.k12.in.us

MANY types of aircraft exist; one often overlooked is the balloon. The three main types of balloon aircraft are: hot air, gas, and Rozière (a hybrid). The balloon's buoyancy enables it to stay aloft. Movement or travel of a balloon is with wind power; with no propulsion system, a balloon is limited in directional control.

In making the balloon rise or sink vertically to favorable wind directions, some degree of control is possible. There are two ways of controlling the balloon's height: change the buoyancy of the balloon, or change its weight.

Volume of a gas increases when ambient pressure decreases. When a balloon rises, the pressure of the air outside the balloon is less, so the balloon will expand. This is why a balloon is not filled to maximum capacity, or else it would burst. Big balloons have a venting system to release excessive internal pressure.

The buoyancy can change only by opening a valve and releasing some helium. Changing the weight is done

Daryl D. Keesling is a transformed STEM to STEAM Engineering, Manufacturing, and Construction teacher at Tri Junior Senior High School, Straughn, IN.

through the release of ballast (material use for stabilizing something). Ballast is carried on big balloon aircraft that can be released, making it lighter. Sandbags are the most common form of ballast carried in the basket.

With an airship (another type of buoyant aircraft) however, movement through the air can be controlled. Suspended beneath a balloon with cables (commonly made from a very strong, thick rope made of twisted hemp) is a basket or capsule. Anything can be a payload—people, animals, or equipment.

Balloons are used for a variety of different reasons such as pleasure rides, business advertisements, sports, and scientific research. Some people even choose to get married on board them!

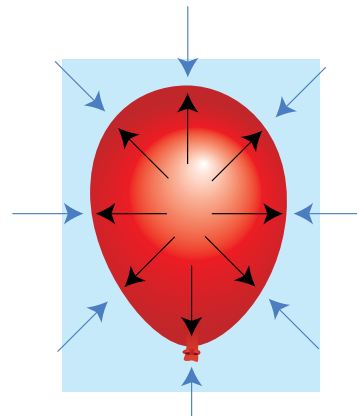
Possible Classroom Discussion Items

Define air lift, flow, and drag. Define buoyancy. How is rope made? What are some differences between an airship and a balloon? List some types of buoyant aircraft. What is

wind? A blimp is what type of aircraft? What is ballast? Students could do a group brainstorming session with questions.

A Brief History

August 1783 saw the first flight of a gas-filled balloon. It was unmanned and without cargo. The first gas-filled balloons used hydrogen instead of helium because of cost and effectiveness. After all, hydrogen is lighter than helium. But, hydrogen, unlike helium, is flammable. The balloon was designed by Jacques Charles, an inventor. The Robert brothers, French engineers, built the balloon. They engineered a balloon bag that was airtight so hydrogen or other gases would not leak. Later designs were long and



The pressure outside the balloon is less, so it expands

slender, had some control, and carried passengers.

Used in the wars of Napoleon Bonaparte's French Empire around 1803 and the American Civil War in 1865, early balloons were used for observation and reconnaissance. This gave the Union Army an aerial advantage. The balloons were teth-

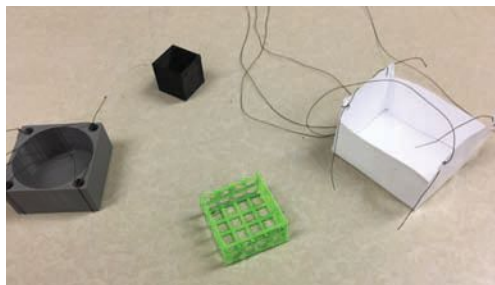
ered to the ground with long ropes to bring them back to the ground and keep them from drifting away.

Ballooning still exists today and is gaining popularity.

Helium

Gas filled balloons can fly higher and travel longer distances than hot air balloons. Balloons for this reason are very helpful to meteorologists. They also helped in map making by giving an aerial view.

Balloons inflated with a buoyant gas will have a weight lower than the ambient atmosphere. Helium, one type of gas, is used today for all gas airships and most manned balloons. The air surrounding a helium-filled balloon is heavier and has a greater density. Therefore, the balloon will be pushed upward by the helium



Several basket designs

inside because the helium is lighter than the surrounding air.

Balloons, once filled with hot air or gases, must be tethered.

The helium that is put into balloons is cryogenically (cryo- means freezing and genic, meaning pertaining to production) distilled from natural gas.

The way to figure the volume and lifting capacity of helium in a spherical helium balloon is the following:

Calculate the volume of the balloon.

$\frac{4}{3} \times \pi \times r^3$ is the formula to use. Cube the radius (half the diameter of the sphere) by multiplying the radius by itself twice ($r \times r \times r$),

Multiply 4 by π , then the radius cubed (r^3 , or $r \times r \times r$), then divide by 3.

28.2 grams is about how much one cubic foot of helium will lift, so

the volume of the balloon will be multiplied by 28.2 to figure the lifting power of the balloon in grams.

If you don't like metrics, you can divide by 448 (the number of grams in a pound). This will be the balloon's lifting power in pounds.

Example Exercise

Determine the volume and lifting capacity of a 10' diameter balloon using the above information.

Volume first: a 10' balloon has a radius of 5'.

$$V = \frac{4}{3} \times \pi \times r^3$$

$$V = \frac{4 \times 3.14 \times 5 \times 5 \times 5}{3} = \frac{1570}{3}$$

$V = 523.3$ cubic ft. (rounded to the nearest tenth)

Lifting capacity: 523.3 cubic ft. \times 28.2 grams/cubic ft. = $14,757$ grams.

$14,757$ grams / 448 grams per pound = 32.9 pounds of lifting force.

