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NOVEMBER 2017

Building Trades *Focused Issue Inside*

Leading Students Toward Energy Industry Careers

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VISION



Vanessa Revelli vanessa@techdirections.com



We spend a lot of time talking about the aging career-technical workforce, and the shortage of skilled workers to replace them once they retire. With that in mind, I was so happy to read what is going on in Colorado Springs at Pikes Peak Community College (PPCC)—a construction trades certificate program for high school students that is funded by those working in the industry.

“We want Colorado Springs to be the careers and construction hub,” said Renee Zentz, CEO of the Housing & Building Association (HBA) of Colorado Springs.

In 2015 the HBA, comprised of 500 businesses representing 12,000 employees, started the Careers in Construction program, which provides pre-apprenticeship training for 9th-12th grade students. This program, which initially had 30 students at one high school, now has 350 students in six schools.

PPCC is continuing the pathway with a new associate in applied science degree in building and construction technology, along with two certificate programs that lead to the degree.

“For the last couple of years, in our architectural engineering and construction management programs, they’d say why aren’t we building anything,” said Michele Koster, advanced manufacturing and building trades coordinator for PPCC. “Between that and the high interest in the community about building trades and not having enough of a skilled workforce, it set us on fire to get a program up and running for local kids and contractors.”

New programs at PPCC generally have about 20 students, Koster said, but 125 students have registered for the construction offerings including roofing, drywall, carpentry and floor finishing, and even internships at local companies.

Coursework builds on the high school curriculum and is applied to PPCC’s accreditation system.

“It articulates beautifully,” Koster said. “This is huge for students. We’re hoping to take the training out of the equation for contractors needing help. Students should be able to jump right in and frame.”

Mitchell high school, one of the six involved with PPCC, remodeled their old shop room to feel like a job site.

“The first week of school they built a shed for our theater department,” Mitchell assistant principal Amy Sanchez-Martinez said. “This is not a hobby, this is a career, and we want to prepare students for that.”

Advanced classes focus on specific disciplines, including carpentry, electrical, HVAC, and plumbing. Students work together in teams to build projects.

“They get to see how real-life experiences give the opportunity to have a job and make money,” Mitchell High construction trades teacher Tracy Pope said.

Some students will be fired during the course.

“We make sure they understand they were fired for a reason, so when they do get to re-enter the workforce, they fix it,” Pope said.

Just like a real job.

Vanessa Revelli

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By Pat Roane

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A collection of articles for building trades educators.

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By Charles Eaton

There's lots of false information out there about careers in technology. This article breaks down, and debunks, some of the more common myths.

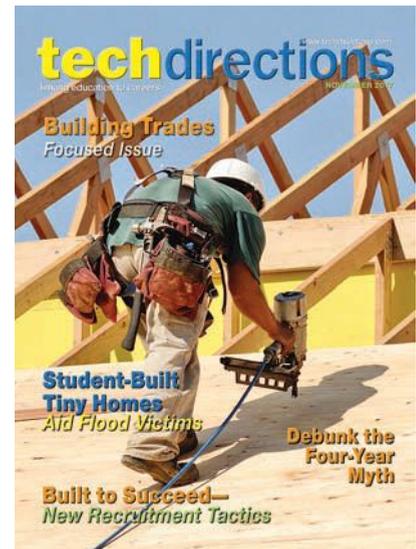
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The Association for Career and Technical Education's annual convention will offer ample opportunities for professional development and a chance to see a variety of excellent products for the CTE field.



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About the cover: Catie Rogers, an apprentice with Sheet Metal Workers Local 20 in Indianapolis, helps to recruit apprentices by participating as a cast member for Built to Succeed. Cover design by Sharon K. Miller.

Vanessa Revelli

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Lowe's Grants Help SkillsUSA Chapters Apply Learning to Community Projects

This year, 31 SkillsUSA chapters will receive grants from Lowe's to enhance schools and communities while building the skills of students learning trades. Lowe's, the largest corporate donor in SkillsUSA history, has provided a total of \$1.5 million this year, bringing Lowe's and the Lowe's Charitable and Educational Foundation's total contributions to SkillsUSA to more than \$15 million since 2006.

The school grants strengthen local communities while providing

Vanessa Revelli is managing editor of techdirections.

enhanced learning opportunities for students and fostering relationships between local Lowe's stores and SkillsUSA chapters.

"Lowe's is one of our finest partners, providing millions of dollars that go directly to enriching local and state SkillsUSA programs," said Timothy Lawrence, executive director of SkillsUSA. "Schools often struggle to fund new equipment and updated classrooms or school campus enhancements—there are so many demands on their budgets. Communities face the same challenge. As a skills gap solution and verified talent pipeline, SkillsUSA is working to graduate more than 100,000 students each year who are career-ready. These Lowe's grants enable career and technical educa-

tion students to hone their knowledge and apply their skills in real-world scenarios while giving back. With the help of Lowe's, we can truly make a lasting impact in these communities."

"Our partnership with SkillsUSA is important to helping address the growing demand for skilled workers in the United States," said James Frison, director of community relations at Lowe's. "Lowe's support of the SkillsUSA community service grants program provides students with hands-on experience using their skills to make a difference and helps prepare them for future careers in skilled trades."

The grants will be used for various community and school projects such as materials to build a Habitat for Humanity house, a tiny house for a homeless veteran, and to renovate the bathroom/shower and kitchen of a nonprofit that provides food and showers to people in need.

For more information about Lowe's Charitable and Educational Foundation, and to apply for a



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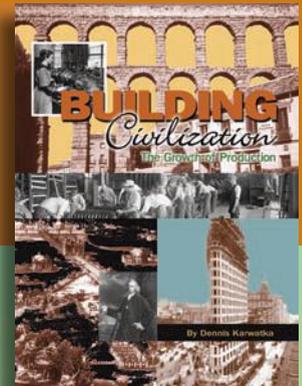
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About SkillsUSA

SkillsUSA is a vital solution to the growing U.S. skills gap. This nonprofit partnership of students, instructors, and industry ensures America has the skilled workforce it needs to stay competitive. Founded in 1965 and 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 programs are integrated into career and technical education through a framework of personal, workplace, and technical skills grounded in academics. For more information, go to: SkillsUSA.org.

ITEEA Awards—Deadline December 1st!

Each year, ITEEA recognizes technology and engineering educators and programs from across the country. ITEEA created its awards program to raise awareness of and exposure to the outstanding work being done in technology and engineering education.

Award and scholarship opportunities exist for educators at all levels, undergraduate and graduate students, and programs at the elementary, middle, and high school levels. ITEEA award winners will be recognized at ITEEA's Annual Conference.

Some of the opportunities available are:

The Teacher Excellence Award—One of the highest honors given to technology and engineering education classroom teachers, this award is presented in recognition of their outstanding contributions to the profession and their students.

FTEE scholarship—Opportunities are available to support the advancement of technology and engineering education. If you are an ITEEA member who is seeking professional

development or to continue your education, you owe it to yourself to apply for a scholarship today.

Special Recognition Awards—ITEEA's most prestigious awards are given to those who elevate the profession through their dedication and contributions to the mission of technological literacy for all. This is your opportunity to recognize exemplary colleagues. Nominate a deserving colleague today!

Gerhard Salinger Award for Enhancing STEM Education—ITEEA's

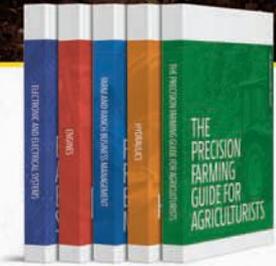
newest award will be presented annually to an individual or team of collaborators whose work has exemplified, promoted, investigated, and/or enhanced teaching and learning in science, technology, engineering, and mathematics (STEM) subjects through the effective application of technological/engineering design activity.

Complete award and scholarship details are available at <https://www.iteea.org/Activities/AwardsScholarships.aspx>. ©



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New NYC Interactive Art Landmark— Climb 2,500 Steps to Breathtaking Views

For at least 8,000 years people have used staircases to go from one elevation to another. It is hard to imagine a new sixteen-story structure being built today emphasizing staircases as the way to go from floor to floor. By emphasizing the staircases as the means of travel in and around Vessel, a new interactive public art installation (Photo 1), climbers will definitely need to catch their breath as they climb 2,500 steps to different observation landings for unique views of the surrounding area. Vessel is scheduled to be completed in fall of 2018.

Hudson Yards is a \$20 billion mega construction project now under construction in NYC. When completed, this 12.7 million square foot neighborhood will include 16 new skyscrapers with places for

now building Vessel (Photo 2.) It is an observation tower that will become



Forbes Massie Heatherwick Studio

Photo 1— The bronze-colored tower is an interactive architectural art structure of staircases for people to climb.

tural art. From the outside Vessel resembles an open woven beehive shaped structure with an outer skin of bronzed steel. From the inside Vessel is a structure of grand staircases that spiral upward with majestic beauty toward the sky (Photos 3 and 4.)

When you build a tall building, the load of each level must be supported by the floors below, with the foundation supporting the total load of the structure. Vessel has been designed so it will look like it defies gravity. It will have a relatively small footprint at its foundation. From this base diameter, each level spirals a little further out as its staircases and landings climb 16 stories into the air to give many breath-taking views.

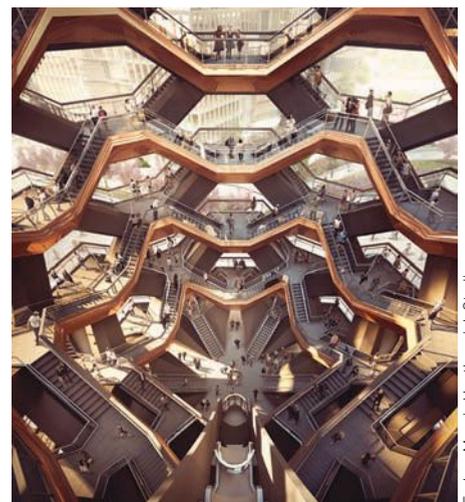
The staircases with their landings are being built in Italy and will be shipped to the construction site for assembly. They can best be described as giant jigsaw puzzle pieces, each consisting of a staircase and a landing (Photo 5). Many workers will join together giant Lego sections that can only give full structural integrity when all of them



Visual House Nelson Byrd Wolz

Photo 2—Vessel will sit in the center of a five-acre park surrounded by new office buildings, stores, restaurants, and a school, a place for people to visit and also climb to see spectacular views of the area.

Photo 3— Inside the structure, you are surrounded by beautiful staircases that wind their way up to the top.



Forbes Massie Heatherwick Studio

people to live, work, shop, eat, and even go to school.

At the center of this 21st century mini city is an open-to-the-public five-acre park-like setting, where they are

to anchor its staircases, it is a unique construction project.

The *Architects Newspaper* describes Vessel as a \$2.5 million super large interactive piece of architec-

a NYC landmark. Vessel is designed as interactive art for people to climb. Since Vessel has no floors

are joined together. Each section transfers its load to the next section going up, and the last section going down, until all the sections are attached and Vessel can carry the

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



Photo 4— The landings of the different staircases all give you different views of the surrounding city.

full load of the structure down to its foundation.

Vessel's structure will draw citizens of NYC and tourists to the area's restaurants and shops. The 154 flights of stairs will provide 80 large landings for people to relax and regain their strength so they can continue to walk up and down the 2,500 steps to get different views of the city.

Vessel's maze of staircases will provide breathtaking views only for

those people with the stamina to climb some, or all, of its flights of stairs. There will be no shops, restaurants, or other places to visit at any of the staircase landings; the only entrance and exit is on the ground. In many ways Vessel is a monument to physical fitness.

These YouTube videos will give you a good idea of the engineering behind Vessel 's design: www.youtube.com/watch?v=OLG3uTmceCE, and its construction: www.youtube.com/watch?v=zInhFBV1IAI. You can also see what the entire \$20 billion Hudson Yards project entails by watching this video: www.youtube.com/watch?v=q9liS9RnchQ.

Taking It a Step Further

Tech Challenge: Your mission, if your teacher assigns it, is to build the tallest tower possible that is

narrower at its base than it is at its top. Specific design elements and construction materials will be determined by your teacher. ©



Joe Woolhead for Related Oxford

Photo 5—Vessel is a giant jigsaw puzzle that is being shipped from Italy for onsite assembly at the construction site.

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technology's past

Dennis Karwatka
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Jacques Cousteau and His Undersea World

Undersea exploration has always been difficult because divers have to be supplied with air to breathe. Bulky canvas diving suits with metal helmets were common in the early 20th century. In 1943, Jacques Cousteau and Emile Gagnan introduced an entirely new device called an aqua lung. We now call it SCUBA equipment, which stands for "self-contained underwater breathing apparatus."

Cousteau was born near Bordeaux, France, in 1910 and raised

with a younger brother. Their father was a country lawyer who had some American clients and traveled to the United States with his family. Jacques learned to speak English at an early age and typically used that language in his adult years.



Jacques Cousteau wearing his signature red knit hat, circa 1970

He attended local primary schools and entered the French Naval Academy in 1930. Following graduation, Cousteau was assigned to the Navy's information service until he had a serious automobile accident

in 1933. Part of his rehabilitation included daily swimming in the Mediterranean Sea. There, he used a pair of goggles to view the undersea world for the first time.

Cousteau remained in the Navy and married Simone Melchior in 1937. They had two sons. Cousteau spent World War II (1939-1945) near the Swiss border, where he worked with the French Resistance by photographing enemy installations.

Compressed-air tanks were coming into use at that time and Cousteau tried some div-



Above, Cousteau at a New York City pool, testing an aqua lung in the 1940s

Right, Cousteau operating diving equipment, circa 1955



**The yellow mini-submarine
at the Monaco
Oceanographic Museum**



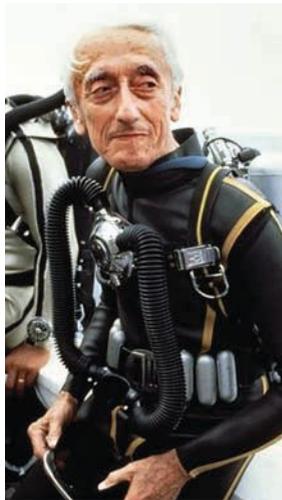
**The Calypso
at sea**

on the public stage. He wrote a 1953 book titled *The Silent World* that sold over 5 million copies. It was made into a popular 1956 film. Cousteau received a sponsorship from the country of Monaco in 1957. Princess Grace (born Grace Kelly in America) and Prince Rainer made him Director of their Oceanographic Institute.

Cousteau is best known for his 1968-1975 television series, *The Undersea World of Jacques Cousteau*. While wearing his characteristic red knit hat, the 6' 3" Cousteau took his audience to places they had never seen. He used his yellow mini-submarine and other equipment to film sea creatures like whales, turtles, and octopuses. The series aired in over 100 countries.

Cousteau's first wife died in 1990 and he remarried the following year. He had a total of four children; some of them served as his assistants. Although Cousteau had many oceanographic accomplishments, he never claimed to be an expert in any discipline. He died in 1997. *Calypso* was moored in Singapore harbor in 1996 when a barge rammed into it. It sank but was later refloated and *Calypso* is currently being rebuilt in Istanbul, Turkey. ☹

ing gear that used a constant flow of air. But the gear drained the air tanks too quickly. Cousteau became associated with Emile Gagnan (1900-1979), who worked for a large gas company. The two combined their talents and developed an on-demand regulator, which meant it only provided air when the diver inhaled. They called it an aqua lung and applied for a patent in 1943. This became the basis for all modern SCUBA equipment. Cousteau shared in at least seven patents including those for diving tanks, air regulators, mouthpieces, and swim fins.



Cousteau in a diving suit

the Roman shipwreck *Mahdia*. It was the first underwater archeology operation using self-contained diving equipment.

Cousteau found financial backing to purchase a World War II-era wooden minesweeper that had been built in Seattle, WA. He converted it to a floating laboratory in 1951 and called it *Calypso*. He used the ship to tour oceans and seas for most of the next 46 years.