Possible Classroom Discussion Items

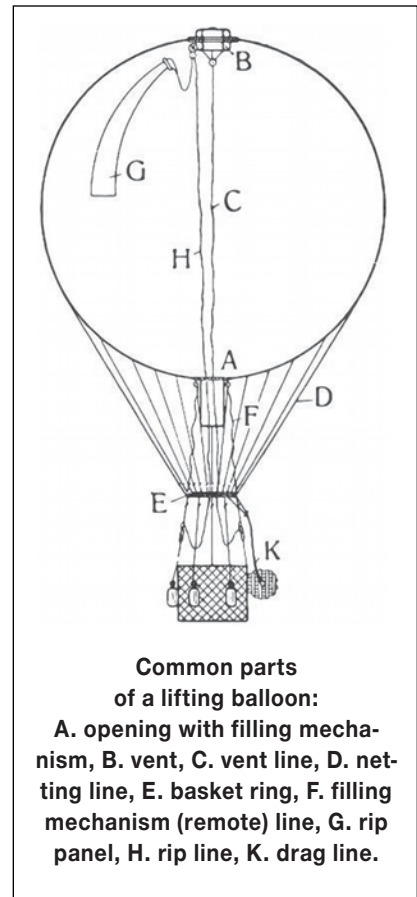
How do helium balloons work? What makes them float? The main differences between helium and air are? Where does helium come from? Can balloon aircraft be controlled? What does it mean to be tethered?

Design

Design is the act of working out the form of something. Engineers accomplish this through brainstorm-



3D-printed basket



ing possible solutions and making sketches or an outline or plan; in a lot of designs all three are used. They must keep in mind both function and form, and the connection between product and the user.

Some designs employ one or several engineers using their STEAM knowledge to create and execute design solutions. Several solutions may be considered before the final design is selected. A design matrix is a decision-support tool allowing design problems to be evaluated, rated, and compared with different alternatives on multiple criteria based upon project requirements. All ideas, sketches (with annotations preferred), data, research, and notes are kept in an engineering log book. For a description of what an engineering log book is, and how to use it, please see this video: www.youtube.com/watch?v=jv3i_aQp4Ug#action=share.

Possible Classroom Discussion Items

What does STEAM mean? What

is science? Technology is? What is engineering? How is art involved? The importance math is? What is an engineer? Explain what should be



Sealing the balloon

recorded in an engineer's log book. What is a design? How can art benefit a design? How is a design selection matrix used? Why is sketching an important engineering skill? The importance of brainstorming is? What is an annotation?

Design Statement

Design and construct a helium balloon aircraft.

Constraints

- Basket must have a length, width, and height of no greater than 1.5".
- Basket can be made from cardstock, plastic, or fabric. 3D printing the basket is acceptable.
- This will be a team project.

Materials

- Balloon valve
- Rubber band to secure balloon to valve
- Thread/lightweight string—used to attach netting and basket (Tape and other adhesives are not permitted.)
- 24" helium-quality balloon
- Netting (bird netting)
- Payload—1 to 3 different size diameter marbles.

Note: Document all team work in an engineering log book (30 points). Items like brainstorming, written ideas, sketches, annotations, research results, math calculations, and summary statements are major components.

Step One: Presentation

Your team will research gas, hot air balloon, and Rozière aircraft history and how these aircraft work. Define the key terms. The team will design a slide show highlighting similarities and differences between the three types of aircraft.

Assignment: Balloon aircraft history and how they work presentation (30 points)

Step Two: Individual Sketches

In your personal logbook, make a sketch of a gas balloon aircraft and label the parts. Your team will then create a series of rough sketches for three potential helium balloon aircraft. The pencil-drawn designs must include top, front, and right side views of each design. Note: The basket, rope, and/or netting are the key parts of your team's design.

Assignment: Individual sketches (30 points)

Step Three: Refinement of Ideas and Design Analysis

Decide on project evaluation criteria (a defining characteristic of something). Do the team's designs meet the criteria? Consider color, shape, height, overall design, and materials used. Evaluate the designs with a design selection matrix using the evaluation criteria.

Assignment: Design selection matrix (10 points)

Step Four: Design Analysis

1. Draw the winning airship. The pencil-drawn design must include top, front, and right side views, drawn to 1/4 scale of each part with all parts dimensioned. The design must also include an oblique of the final design.
2. Have the drawing approved and signed by the instructor.
3. Design a unique decal for the bas-

ket with markers or colored pencils.

4. Calculate the lifting capacity of a 24" diameter helium balloon.

5. Calculate the weight of three different sized marbles.

Assignment: Final annotated sketch of prototype (20 points)

If you don't have access to an accurate scale to weigh the marble(s), you can calculate the weight by finding the volume:

Calculate the volume of the marble.

1. $\frac{4}{3} \times \pi \times r^3$ is the formula to use. The radius r is half the diameter of the sphere. Cube the radius by multiplying the radius by itself twice, ($r \times r \times r$).
2. Multiply 4 by π then the radius r^3 ($r \times r \times r$) and divide by 3. This will give you the volume of the marble in grams if the balloon is measured in cm.



Attaching the net

3. The average density (D) of a solid glass ball is 2.60. Density = mass in grams divided the volume. Calculate the cargo weight of a 2 cm. marble. The same method for finding volume of the balloon will be used.

$$V = \frac{4}{3} \times \pi \times r^3$$

$$V = \frac{4 \times 3.14 \times 1 \times 1 \times 1}{3} = \frac{12.56}{3}$$

$$V = 4.19$$

$$D = M/V$$

$$2.60 = M/4.19$$

$$M = 2.60 \times 4.19$$

$$M = 10.89 \text{ g}$$

Step Five: Developments and Implementation

Create CAD drawings of parts and create an assembly drawing. CAD drawings will include all parts with multiviews (front, top, and right side) of each part. Once completed, with your instructor's approval, you are ready to build.