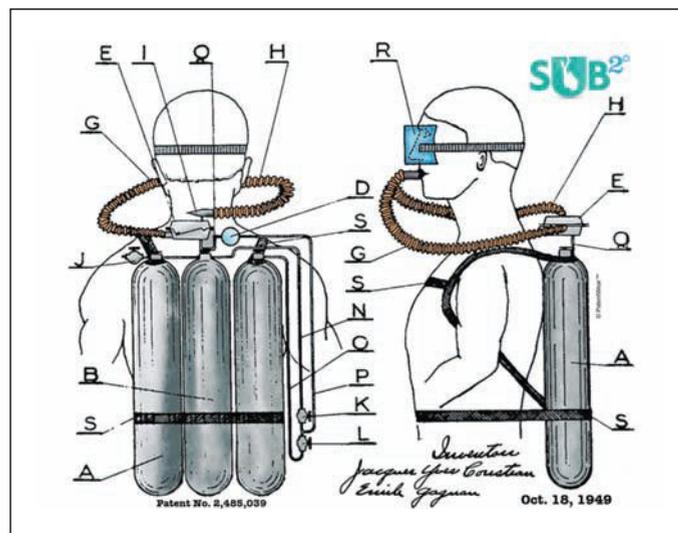
Cousteau developed an international reputation and enjoyed being

After the war, the French Navy appointed Cousteau the first director of its Underwater Research Group. He had previously assisted in the development of sealed housings for motion picture cameras. Cousteau used a sealed camera and his aqua lung to film underwater activities. The Navy supported his 1948 exploration of

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

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**Aqua lung
patent
drawing**

Energy Industry Fundamentals Certificate Program

By Pat Roane

ELECTRICAL energy is vital to all engineering & technology industries. In recent years, much emphasis has been placed on sources and applications of renewable and inexhaustible energy. While these provide alternatives to our conventional, non-renewable fuel sources, most industry, manufacturing, and home heating and cooling relies on electricity.

Regardless of the initial source of power, the generation, transmission, and distribution of electrical energy is crucial to our future. High school seniors in the pre-engineering program at Bridging Communities recently took their first steps toward careers in the energy industry when they completed the Energy Industry Fundamentals (EIF) Certificate program.

Bridging Communities Career & Technical Center and Governor's STEM Academy is located in New Kent, Virginia. A regional program, Bridging Communities, serves Charles City, Middlesex, King &

Pat Roane served 30 years as a naval officer, retiring at the rank of Captain. He holds a teaching certification in the Commonwealth of Virginia with an endorsement in Technology Education. He now teaches a dual-enrollment pre-engineering program at Bridging Communities Career & Technical Center and Governor's STEM Academy in New Kent, VA.

Queen, King William, and New Kent counties, as well as the town of West Point.

Engineering & technology program students at Bridging Communities are enrolled through their junior and senior years in high school, completing dual-enrollment courses in partnership with Rappahannock

burdensome, it ensures the necessary elements are in place to support student success.

Although two months are requested for processing course provider applications, additional time is necessary to establish the optional, but highly recommended, online learning management system. With our first course scheduled to begin in late January 2017, Bridging Communities submitted a course provider application in mid-June 2016 and received approval to deliver the course in early August.

Julie Strzempko, educational consultant at CEWD, coordinated the approval process and offered a webinar for new course providers in October 2016. CEWD also offers an online learning management portal tailored to the educational institution; the Bridging Communities system was operational by the end of November 2016. A second webinar,

also hosted by CEWD, ensured those using the learning management portal understood its operation and capabilities.

While the online learning management portal is not required to deliver the course, it provides a significant increase in flexibility for both instructors and students. Using their unique profiles, students can access their reading assignments and complete quizzes online. Feedback is immediately available, allowing students to move ahead with assignments.

CEWD provides downloads for

Continued on page 25.



Community College. The pre-engineering program operates as part of the Governor's STEM Academy, with students completing the Virginia CTE Engineering Explorations curriculum as juniors and Engineering Studies as seniors.

Start to Finish

A bit of time is required before implementing the EIF curriculum in the classroom. The Center for Energy Workforce Development (CEWD) coordinates the approval of course providers, ensuring consistency in the delivery and assessment of the material. While the application is not

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linking education to careers

NOVEMBER 2017

Building Trades *Focused Issue*

**Student-Built
Tiny Homes
Aid Flood Victims**

**Built to Succeed—
New Recruitment Tactics**

**Debunk the
Four-Year
Myth**

BUILDING TRADES

15 High School Students Build Tiny Homes for Flood Victims
By Kara Lofton and West Virginia Public Broadcasting
After a historic flood in West Virginia, 12 vocational schools stepped up to provide housing for families who lost their homes.

17 Indiana Building Trades Are ‘Built to Succeed’
The Built to Succeed street team uses a variety of new recruiting tactics to increase awareness, education, and recruiting opportunities across the building trades fields.

18 HBA Members Debunk Four-Year Degree Myth to Promote Trades Careers By Chelsea Diederich
The Herdina Academy’s summer program gives high school students a taste of what building trades are, and shows them that a four-year degree isn’t necessary to have a successful career.



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An after-school program in New Orleans matches student’s interests right from the beginning of school, and helps them find pathways to careers.



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21 Improving Students’ Linear Measurement Skills
By Brandon Richard
Introducing students to different techniques improves their measurement skills, increases project successes, and reduces waste.

About the cover: Working on the roof sheathing of a new, two-story, commercial apartment building in Oregon. Photo by dpfoxfoto. Cover design by Sharon K. Miller.

High School Students Build Tiny Homes for Flood Victims

By Kara Lofton and West Virginia Public Broadcasting

TEN tiny homes lined up in two rows at the National Guard air base in Charleston recently. West Virginia high school students built the homes for victims of the June 2016 historic flooding who were still struggling to find adequate housing.

The idea was that instead of vocational students building birdhouses or shelves, they could use the skills they were learning in class—carpentry, electrical work, plumbing, welding—to help out local families.

“I was very concerned that folks in West Virginia were still suffering even though all the press had gone away—just like there’s a new story, there’s a new day,” said Kathy D’Antoni, West Virginia’s chief officer for career

six people. For reference, the average American home is about 2,500 sq. feet according to the U.S. Census Bureau.

“Up here’s the loft that’s where they sleep, that’s where the hot water tank stays, then right here’s like your living area, your living quarters, then you have like your fridge right here, your stove’s in there—they’re working on that right now,” said Dakota Carte, one of the students who worked on the project at Carver Career Center in Charleston.

We were standing in the house’s living room during one of the last days of production. The space also served as a kitchen, dining room, and bedroom. All in all, the structure was little bigger than a generous walk-in closet.

But it’s much better than what many of the recipients lived in all summer.

Rivers is a retired nurse who lived in her home beside the Greenbrier River for 18 years. During the flood, she, her dog and cat evacuated in a tiny camper to a neighbor’s driveway up the hill. There was 6” of mud on the floor and watermarks 2’ up the wall when she returned to the house several days later.

She said after the flood she thought she might be able to clean up and move back in. But it quickly be-

Photos Kara Lofton/West Virginia Public Broadcasting



A student stands in one of the Tiny Homes during a demonstration in December.

and technical education. Twelve vocational schools received \$20,000 for the project from the state board of education.

“And it’s a killer time frame for these schools,” she said. “Takes normally four to six months to build a tiny home, they’ve done it in nine weeks.”

It should also be noted that all the tiny homes projects also received significant support—both financial and labor—from the schools’ communities.

Most of these homes—there are 15 total—are less than 500 sq. feet, but are designed to house two to



A student demonstrates a hideaway “Murphy Bed” in one of the tiny homes.



Left, a student works at Carver Career Center outside Charleston



Above, Inside one of the tiny homes built by WV vocational students.

Left, a student works on a tiny home at Marion County Technical Center. Marion County was the only school that built more than one home (they produced 4).

came evident that just hosing the mud off wasn't an option. Not only was the foundation knocked off kilter, she said, but the mud hardened to a concrete-like substance that had to be scrubbed, rather than sprayed, off.

"We had to carry everything out and put it in a dump truck...so my whole life was like thrown out there," she said.

Rivers was unable to find rental property that would take her dog or allow her to sign a month-to-month lease so she moved her camper onto the back of her daughter's property and lived there for the summer—moving into the living room when it became too cold to continue living outside.

She said living with her daughter and five grandchildren permanently isn't a great option—the kids are home-schooled and it's a pretty chaotic house, she explained.