Assignment: CAD design (30 points)

Step Six: Construction

Construct a full-sized model of the helium balloon aircraft, based on the final sketch.

Assignment: Construction of the model (60 points)

Step Seven: Optimization

Write a paragraph evaluating the aircraft design. What aspects of the design would the team change?

Assignment: Evaluate the design (10 points)

Step Eight: Electronic Portfolio/Presentation

Electronic portfolio/presentation of the team's project must include:

- Title page including: names, date, period, and picture of the design.
- Introduction of your team
- Table of contents
- Preliminary sketches
- Math calculations of marbles' weight and balloon lifting capacity (show your work—20 points).
- Design selection matrix
- Final annotated sketch
- Strengths and weaknesses of your team's design
- Pictures of the plans
- Drawings of each part used
- Pictures of the final model

Assignments: Create Project Electronic Portfolio/Presentation (40 points).

Formal Presentation Presented in front of class (40 points) ©

Online Calculation Tools

Materials weight calculator
www.amlinkmarble.com/weight-calculator/weightcalculator.htm

Helium calculator
www.heliumcalculator.com/

Grading Rubric			
Assignment	Points Possible	Points Earned	Teacher Signature
Step One: Presentation	30		
Step Two: Individual Sketches	30		
Step Three: Design Selection Matrix	10		
Step Four: Final Annotated Sketch	20		
Step Five: CAD Design	30		
Log Book	30		
Step Six: Construction of the Model	60		
Step Seven: Evaluate the Design	10		
Math Calculations/Show Steps	20		
Step Eight: Create Electronic Portfolio/Presentation	40		
Step Eight: Formal Presentation	40		
Total	320		

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SkillsUSA Showcases the Nation's Best in CTE

THIS year SkillsUSA heads back to Louisville, KY, June 25-29, for the 54th annual National Leadership and Skills Conference (NLSC), a showcase of career and technical education students. More than 16,000 people—including students, teachers, and business partners—are expected to participate in the weeklong event.

The SkillsUSA Championships is a national competition for middle school, high school, and college/postsecondary students enrolled in public career and technical education programs. Each SkillsUSA Championships contestant is a state gold medalist. Started in 1967, the SkillsUSA Championships has 6,000 competitors in 100 hands-on skill and leadership contests.

SkillsUSA organizes this event, which is considered the largest skill contest in the world and the single greatest day of industry volunteerism in America, annually at an estimated cost of more than \$36 million. SkillsUSA adds contests to the SkillsUSA Championships each year to meet the demands of new and expanding occupations. SkillsUSA instructional programs represent 130 different occupational areas.

Prior to the official start, from June 23-25, students and advisors can experience **Activate**, **Leverage**, and **Engage**. Intense and rewarding, these three events cover individual, group, and interactive leadership training. **Activate** will help SkillsUSA members find their “start button” through hands-on, high-energy, and motivational programming. Activate is open to all SkillsUSA student lead-

ers. **Leverage** is open to SkillsUSA's high school and college/postsecondary state officers. It provides state officers with high-energy leadership training that focuses on individual leadership skill development, building teams, and communicating effectively.

Engage, open to advisors, will show how to use SkillsUSA as an educational teaching strategy and an integral component of any career and technical education program. For more information, and to register, visit: www.skillsusa.org/events-training/national-leadership-and-skills-conference/training-opportunities.

On Tuesday, the Opening Ceremony is the first official conference event.

Delegate sessions for students are conducted by the national officers. The sessions provide a platform to conduct the organization's official business, elect student leaders, and recognize state association voting delegates.

SkillsUSA University is a program of educational seminars available to all participants Wednesday, Thursday, and Friday. SkillsUSA TECHSPO returns to the conference as a whole new experience and is now located on the competition floor. Look for products available to purchase from SkillsUSA's sponsors and vendors in both indoor and outdoor exhibits.

The SkillsUSA Championships will

be held on Wednesday and Thursday. Students work against the clock and each other, proving their expertise in occupations such as electronics, computer-aided drafting, precision machining, medical assisting, and



culinary arts. Contests are run with the help of industry, trade associations, and labor organizations, and test competencies are set by industry. Leadership contestants will demonstrate skills including extemporaneous speaking and conducting meetings by parliamentary procedure. The competitions will be open to the public and free of charge.

The week caps off with the Awards Ceremony, which takes place on Friday evening.

To help students who face a financial challenge in going to the national competition, the mikeroweWORKS Foundation has offered scholarships for the past eight years. In 2018 they contributed \$50,000 to a scholarship fund for students.

The foundation focuses on students who are working primarily toward careers in manufacturing, construction, transportation, electron-

ics, and other program areas where a skills gap exists. Since 2011, it has provided scholarships to nearly 500 SkillsUSA students, representing an investment of more than \$400,000 in America's future skilled workforce.

"The skills gap is not only real, it's a reflection of what we value," said Mike Rowe. "To close the gap, we need to change the way the country feels about work. My foundation supports SkillsUSA because it celebrates the kind of skills that are actually in demand. Through excellence and competition, SkillsUSA encourages real-world training, and in the process, lays a foundation for thousands of careers in the skilled trades. SkillsUSA works."

To see the SkillsUSA 2017 Week in Review—National Leadership and Skills Conference, visit www.youtube.com/watch?v=qzbZvqwCEVM.