The hope was that the flood victims would be in the

homes by Christmas 2016. That goal was not quite met—partially because although a majority of the homes were finished before the holiday, the local relief agencies still needed to coordinate building a concrete foundation for the homes. They also needed to make sure that electric, water, and sewer hookups were available, which is a bit of a longer process. Rivers said she hopes to be in her new home within a week or two, though. When all that is ready, the local National Guard will transport the structures to their new locations.

To hear Kara's full interview about this project, visit <https://cpa.ds.npr.org/wvpn/audio/2017/03/0103TinyHome-alt.mp3>. ©

Appalachia Health News is a project of West Virginia Public Broadcasting, with support from the Benedum Foundation, Charleston Area Medical Center and WVU Medicine.

Indiana Building Trades Are ‘Built to Succeed’

THE world of apprenticeships works much like academia—many good programs all try to recruit the same stellar students.

In Indianapolis, instead of fighting for those students, training coordinators banded together to form Built to Succeed, a group created to increase awareness, education, and recruiting opportunities for the building trades.

Formed in March 2016, Built to Succeed created a street team, known as cast members, made up of apprentices passionate about their programs, their careers, and more importantly, their futures. Marketing and social media campaigns featuring the cast members help get out the word that apprenticeships are higher education and come with a college degree upon graduation. Participating building trades apprenticeship programs contribute equally to the organization.

“We are trying to emulate how the colleges go about recruiting,” said Tim Myres, training coordinator for Sheet Metal Workers Local No. 20, which covers the state of Indiana. “We’re trying to make a bridge to all the schools, all the trades. We’re trying to work together as building trades rather than fight for the same students.”

Students accepted into any of the apprenticeship programs are encouraged to take a selfie with the hashtag, “I am Built to Succeed.” Through a partnership with the Indiana High School Athletic Association, Built to Succeed’s cast members are featured in videos played at state athletic

Article courtesy of International Training Institute.

championships, and cast members attend public events such as New Year’s Eve in downtown Indianapolis, and Indiana Pacers games to spread the word.

“We can reach out to everyone associated with potential applicants, including students, parents, grandparents, teachers, and administrators at one large event with our message at the same time,” Myres said.

Catie Rogers, 25, will graduate from the sheet metal apprenticeship this year and is a cast member with Built to Succeed. As the only female in the Indianapolis school, she tells anyone who will listen about her education, career, and future. As a student, she just purchased a home for herself and her young daughter.

“In my eyes, if a young person is looking for a career, why not choose a career that pays you to learn, that gives you a pension, that provides you benefits? Why not?” she said. “The most important thing to do is show up every day on time and do the work. I think it’s a really great opportunity that other young people would take advantage of if they knew about it.”

In Central Indiana, the building trades’ directors of apprenticeship training often meet to discuss common challenges. Built to Succeed came out of one of those conversations.

“Sixty training centers, 15 different trades—we all sat down at the table and tried to determine the most effective way to market our trades,” said Jim Patterson, training coordinator for the International Brotherhood of Electrical Workers Local No. 481/National



Sheet Metal Workers Local 20

Catie Rogers, an apprentice with Sheet Metal Workers Local 20 in Indianapolis, helps to recruit apprentices by participating as a cast member for Built to Succeed.

Electrical Contractors Association.

A potential apprentice can fill out one application, which will go to all participating building trades, a tactic also used by state colleges around the country.

“They now have one tool, one place to go to find out all the information on all the building trades. It’s taken a lot of steps out of the process,” Patterson said. “Through the common application, it’s allowed us to contact people right away who are interested. It’s a more effective means of communication, and we’ve seen a huge uptick in applicants.”

A handful of 2017 high school graduates has already applied to the program, and “that’s never happened before,” Patterson said. ☺

HBA Members Debunk Four-Year Degree Myth to Promote Trades Careers

By Chelsea Diederich, HBA of F-M Communications Coordinator

THE Herdina Academy for the Construction Trades was in full-swing June 5-16 for its 20th anniversary! Fifteen excited, nervous, or ambivalent students began the experience for different reasons, but all 15 left impressed with the knowledge gained.

This year the students built a garage for the Fargo Parks Department at Courts Plus, and spent time at Minnesota State Community and Technical College learning electrical and plumbing skills. Students also experienced concrete work at a Camrud-Foss Concrete Construction, Inc., worksite and toured Fabricators Unlimited.

The Home Builders Association of F-M and its charity, Home Builders Care of F-M Foundation, are major sponsors of the Academy and have been involved in its coordination since the beginning. A key component of the Academy is scheduling skilled, professional tradespeople who volunteer their time to work with the students as they complete the project. It is an experience the students generally do not receive in their construction classes at high school.

Article courtesy of HBA of F-M and Home Builders Care of F-M Foundation

Dave Anderson, Dave Anderson Construction, is an active Academy volunteer. "I enjoy teaching the

something with your intellect and skills," he says.

He along with 15 other people

Students work on framing the garage walls during the Herdina Academy for the Construction Trades.



HBA member Dave Anderson, Dave Anderson Construction, works with students during the Herdina Academy for the Construction Trades.

students skills that they have never been exposed to or experienced. It is important to show the students that the trades are meaningful, valuable occupations that allow you to create

from different organizations are on the steering committee that helps make decisions for the Herdina Academy. "I serve on the steering

Continued on page 20.

Building Passion

Students from Building 21 Get Hands-On with the Building Trades

By Shealyn Kilroy

TWO SEPTA buses and a train: That's the means of transportation Building 21 students take to attend an after-school program to learn the building trades at Orleans Technical Institute in Northeast Philadelphia.

"The one day we had snow, they had to go up to the Northeast. It's a long commute to get up there," Laura Shubilla, principal of Building 21, said. "When the snow was coming, I was curious if it was going to be a poor attendance day, but it wasn't. They all made the trip up there even in the bad weather."

Since early January, 15 juniors from Building 21 have commuted two days a week to participate in a 16-week program to enhance their trade skills.

The program, entitled the Career Exploration Program, is provided by Orleans' parent organization, JEVS Human Services.

Located in the former Ferguson Elementary School, Building 21 opened its doors to students in September 2014. The Ferguson campus currently has grades 9 to 11, but the high school plans on expanding to

This article originally appeared on <https://spiritnews.org/articles/building-passion-students-from-building-21-get-hand-on-with-the-building-trades/>

grade 12 next year. While still existing in the School District of Philadelphia, Building 21 is a non-profit organization founded by Shubilla and Chip Linehan.

The new academic model of Building 21 is intended to cater to a student's specific needs, provid-

ing Temple University's Medical School to show students those fields.

"One of the ways that we're trying to make the school different is by helping connect students to interest areas from the beginning of their time in high school and helping them learn about a variety of different

careers and connections to college in their classes," Shubilla said.

After receiving a grant from the Lenfest Foundation, Building 21 partnered with JEVS to respond to student interest in the trades. For two and a half hours, Orleans' instructor Milton Dillard teaches the students basic aspects of the



ing academic courses and pathways-career centered opportunities. The "foundation years," grades 9 and 11, are designed to give kids exposure to career fields such as culinary and entrepreneurship. The older grades are designed for students to get hands-on training and internships in their chosen pathways. Building 21 has partnered with Vetri and



building trades: carpentry, electricity, and plumbing.

Building 21 student Terrance Harris, 17, found a passion for construc-

We're trying to help connect students to interest areas from the beginning of their time in high school, and to help them learn about different careers.

tion when he first did framing in the program at Orleans.

"A teacher approached me about the program and asked me if I was interested in construction," Harris said. "I told her I was interested in it, but I wasn't passionate. After I started coming to Orleans, I began to be passionate about [construction.]"

The students work in teams of

three, on projects like installing a door, for a pass or fail grade. Dillard tries to "keep it real" on teamwork and takes it "outside" of just learning the basic trade skills.

"Bringing them in as youth, I try to teach them you can pick and choose." Dillard said. "Out there in the real world, you get to a construction site where you might not know anyone, but you still have a job to do. I try to instill that in them, and that what they know will take them further in this business." Dillard applauds the student's commute to Orleans, and Anna Bogdanov, Orleans Technical College, claims the traveling is adding more to the program.

"The program doesn't just teach the hands-on building trade skills," Bogdanov said. "It also teaches team-

work, problem-solving, communication skills, time management, and Philadelphia geography."