SkillsUSA is a vital solution to the growing U.S. skills gap. The nonprofit partnership of students, instructors, and industry ensures America has the skilled workforce it needs to stay competitive. Endorsed by the U.S.

Department of Education, the association serves more than 335,000-member students and instructors each year in middle schools, high schools, and colleges.

This diverse talent pipeline covers 130 trade, technical and skilled service occupations, the majority STEM-related. More than 600 corporations, trade associations, businesses, and labor unions actively support SkillsUSA at the national level.

SkillsUSA empowers its members to become world-class workers, leaders and responsible American citizens as it improves the quality of our nation's future skilled workforce. SkillsUSA supports its student members through the development of SkillsUSA Framework skills that include personal, workplace, and technical skills grounded in academics.

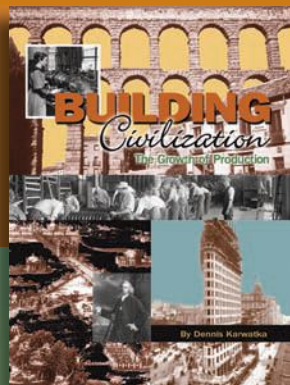
Local, state, and national championships, designed and judged by industry, set relevant standards for career and technical education and provide recognition opportunities for students. SkillsUSA also offers technical skill assessments and



workplace credentials through the SkillsUSA Career Essentials program, a cutting-edge solution that defines, implements, and measures career readiness skills for students.

SkillsUSA is organized into 18,000 chapters and 52 state and territorial associations. It has served more than 12.5 million annual members cumulatively since 1965. ©

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Can Educating Kids about Unions Prepare Them for the Future of Work?

Labor history is often missing from textbooks, but some schools are finding creative ways to teach economic justice

By Caroline Preston

THE young woman in the black sweatshirt was indignant. Across the negotiating table, a stern, occasionally sharp-tongued adversary refused to budge — first on wages and now on the organization’s social media policy. “We’re a hospital,” said the woman with marked intensity. “Don’t you agree that our first responsibility is to our patients?”

A cluster of young people nearby hotly debated the fairness of random drug tests for employees. Over in a far corner, a third group traded opinions on whether to accept management’s proposal to offer new hires 401(k)s instead of pensions. “It’s just for new employees,” said one young man, clad in a purple T-shirt. “But we have to think about solidarity,” replied a young woman in clear-framed glasses.

The speakers weren’t impassioned union representatives or managers concerned with the bottom line. They were juniors at Niles West High School, an economically diverse

Caroline Preston is a senior editor for The Hechinger Report. This article was originally published on The Hechinger Report website, www.hechingerreport.org. The Hechinger Report is a nonprofit, independent news website focused on inequality and innovation in education.

school serving approximately 2,500 students in the Chicago suburbs. The collective bargaining simulation was organized by the DePaul University Labor Education Center, which runs the exercises in roughly 10 high

America’s economic inequality, some say teaching teens about organizing might offer a chance of preserving the country’s middle class.

“Many of the gains made by the labor movement, people just take for

Gaby Goldman, left, and Leah Nano, cast as hospital managers, try to hammer out an agreement with the union on the organization’s policies on social media and drug testing.



Photos by Caroline Preston/The Hechinger Report

schools a year to introduce students to economic justice and the negotiating power of unions. For most of the students, it was the first time they were exposed to what unions do — not to mention their first encounter with terms like “HR,” “401(k)” and “union security.”

Lessons like these help students gain critical thinking skills and give them an opportunity to learn about workers’ rights and labor history, subjects that are often missing from classroom discussions, educators say. And, with a stack of studies suggesting that the decline of unionized labor since the 1970s has deepened

granted,” said Matthew Hardy, communications director for the California Federation of Teachers (CFT), which hopes to introduce labor history and bargaining exercises in five school districts this fall. “From things like workplace safety laws, to child labor laws, to vacations, holidays, civil rights, Medicare, Social Security, you name it — these didn’t appear out of thin air... Working people standing together did that.”

CFT, which represents roughly 120,000 educators, is lobbying for \$2.7 million in state funds for a three-year pilot that would incorporate labor history in civics, economics,

and history classes, along with simulations like those run by the DePaul center.

Students aren't likely to learn much about how labor unions have shaped economic and social policy if they stick to traditional textbooks, according to a report by the Albert Shanker Institute, a pro-labor group named for the longtime leader of the American Federation of Teachers. The 2011 study of four popular U.S. history textbooks found that coverage of the labor movement was "spotty, inadequate, or slanted."

"Textbooks tend to be tilted to the perspectives of the Rockefellers and the DuPonts and the Morgans, and don't do a fair job in terms of representing the conditions that working people were toiling under, or the often-difficult struggles they had to engage in to establish basic rights," said Leo Casey, the Shanker institute's executive director.

Striking workers, for example, are often portrayed as menacing and violent. In its treatment of politics during the mid-20th century, the Houghton Mifflin Harcourt textbook *The Americans* downplays the concerns of steel and railroad workers about their wages and celebrates President

Union membership has fallen since its peak in the 1950s and today includes just 10.7% of American workers.

Harry Truman for threatening to draft striking workers into the Army. Truman, the book declares, refused to let organized labor "cripple the nation."

But the textbooks mostly minimize or ignore the role of unions. One reason for this, according to Casey, is the outsize influence of Texas on the country's textbook market. The state's Board of Education meddles more than most in the process of approving textbooks,

Roughly 70 Niles West students spent four hours on a recent Friday learning how to negotiate on workplace issues.