Similarly to peer Harris, Benjamin Davis, 18, was approached by a teacher about the program. Thinking of his mom, Davis told the teacher he was onboard immediately.

"My mom and I redo our house a lot," Davis said. "I knew this would give me some skills to help me so I can fix things without having to call the contractor." 📍



Continued from page 18.

committee because I believe there should be HBA members to speak for the needs of the construction industry. I would like to see more members participate on the committee and provide input for the direction of the academy," Anderson says.

"There is an opportunity with these students to advise and direct them into the trades. It is up to us as skilled trades people and construction company owners to take some responsibility for the future of our industry. So I encourage all HBA members to take part in the Herdina Academy in some way."

Ryan Hoss, Matrix Properties, is a long-time HBA member who has helped with the Herdina Academy for many years. He believes there is too much emphasis on four-year degrees and believes there is more to education than learning from a book.

"I believe that everyone needs to develop skills and find ways

to be creative. Working in the trades allows you to be creative and see things in three dimensions. You get to implement the thought and drawing and make it come to life! There is equal opportunity within all the trades. You can be self-employed, set your own hours, and make good money," Hoss says.

Not every student that takes the two-week construction course has decided they want to work in the trades, but this academy allows the opportunity to find out if it fits with their personality, and if not, they still leave with valuable life experience.

"The Herdina Academy is important because, even if students don't plan to go into the trades, they develop skills and knowledge for their own homes. They will know enough to know what to expect from contractors," he says.

Hoss's advice to students unsure of what their future holds... "find something you are passionate about and pursue it!" 📍

What the students have to say...

Nick, age 15

I heard about the Academy from my grandfather who saw it on the news. I was "iffy" about it at the beginning since it would take place over the first two weeks of my summer break, but it ended up being a fun experience.

Grant, age 16

I would definitely recommend the Academy to my peers. It taught me a lot of things I didn't know. Drafting was my favorite part; I enjoyed working with a 3D design on the computer.

Zach, age 15

My mom found out about it, and since I have grandparents that live here, I stayed with them so I could attend the Academy. I knew that three credits for \$25 sounded a lot better than \$1,000+.



Improving Students' Linear Measurement Skills

By Brandon Richard

MEASUREMENT plays an important role in education, whether it is measuring the doorway at your new house to see if the furniture is going to fit through the doorframe, or dispensing the proper amount of oil into your car for an oil change; measurement is a skill students use long after their formal education is over.

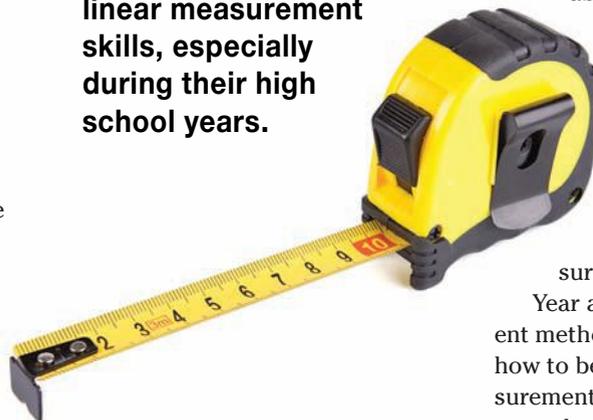
In technology education courses, proficient linear measurement skills are vital to success both in, and beyond, the classroom. In fields driven by technical drawings, tape measures, and accuracy down to fractions of an inch, the ability to use a variety of measurement tools in practical applications is something students will use for the rest of their lives. Yet, so many students fail to develop adequate linear measurement skills, especially during their high school years.

I find that this is a topic of con-

Brandon Richard is technology education teacher from Connecticut working on completing his Masters in STEM education at Central Connecticut State University. Currently he teaches at Canton (CT) High School.

versation in many of the technology education classes I visit, as well as something I have observed while trying to teach my students more advanced woodworking skills, which require working to a high degree of accuracy and precision. Frequently

Many students fail to develop adequate linear measurement skills, especially during their high school years.



I find myself revisiting the basics, even in advanced classes, because students' inability to measure proficiently often prevents them from advancing their skillset as they are still hung up on the basics.

A lack of measurement skills, especially in the technology education

classroom, can result in decreased student confidence, a lack of quality work production, and increased student frustration. Teachers have searched for the most effective way to teach students these skills for decades.

From *School Shop* in the '70s and '80s, to its successor *Tech Directions* in the '90s, each decade's technology education periodicals had articles about teaching students to read a ruler and become proficient in linear measurement. Another thing each article had in common was bringing attention to the growing number of students who cannot proficiently measure in a linear fashion.

Year after year, I have tried different methods to teach my students how to better work with linear measurements, and be able to more accurately and easily transfer measurements to a workpiece. Up until now, my instruction has mainly focused on what the individual markings on a ruler or tape measure meant in relation to how long the marking was. Students would learn that the longest graduation is a half inch, the second longest is a quarter inch, down to



a sixteenth of an inch. This is how I was taught to measure in my high school technology education classes and, in a way, it has always worked for me.

However, this is nothing more than simple memorization, and even though most students would choose the correct answer when asked to identify a given measurement on a multiple-choice test, when tasked with cutting materials to the correct size for a project, or making marks on a piece of material from a set of plans, many students will fail to produce results accurate enough to satisfactorily complete the task at hand. This often leads to wasted materials and students who become discouraged from trying to improve their abilities to build and create.

In my experiences, students who do not succeed in producing a satis-

factory product on their first or second attempt are far less likely to try again, and often choose to continue on without fixing their mistakes, lead-

and assessment strategies over five class periods.

Students were initially surveyed as to how confident they were in

their ability to apply linear measurement skills in class. This pre-assessment consisted of students being asked to transfer a set of measurements from a drawing onto a piece of 1/4" square graph paper. This gave me an idea of students' current abilities in making accurate and pre-

precise measurements. Using a more hands-on type assessment such as this also allowed me to make better observations about how students think and work in a more controlled environment than when we are actively working in the lab space with real materials/equipment.

We then spent roughly one period learning about different techniques for accurately and neatly laying out measurements. While many of these techniques are similar to the hand drafting that sometimes precedes CAD classes, they are much more informal and students are encouraged to see what works best for them. I introduce a base set of concepts and techniques, such as ensuring lines are parallel to an edge when appropriate, or maintaining square (90°), as well as drawing precise and neat lines, then each student can adapt the techniques introduced to best suit them.

A post-assessment was given in the following class period, so that students had adequate time to complete everything. It differed slightly from the pre-assessment since students were not given graph paper to work on, but instead used a single piece of white printer paper to better represent transferring dimensions to a piece of material, since materi-

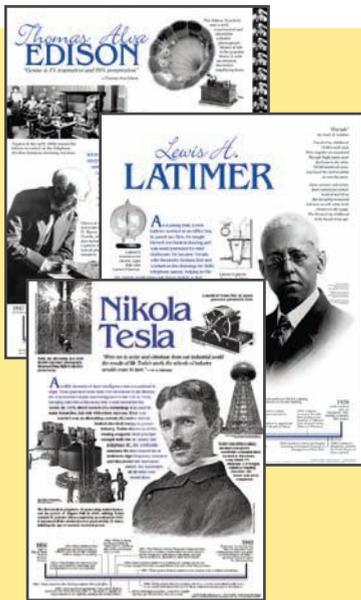


A lack of measurement skills, especially in the technology education classroom, can result in decreased student confidence, a lack of quality work production, and increased student frustration.

ing to an end result that falls short of expectations.

In order to find an answer to the questions, 1. How confident are students in their ability to apply these linear measurement and layout techniques in a technology education classroom/ lab?, and 2. To what extent do students' improve their ability to make accurate measurements?, I implemented a new method for teaching/assessing the same linear measurement skills I have taught in the past, but in a way that incorporates and teaches techniques to make accurate and precise marks when transferring dimensions from a set of plans, or instructions, to a workpiece. My hope is that by having implemented a more hands-on and practical instructional and assessment style, students will be more confident in their ability to complete projects in class.

I focused on my two woodworking classes, as they often require the greatest degree of precision when preparing materials for a project. To track students' confidence in their ability to work accurately and precisely, using the skills they had learned, I surveyed the students prior to beginning the measurement unit, as well as after I had implemented the modified instructional



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als such as wood do not come with gridlines on them.