Jessica Cook, director of the DePaul University Labor Education Center, uses the collective bargaining simulations to encourage students to think about the future of work.

and looks unfavorably on progressive social movements. As a result, publishers have tended to gear their

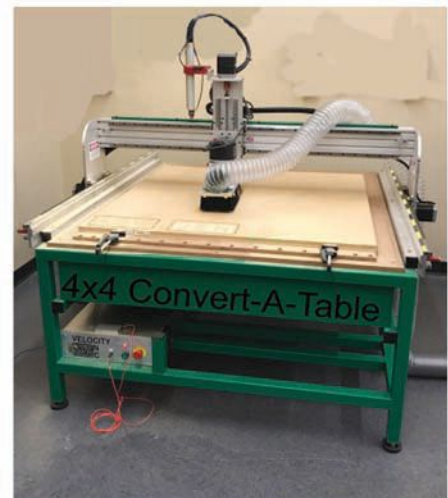
textbooks toward pleasing this deep-pocketed buyer.

Adam Sanchez found this to be



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the case when he started teaching U.S. history, first in Portland, Oregon, and later at the Harvest Collegiate High School, a small public school in New York City. “You might have some mention of the labor movement in a chapter on industrialization or, in

“Textbooks tend to be tilted to the perspectives of the Rockefellers and the DuPonts and the Morgans and don’t do a fair job in terms of representing the conditions that working people were toiling under, or the often-difficult struggles they had to engage in to establish basic rights”

*—Leo Casey,
Albert Shanker Institute*

a decent textbook, they might talk about the labor movement a bit in the 1930s,” he said. “But really it is totally ignored.”

Eager to help plug these gaps, Sanchez began drafting course materials on labor for Rethinking Schools, a publisher that co-launched the Zinn Education Project to develop curriculums on workers, women, people of color and social movements. Some 75,000 teachers to date have signed up to download its materials, including the lessons on labor, said Deborah Menkart, co-director of the Zinn project.

Sanchez’s favorite lesson (not one he authored) is the “Organic Goodie Simulation.” In the exercise, the teacher owns a “goodie machine” and pits the students — divided into employed and unemployed — against one another. The teacher tries to drive down workers’ wages by offering lower-paying jobs to the unemployed, who face starvation because they can’t afford enough “goodies.” Eventually, some students

recognize that it’s in their collective interest to organize, and they may strike or seize the goodie machine. “It’s an interesting flip of the typical classroom,” said Sanchez. “This is a lesson that rewards rebellion, and it’s often the rebellious classes that do well.”

At Niles West, 70 students bustled into a large classroom just past 8 a.m. on a recent Friday for the start of the simulation. In preparation for the exercise, they’d received handouts on the fictional Getswelle Hospital and its protracted labor negotiations with the nurses’ union. After being cast as union members or managers, they were assigned “coaches,” who included a Service Employees International Union researcher and an organizer with a local mechanics union. The DePaul center strives for verisimilitude: It even brought in two mediators from the Federal Mediation and Conciliation Service, the government agency that helps resolve worker-manager conflicts.

At table one, Hana Frisch, the young woman in the clear-framed

Rolling Stones fans out there?” asked Jerry Hughes, a retired federal mediator and coach for the union side. “You can’t always get what you want, but you get what you need. That’s the whole point of collective bargaining. You go for what you want to get what you need.”

Steve Grossman, a social studies teacher at Niles West and the DePaul center’s associate director, said that few high schoolers know anything about unions before the simulation. He tells them to seek the best deal for their side, but it also has to be a fair deal. If the union tricks management into accepting exorbitant wages, for example, that’s in no one’s interest. “The kids understand why — the hospital might go out of business,” he said. At the end of the exercise, Grossman asks students to consider what the contract might have looked like if they’d had no right to bargain. “It’s kind of like a switch goes off,” he said.

At least two states have tried to ensure that students receive an introduction to labor history. In 2009, Wisconsin passed a law incor-

Jerry Hughes, a retired federal mediator, coaches Niles West students who’ve been cast as union representatives.



glasses, took the lead in negotiating for the union. Her opening bid: Wage increases of 7% the first year, then 4.5% and 4% in years two and three. Frisch’s counterpart on the management side, Lily Gussis, returned to an earlier union proposal on employee health care. The hospital was willing to shoulder a slightly higher share of insurance costs, she said.

The two groups hustled back to their corners. Management hammered out a counter-proposal on wage increases. The nurses’ union began to consider overtime pay. “Any

porating the “history of organized labor and the collective bargaining process” into the state’s social studies standards. The rollout of those lessons has been slow, but the Wisconsin Department of Public Instruction released a draft of the new social studies standards in January.

In 2015, Connecticut approved legislation requiring the state board of education to distribute course materials on labor history and law, collective bargaining, and workplace rights. The labor-backed bill proved controversial, however, with critics

alleging that it was simply a way for unions — which today represent just 10.7% of U.S. workers — to reach young people in order to attract future members.

“I don’t think there’s anybody



Muhammad Afzal, a junior at Niles West High School, speaks on behalf of his team of managers as part of the DePaul University Labor Education Center’s collective bargaining simulation.

here that will deny that our education system does indoctrinate our kids,” State Rep. Charles Ferraro, a Republican, said in a hearing on the legislation. “It does give me pause as to why this bill was supported by unions primarily I don’t see how this particular bill is gonna give a fair, balanced approach in teaching our children.” Some teachers, meanwhile, objected to what they described as the legislation’s top-down approach and said decisions about what to teach were best left to them.

The law ultimately passed only after compromise language was added that mandated making information available on “the history and economics of free market capitalism and entrepreneurialism” as well.