Then students were given a survey asking them about their confidence in their ability to use their linear measurement skills in the classroom. The survey data caught me a little off guard as I had not expected students to respond so confidently on the pre-assessment survey based on work I had seen done prior in the semester. Even more concerning was the minimal change which was seen in both the pre- and post-assessment survey data. The responses for both seemed to have little change across the entire class with many students providing almost identical answers for both surveys.

One possible explanation for this could be student's reluctance to answer survey questionnaires espe-

students being overly confident in their abilities. It has been my observation that many students will claim they know how to measure and make marks accurately, but when it comes time to apply these skills they fall short, or go to great lengths to avoid tasks involving measurement all together.

I had hoped that providing students with graph paper for their pre-assessment drawing exercise would have aided them in completing the assignment, and helped when discussing parallel and square during the following classes. However their drawings had more errors than I had originally anticipated.

Following the discussions in class the students' post-assessment surveys showed little change, but their drawings were a huge im-

provement over the pre-assessment sample. Many students produced drawings that would be acceptable to use in class while producing parts or material for a project. Implementing this unit in my class again would likely result in the post-assessment scores increasing slightly

as I would have been able to refine the process and improve my instructional methods.

While this information may have little reach outside of my classroom, it might serve to give other technology education teachers a glimpse into a colleague's classroom to better develop their methods, or to examine what others are doing to further student learning and success in their classrooms. When I use this activity in the future it will likely be much earlier in the semester and hopefully the results will be more dramatic given students will have had less exposure to the concepts. 



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My hope is that by having implemented a more hands-on and practical instructional and assessment style, students will be more confident in their ability to complete projects in class.

cially when asked to evaluate their own abilities. Often, I have found that many, if not all students, fail to take the time to provide meaningful, thought-out answers for self-assessment survey questions such as these. This makes determining if the data collected from a survey is actually valuable or if participants chose answers at random to finish as quickly as possible.

However, the drawing data told a different story with many students initially failing to produce a drawing which adequately met the requirements. The seemingly incorrect pre-assessment data may have been

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Making a Laser Level

By Steve Harkins

You and your students can make this tool with the help of an older sibling, uncle, or grandpa. The project is simple and will be a great learning experience for your students. The project is a great way to learn about the construction of a laser level. The project is a great way to learn about the construction of a laser level. The project is a great way to learn about the construction of a laser level.

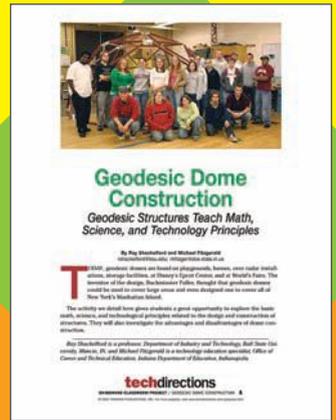
Component Sources

The kit includes a laser level, a tripod, and a carrying case. The kit includes a laser level, a tripod, and a carrying case. The kit includes a laser level, a tripod, and a carrying case.

Construction Details

The kit includes a laser level, a tripod, and a carrying case. The kit includes a laser level, a tripod, and a carrying case. The kit includes a laser level, a tripod, and a carrying case.

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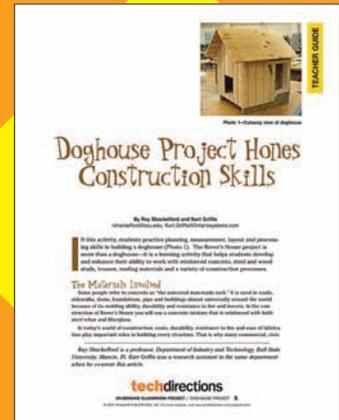
Geodesic Dome Construction

Geodesic Structures Teach Math, Science, and Technology Principles

By Mike Fitzgerald

This geodesic dome project is a great opportunity to explore the basic math, science, and technology principles involved in the design and construction of geodesic structures. They will also investigate the advantages and disadvantages of dome construction.

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Doghouse Project Hones Construction Skills

By Mike Fitzgerald and Matt Smith

In this activity, students practice planning, measurement, layout and precision skills in building a doghouse (Phase 1). The doghouse project is a great way to learn about the construction of a doghouse. The project is a great way to learn about the construction of a doghouse.

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Energy-Efficient Home Design

By Mike Fitzgerald

WORKING to be green for your technology students to gain a practical understanding of how much energy the average home uses, and how to save energy. The project is a great way to learn about the construction of a home. The project is a great way to learn about the construction of a home.

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Designer Concrete

By Mike Fitzgerald

Concrete is an amazing material. It is a great material to work with. The project is a great way to learn about the construction of concrete. The project is a great way to learn about the construction of concrete.

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NEWSPAPER STRUCTURES

By Mike Fitzgerald

In this activity, students practice planning, measurement, layout and precision skills in building newspaper structures. The project is a great way to learn about the construction of newspaper structures. The project is a great way to learn about the construction of newspaper structures.

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Designer Materials

An Introduction to the Application of Materials Science and Technology

By Mike Fitzgerald

From the ancient Greeks to the modern day, materials have played a significant role in the development of human civilization. The project is a great way to learn about the construction of materials. The project is a great way to learn about the construction of materials.

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Continued from page 12.

all reading materials, quizzes, tests, and study guides, as well as instructor guides that greatly assist in the preparation of lesson plans and

nuclear energy and its use in electrical power generation. Furthermore, in the middle of the EIF course, the entire class visited the Chesterfield Power Station, where they

The Course

Energy Industry Fundamentals is delivered in five modules: History and Organization of the Industry, Safety, Electric Power Generation, Electric Power Transmission, and Electric Power & Natural Gas Distribution. According to the CEWD, the course “covers such basics as emerging principles and concepts that impact the energy industry; compliance with safety and health procedures; how electric power and natural gas generation, transmission, and distribution work; a range of entry-level energy careers; and ‘hot topics’ in energy.” The course is essentially non-technical, and satisfies Tier 4 and Tier 5 industry technical competencies of the Energy Competency Model (Fig. 1).

CEWD provides some PowerPoint presentations for incorporation into lesson plans, but the instructor should prepare and deliver their own lesson plans. Most helpful for our students were the glossaries, online reading modules and scenarios, and repeatable quizzes that enabled student mastery of the material. In addition, CEWD added variety to the mix, including interactive quizzes based on familiar game shows: “Jeopardy,” “Family Feud,” and “Who



Jessica Sterling, Dominion Energy

Bridging Communities students learned about power generation during their visit to Dominion Energy’s Chesterfield Power Station in 2017.

materials. Although Bridging Communities provided each student with a full set of printed materials, most students used laptops and notebook computers to complete assignments.

At Bridging Communities, the EIF course was introduced to seniors who were already scheduled to take a dual-enrollment course titled “Introduction to Alternative Energy.” With a clear focus on renewable and inexhaustible energy sources, the course includes an overview of current, conventional energy sources and power generation. Aligning the Energy Industry Fundamentals with the alternative energy course provides a more comprehensive view of all facets of the energy industry in the 21st century.

A significant element of EIF course provider approval is the requirement to partner with a local electric utility. In our case, Dominion Energy was quick to offer assistance. During the time leading up to our first EIF course, three Dominion engineers visited our pre-engineering classroom, providing an overview of

experienced many of the classroom concepts: coal-powered boilers and steam turbines, gas turbines, generators, and environmental protection systems.