Labor historians and progressive educators shrug off accusations that they’re trying to indoctrinate students. “There’s a lot about free market capitalism that’s already out there,” said Steve Kass, president of the Greater New Haven Labor History Association, which supported the bill. “The idea with this was to rebalance the scale.”

In some places, groups affiliated with unions have tried to educate young people about collective action by helping them organize around perceived injustices in their own lives. AiKea, an offshoot of Unite Here Local 5, in Honolulu, helps teens operate “justice clubs” in their schools.

Students successfully campaigned for funding for air conditioning in classrooms and against a dress code they felt was sexist. “Schools can be a great way to inspire young people and teach about economic justice,”

said Lisa Grandinetti, 22, who was active with AiKea while a student at Mililani High School, in Honolulu, and now works for the group. But, she said, because of over testing and standardization “that’s not what they are doing now.”

In Illinois, there’s no requirement that high schoolers learn about labor history, but the state recently started making students pass civics in order to graduate. Jessica Cook, director of the DePaul University Labor Education Center, said she hopes this will prompt more teachers to incorporate the bargaining simulations into their lesson plans.

Over pizza toward the end of the four-hour session at Niles West, Cook told the students: “If there’s one thing I hope you take away from this, it’s that it’s easier to have a voice in your working conditions when you’re together.”

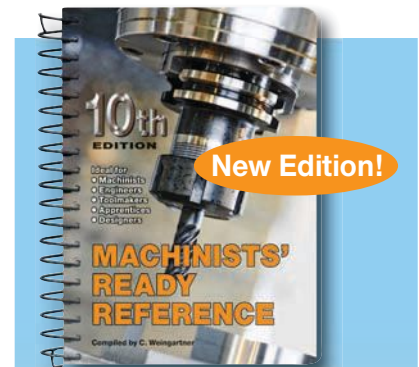
Gussis, the student who’d played the role of manager, said she could see herself as a union member. She aspires to work in theater and said that unions like Screen Actors Guild-American Federation of Television and Radio Artists help safeguard artists’ rights. The labor simulation was the one of the first occasions she could think of in which she’d used negotiating skills. “There are those times when you go up to your teacher to negotiate your grades. If you get an 88.5, your teacher might say you

could write an argument for why you should get an A.”

Over at the far end of the room, Leah Nano and her friend Gaby Goldman were reflecting on the pressures they’d felt as managers. “You have to make not just your employees happy but your bosses and the patients,” said Nano, who is interested in musical theater and business. “Sometimes I forgot it was a simulation.”

“My veins were popping, my hands were shaking,” added Goldman, an aspiring special-education teacher.

Muhammad Afzal, a Niles West junior, said he hopes to be a nuclear engineer and will probably wind up working for a big corporation. The bargaining simulation, he said, helped him consider how he might negotiate for better pay and working conditions when he’s older. “I learned about how to communicate and how, if you’re more civil, you get a better deal,” he said. Before this day, he said, “I didn’t realize there was a system [for this] where you try to be fair.” ¹⁰



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Building Bridges Across the IT Skills Gap in Fewer than Four Years

By Eric Larson

THE tech business is hotter than ever—pretty much everywhere. The global information technology industry surpassed \$4.5 trillion in revenues in 2017, according to research consultancy, IDC. What's more, the research team at CompTIA—the parent organization of Creating IT Futures—expects the global IT industry to grow a whopping 5% in 2018.

scape seems, there's a growing cloud—demand for tech talent continues to exceed supply. We call this foreboding storm the “IT skills gap.” It's a compelling reality motivating many organizations to rethink approaches to recruiting, training, and talent management.

Filling the IT skills gap already is tough. As I shared in my last article in March, a poll of more than 550 U.S. hiring managers uncovered that 67% expect filling openings with the right candidate to be challenging during the next two years. Moreover, virtually all (99%) noted at least one current staffing challenge, such as finding candidates with the right level of experience, finding candidates with the right “hard” technical skills, or

identifying candidates with the right “soft” business skills.

Analysts expect the IT skills gap to widen. In CompTIA's “Creating a 21st Century Workforce” white paper, the authors warn that there may be 1.8 million unfilled technology jobs in the U.S. over the course of the next five years as an estimated 800,000 technology workers retire.

There are no quick and easy ways to address the double-edged dilemma. As a stop-gap, companies utilize training and certification programs to sharpen the technical skills of their existing workforce. Many ex-

tend such skills development to their non-IT workforce.

However, if we aim to close the gap, seeding the IT talent pipeline will be necessary. It's why my organization believes middle and high schools are excellent focal points for long-term efforts. That's because tweens and teens already make up a quarter of the U.S. population and will account for more than 20% of the workforce in the next five years.

Furthermore, my team's research suggests many in this cohort have the disposition to become more than technicians; they will become technologists, working with technology of varied types in companies of all shapes and sizes along a broad spectrum of industries—not just software and hardware companies. We expect that workers with a technologist's

IT Industry Growth Forecasts

Gartner 4.5% worldwide forecast

IDC 5.3% worldwide forecast

Forrester 5.8% U.S. forecast

Note: Research consultancies tend to update their forecasts periodically to reflect new information, so these figures should not be viewed as static. Differences in forecasting methodologies, such as using current or constant dollars, should also be taken into account.

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That said, the U.S. is the largest component of the world tech market, comprising 31% of total spending, or approximately \$1.5 trillion for 2018. The tech sector continues to be one of this country's most significant contributors to GDP and year-over-year growth.

As rosy as this economic land-

Eric Larson is senior director of Creating IT Futures' signature initiative, IT Futures Labs, which discovers and develops research, projects, programs, and best practices for charting new pathways to tech careers.