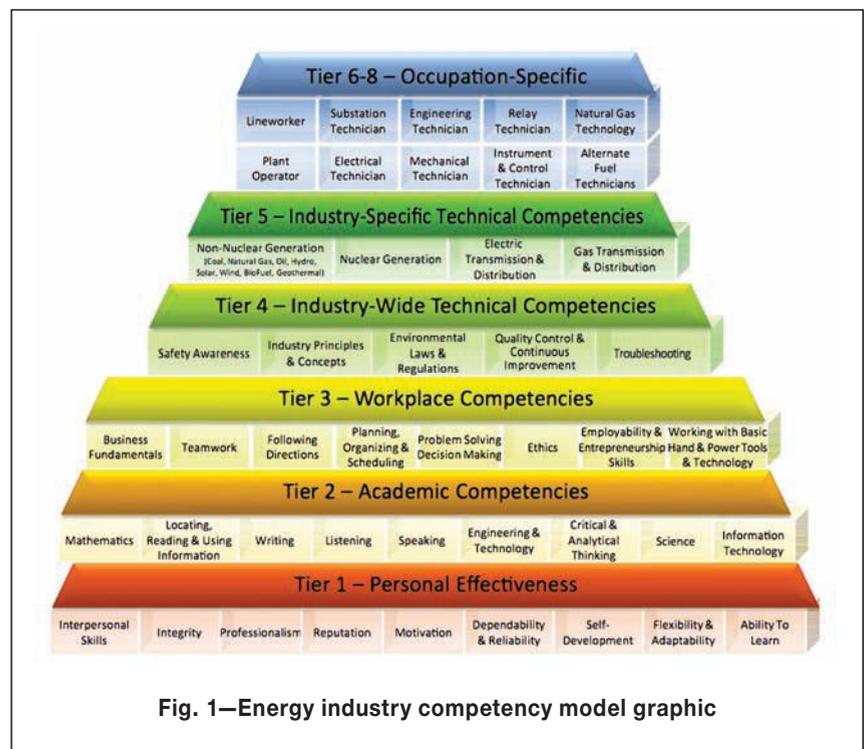


Fig. 1—Energy industry competency model graphic



Using energy converted using a portable photovoltaic system, a Bridging Communities student determines the load on the circuit powered by the 12 V battery.

Wants to Be a Millionaire.” Imbedded throughout the readings are “career profiles,” such as nuclear health physics technician and power plant operator, providing students with a better perspective on the education and training required of energy industry careers.

For the instructor, each module and unit provides an overview of the topic, learner expectations, teaching strategies, and a pacing chart for lesson delivery that enables realistic lesson planning. These resources support tailoring the curriculum while maintaining consistent focus on the learning objectives.

Numerous activities are available to encourage in-class discussion, while handouts and worksheets provide ample opportunity for seatwork and homework assignments. Furthermore, each unit provides a listing of online video and animations that provide the opportunity for a “virtual field trip” without leaving the classroom.

The Student Perspective

The EIF course is essentially non-technical. Electrical concepts such as voltage, resistance, and current are presented, as well as basic thermodynamic properties. While previous knowledge of Ohm’s Law, Watt’s Law, thermodynamic laws, and types of energy would be helpful, it is not a requirement for successful completion of the course.

Students performed best when they read the assigned material in

advance, kept pace with the provided note-taking guides, and completed the online quizzes. The students also learned the value of the glossary; the terms used in the energy industry are likely to be unfamiliar. Of particular help was the use of highlighted text in both the printed and online text. In the printed text, the highlights reminded the student

Building and analyzing electric circuits reinforces power transmission fundamentals for Bridging Communities circuits.



that the definition was available in the unit glossary. Using the online text, placing the mouse over the highlight brought the definition right onto the screen.

The Result

All Bridging Communities students completed the course and successfully passed the online certificate certification assessment. The Energy Industry Fundamentals cer-

tificate assessment is approved by the Virginia Department of Education for high school career and technical education industry certification. As detailed above, to be eligible to take the certification assessment, the school or institution must apply for “approved course provider status” and students must complete the EIF course.

The energy industry is forging a plan to address workforce shortages in the years ahead; the Energy Industry Fundamentals course was developed to help address that challenge. Students with a desire to work in the energy industry would be well served by the course.

Additionally, the EIF course provides a solid foundation for any young adult who desires an engineering or technical degree, regardless of the specific discipline or academic major. As the course also addresses the challenge of non-renewable energy sources, students are well informed regarding renewable, inexhaustible, and emerging

energy industry alternatives that also have demands for a trained workforce.

The Energy Industry Fundamentals course, supported by the Center for Energy Workforce Development, is an excellent resource for high school seniors enrolled in CTE programs. For information on starting the program, visit the EIF “Fast Track” at www.cewd.org/curriculum/fast-tracked-ief.php. ©

Busting 7 Myths about Technology Careers that Discourage Teenage Technologists

By Charles Eaton

MY previous articles for **techdirections** made the case that today's tweens and teens will become tomorrow's technologists and narrow our nation's tech employment gap for us.

In brief, some analysts say at least half a million open IT positions go unfilled in the U.S. during any given calendar quarter. Meanwhile, the U.S. Bureau of Labor Statistics predicts IT occupations will grow 12% by 2024, as many in the tech industry reach retirement age. In combination, these factors could create a national tech talent deficit with negative consequences for workers, employers, and our economy as a whole.

Creating IT Futures believes tweens and teens are a key aspect in the solution to this looming crisis because they 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. Research indicates many in this group have the temperament to become more than technicians; they will be technologists, people working with technology of varied types in companies of all shapes and sizes across the country along a broad spectrum of industries—not just those that

As Executive Vice President of Social Innovation for CompTIA and CEO of Creating IT Futures, Charles Eaton leads three philanthropic endeavors for CompTIA, the world's largest IT trade association: CompTIA Giving, Creating IT Futures, and NextUp, the organization's initiative to inspire young people to choose technology careers.

write software and make hardware.

Workers with a technologist's mentality—an optimal mix of hard technical and relationship skills (often called “soft skills”)—are well-suited for today's fast-paced, continually evolving digital business environment.

But there are issues confounding and complicating raising the next generation of technologists. Seven myths about technology careers discourage potential teenage technologists and their parents. So, in my position as leader of a philanthropic organization dedicated to creating on-ramps to tech careers, I consider busting those myths not only a duty, but a pleasure.

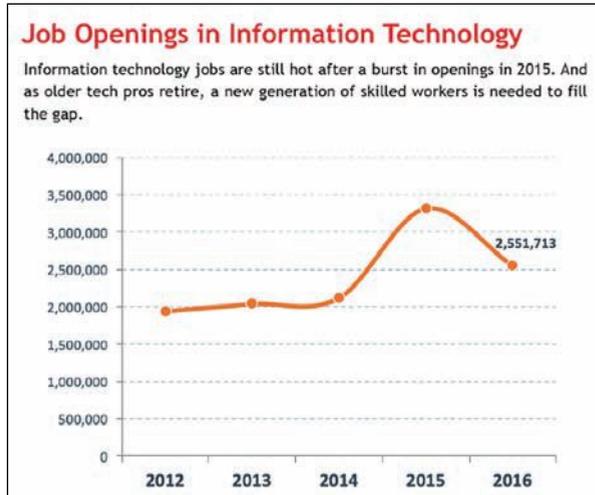
Let's take them one by one:

1. “Technology is all about coding, math, and science.”

Coding: Tech entrepreneur success stories in the news always seem to revolve around software and coding. Plus, starting salaries for web and software developers are relatively high. That's great and surely will inspire more teens to consider tech careers. But these facts could discourage a lot of kids, too, for whom coding is neither easy, accessible, nor interesting.

Reality is, as more businesses and

households connect more devices to the internet, more data will be gathered, which will need to be protected and understood. We will need more technicians, network specialists, cybersecurity pros, and data



CompTIA IT Industry Outlook 2017, based on analysis of Burning Glass Technologies data, January 2017

analysts to handle these tasks. Plus, we will need sales and marketing pros to match all these technologists with the consumers and businesses who will need their services. And of course, we will need project managers and other expert technologists to direct and implement these transactions and relationships. Coding is only one aspect of technology.

Math and Science: Resourcefulness and common sense are greater predictors of success in a technology career than excelling in math and science. Communication skills such as active listening and the ability to articulate and present innovative ideas are essential for technologists. We refer to these as soft skills, with aptitude in areas such as problem

solving, empathy, and entrepreneurship.

True, good grades are important for anyone working toward any future career because they demonstrate the ability to learn and develop. And yes, solid grades in math and science certainly won't hurt any aspiring student's chances of finding a future position in technology. But for technologists, grades only tell part of the story. Curiosity and motivation are more important than an impressive report card.

In short, educating technologists must include STEM classes but not be limited to them. Access to tech classes in school at any level should not be dependent on how well a student scores in math and/or science. Every school should offer opportunities to learn and work with technology that are broader than a computer science curriculum.