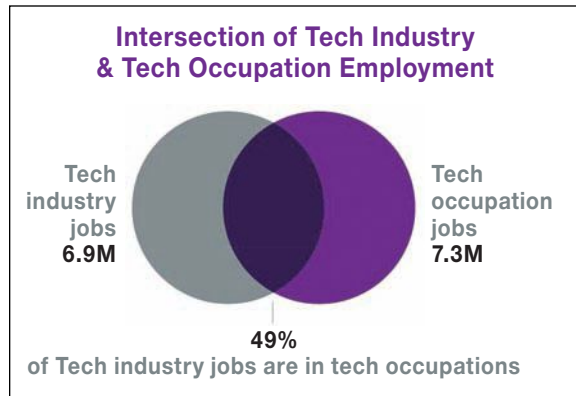
mentality—an optimal mix of hard technical skills, soft skills, and business acumen—will be well-suited for today's evolving fast-paced, continually evolving technology environment.

The question is how to prepare

tomorrow’s technologists beginning today. Increasingly, four-year colleges are not the solution. In our “Assessing the IT Skills Gap” study, 87% of the 600 U.S. IT and business executives surveyed across a variety of industries agreed with the statement “Colleges are not sufficiently prepar-

tion. According to the U.S. Census Bureau’s 2014 American Community Survey, 59% of employed computer support specialists didn’t have a bachelor’s degree. Motivated students can learn the underpinnings of technology and start troubleshooting IT problems after one introductory class.

Talent Gap” by my colleague Charles Eaton in the January 2018 edition of Tech Directions to learn more) and apprenticeships (see my article “The Time is Ripe for Tech Apprenticeships” in the March 2018 edition of Tech Directions to learn more.) Such work-based learning programs can familiarize students with soft skills and help to contextualize technical knowledge.



Sure, many people learn about managing tech in college, but plenty others self-study, enroll in online programs, or pursue an associate degree. As any CTE educator can tell you, there are more pathways to technical careers than just the one that winds through a campus quad.

ing students for today’s jobs,” including critical roles such as cybersecurity, which ranked among our poll’s top five IT skills gap areas.

Instead, students are looking toward industry training and a certifica-

The development of the skills needed for adapting to ever-evolving technology can begin in middle- and high-school, and can be extended through internships (see “Designing New Internship Models to Close the Nation’s Cybersecurity

Sometimes the fastest way to connect two parties on opposite sides of a chasm is for both sides to start building their half of the bridge simultaneously. There’s really no time to waste. ©

More than Fun Answers

Let Me Give You a Tip

He should add \$4.13 to the bill of \$95.11, for a total of \$99.24.

Let x = original bill without the 15% gratuity.

$$\text{Then } x + 0.15x = \$95.11$$

Therefore, $x = \$82.70$ (the price for the food)

$$20\% \text{ of } \$82.70 = \$16.54$$

$$15\% \text{ of } \$82.70 = \$12.41$$

Subtracting, you get \$4.13.

Dial by Name

- | | |
|--------------|--------------|
| 1. AXL-ROSE | 12. RON-PAUL |
| 2. BOB-DOLE | 13. JIM-FIXX |
| 3. ICE-CUBE | 14. JEB-BUSH |
| 4. BOB-SURA | 15. DON-IMUS |
| 5. JAY-LENO | 16. LEN-BIAS |
| 6. BOB-VILA | 17. PAT-CASH |
| 7. DON-KING | 18. SKY-KING |
| 8. DON-JUAN | 19. RON-REED |
| 9. DEL-RICE | 20. UWE-BLAB |
| 10. KID-ROCK | 21. THE-KING |
| 11. MEG-RYAN | |

A Real Hum-Dinger

I could identify the following nine ringers: Amy, Andrew, David, Karen, Kate, Lance, Lynne, Tracy, and Trevor. I could not determine the identities of: Laurie, Michelle, Nancy, Stephanie, and Yvonne. Here is the order in which the ringers were identified:

Musical Selection	Ringers Identified
The Swan	Trevor (the only male)
Kindness	Karen (only person in 1st 2 groups), Amy (only one left in 1st group)
Bist Du Bei Mir	None
Arioso	David (only male in group)
Adagio	Andrew (since Trevor was identified) Lance (since he is the remaining ringer in group 2)
Pick A Winner	Kate (only female in this group)
Over the Rainbow	Lynne (only one to be in groups 4 and 7), Tracy (only one left in group 7)

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Let Me Give You a Tip

At a restaurant, Mr. P was given a bill for \$95.11 that included a 15% gratuity. He wanted to leave a 20% tip instead of the 15% tip already included. How much should he add to the bill?

Puzzle devised by David Pleacher, www.pleacher.com/mp/mpframe.html

A Real Hum-Dinger

My wife and I attended a Handbell Concert where we did not know the identity of any of the ringers. The concert began with small groups of ringers playing seven different pieces, and their names were given in the program. Assuming that I could remember the faces of each ensemble and could distinguish male from female, which of the 14 ringers could I identify by the end of the concert?



The first seven pieces are given below along with the performers.

Musical Selection	Ringers
The Swan	Amy, Karen, Trever
Kindness	Andrew, Karen, Lance
Bist Du Bei Mir	Laurie, Michelle, Tracy, Yvonne
Arioso	David, Lynne, Nancy, Stephanie
Adagio	Andrew, Trever
Pick A Winner	Andrew, Kate, Lance, Trever
Over the Rainbow	Lynne, Tracy

The following ringers were males: Andrew, David, Lance, Trever.

The following ringers were female: Amy, Karen, Kate, Laurie, Michelle, Lynne, Nancy, Stephanie, Tracy, Yvonne.

Puzzle devised by David Pleacher, www.pleacher.com/mp/mpframe.html

Scramble-word Mini Challenge

Unscramble the word below to discover something that a tailor and a shop machinist have in common.

DRASHET



"At the bottom of your report you wrote, 'Please excuse typographical errors as this is being written from my smartphone.' Nice try."

See answers on page 27.

Dial by Name



Can you figure out who the following telephone numbers represent? The three-digit exchange represents the celebrity's first name and the other four digits represent his or her last name. Use a standard telephone keypad to decode the phone numbers.

For example, the phone number 529-2874 would belong to JAY-BUSH, the spokesperson for Bush's Baked Beans.

- | | |
|--------------|--------------|
| 1. 295-7673 | 11. 634-7926 |
| 2. 262-3653 | 12. 766-7285 |
| 3. 423-2823 | 13. 546-3499 |
| 4. 262-7872 | 14. 532-2874 |
| 5. 529-5366 | 15. 366-4687 |
| 6. 262-8452 | 16. 536-2427 |
| 7. 366-5464 | 17. 728-2274 |
| 8. 366-5826 | 18. 759-5464 |
| 9. 335-7423 | 19. 766-7333 |
| 10. 543-7625 | 20. 893-2522 |

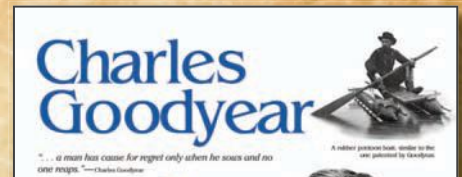
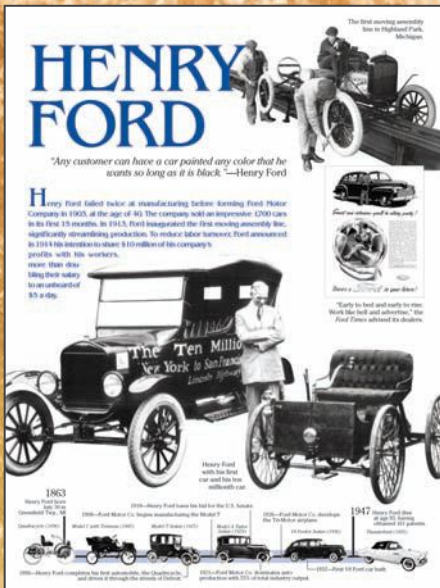
Extra Credit: 21. 843-5464

Puzzle devised by David Pleacher, www.pleacher.com/mp/mpframe.html

We pay \$25 for brainteasers and puzzles and \$20 for cartoons used on this page. Preferable theme for all submissions is career-technical and STEM education. Send contributions to vanessa@techdirections.com or mail to "More Than Fun," PO Box 8623, Ann Arbor, MI 48107-8623.

Technology's Past POSTERS

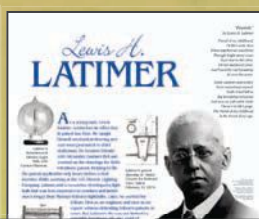
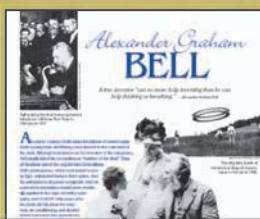
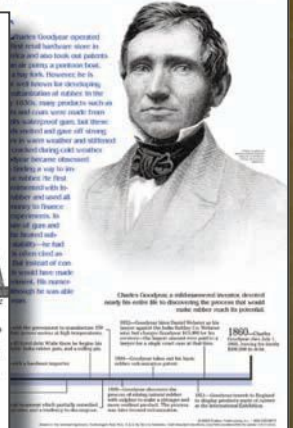
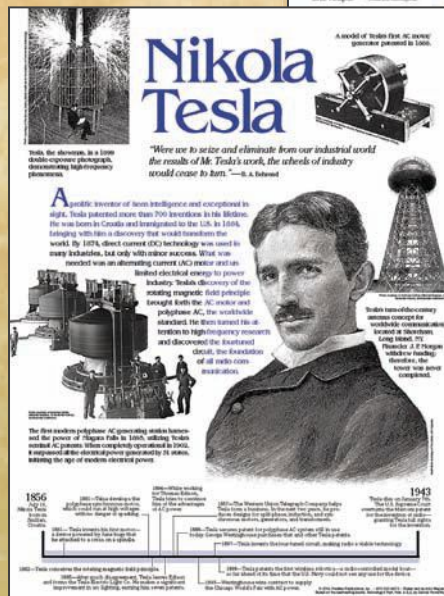
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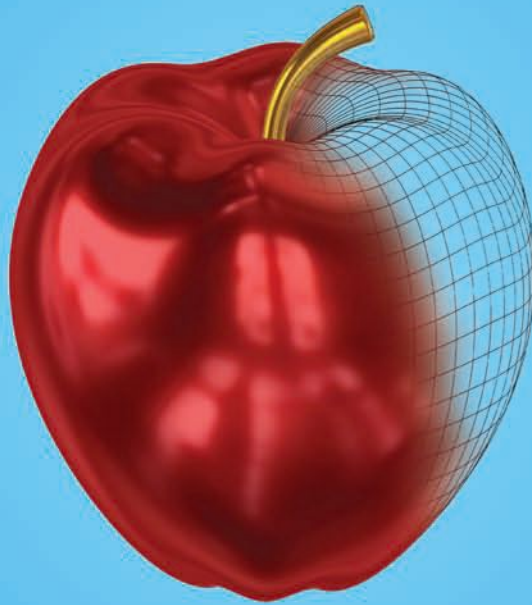
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