2. "Working in technology requires a four-year college degree."

Multiple Paths: Per the U.S. Census Bureau's 2014 American Community Survey, 59% of computer support specialists employed that year didn't have a bachelor's degree. The truth is that many people land a job in tech with just some basic training and a certification.

Motivated students can learn the underpinnings of technology and start troubleshooting problems or writing code after one introductory class—no matter at what age they start studying. Sure, many people learn about technology in high school and college; but plenty of others start studying through online programs that are accessible to anyone—no matter where they live.

Wide Horizon: The traditional route of earning a computer science degree isn't as narrow a road as many would expect. The development of intangible skills, such as being flexible, adaptable and collaborative, can begin in the classroom. These soft skills can help prepare young people for working in large organizations and other, smaller businesses.

A structured program at the col-

lege level can familiarize students with workplace skills they will need on the job, such as functioning as part of a team and following the directions of a supervisor. Students also can begin to specialize in college, studying information systems, data analytics, and similar courses.

Technology moves quickly, and neither a four-year degree nor a certain set of certifications is a guarantee of success. Like any journey, the key to pursuing a successful technology career is being willing to adjust course while staying focused on the final goal. Because the one thing we can guarantee about technology is that it will evolve. So should anyone who works with it.

3. "If it's not at Facebook or Google, it's not a technology job."

No Valley Required: Today, tech arguably is the most crucial factor driving the global economy. So, how could a force that powerful be contained in one place? You don't need to live in Silicon Valley to have a successful, exciting career in technology. Despite surface differences, every industry depends on IT. From small, family-run businesses—such as corner convenience stores, dry cleaners, and lawn services—to big banks and insurance companies, positions as technologists exist in almost every organization around the world.

No Size Fits All: Per the CompTIA IT Industry Outlook 2017, there are about 375,000 small information technology companies in the United States, and those companies employ about 45% of the workforce in the IT industry. Thousands of jobs are available at innovative companies, large and small, and plenty of places to work exist no matter where you live. And as telecommuting becomes more popular, the opportunities will multiply.

My early passions were technology and movies. In college, I wanted to be a screenwriter. Eventually, I realized that was a longshot. Instead, I focused on my strengths—problem solving and leadership—and found my calling in the nonprofit world. I'm still connected to the tech industry through my work, and movies continue to be a nice hobby. There are lots of ways to connect one's passions to meaningful and fulfilling work.

4. "A tech career means being stuck at a desk."

Consider the career of Chicago-based artist, agent, writer, and independent curator Jenny Lam. Lam uses her online platform to shine a spotlight on artists through unfiltered interviews. Her *Artists on the Lam* blog fosters art-based discussions and gives a behind-the-scenes view of the process of curating and installing works of art. Lam posts about the artists she represents, the

Look Beyond Silicon Valley for Technology Jobs

If your city or state isn't listed, don't worry: There are nearly half a million jobs in information technology available across the U.S., with jobs in every state.

Top States for Core IT Job Postings

1.	California
2.	Texas
3.	New York
4.	Virginia
5.	Illinois
6.	Florida
7.	New Jersey
8.	Massachusetts
9.	Georgia
10.	North Carolina

Top Cities for Core IT Job Postings

1.	New York-Northern New Jersey
2.	Washington-Arlington-Alexandria
3.	Los Angeles-Long Beach-Santa Ana, CA
4.	Chicago-Naperville-Elgin, IL-IN-WI
5.	San Francisco-Oakland-Hayward, CA
6.	Dallas-Fort Worth-Arlington, TX
7.	Boston-Cambridge-Nashua, MA-NH
8.	Atlanta-Sandy Springs-Roswell, GA
9.	San Jose-Sunnyvale-Santa Clara, CA
10.	Seattle-Tacoma-Bellevue, WA

exhibitions she curates, and her adventures discovering art and artists around the globe.

Lam's blog covers art-related topics at local, national, and international levels; she brings the world to her local readers, while making her surroundings more accessible to a global audience. Lam is a true technologist, using social media tools to position herself and her clients in the local press, while dipping into other sites as a guest blogger. She's also a featured Instagram photographer.

Technology connects us globally. So, the industry is growing all over the world, reaching into diverse, ex-

665,935 total U.S. IT job postings in the second quarter of 2016
Source: Burning Glass Technologies Labor Insights, July 2016

citing businesses—and many places you may not expect. What’s happening with technology today stretches far beyond what can be displayed on a desktop monitor.

5. “Money is the main benefit of a tech job.”

Many technology jobs pay well, offering salaries significantly higher than the national average of all occupations. And yes, unemployment in tech is low, and the future of tech professions looks good. Per the U.S. Bureau of Labor Statistics’ *Occupational Outlook Handbook*, the availability of IT jobs is projected to grow by 12% during the 10-year period 2014-2024.

So, how could a high likelihood of economic gain deter today’s teens from becoming tomorrow’s technologists? Because money isn’t the only driver for young people. Creating IT Futures learned, from the Teen Views on Tech Careers survey, that having a job they love and helping other people was near the top of the list of what urban teens want in a career.

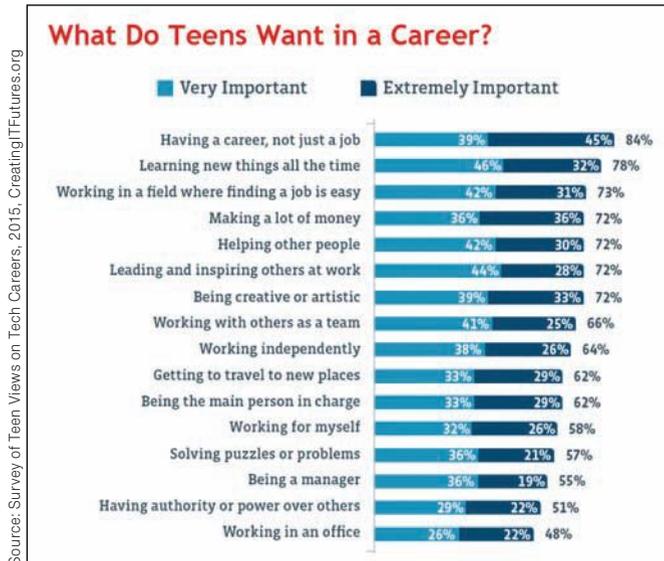
Like scientists, mathematicians, and engineers, people working in technology like to solve problems. Driven by curiosity and empathy, they use big data to alleviate homelessness, for example, or get technology in the hands of people who lack economic opportunity.

Our research shows many of today’s teens want their work to affect more than a bank account. Working in a tech career has the promise of so much more than just earning a good salary.

6. “My kids won’t listen to me.”

The survey also asked teens on

whom they rely most for career advice. The most frequent answer was “parents and guardians.” At 68%, that answer was given more than two times more often than “teachers” (28%) and “school counselors” (25%). Teens do listen to parents. Maybe not all the time about everything parents would like to tell them. But most likely they’re listening more often than parents think they are—especially when the topic is as important as their future.



Source: Survey of Teen Views on Tech Careers, 2015. CreatingITFutures.org

So, educating parents about issues and options in schooling for tech careers is just as critical as teaching teens about their career options.

7. “Tech jobs are going overseas.”

Two misconceptions give this myth staying power: An oversimplification of the global economy, and a narrow definition of the term “tech jobs”.

Yes, over time certain types of technology jobs have been—and continue to be—outsourced overseas. This ebb and flow of employment across increasingly globalized industries and markets, however, doesn’t equal tech jobs leaving the U.S. economy never to return. The dynamics of world markets are too complex for such a simple conclusion—especially one that fails to account for the most crucial factor driving the global economy.

The economic reality is that the digital transformation of business is creating technology jobs faster than many companies—here and abroad—can fill them. And those positions are not concentrated in one area of the country like Silicon Valley. Our research shows open technology jobs in every state on a regular basis.

So, while some tech jobs in specific categories may move from our shores to others as international business expands, some of those positions can come back in time, too, as wages overseas rise or pressure is placed on U.S. companies to reshore work. But overall, these ups and downs don’t change the big picture: Plenty of tech jobs are being created in the U.S. these days, a trend that shows no signs of slowing down.

And if we as educators—whether as teachers in a school environment or mentors from the business world—can clear these seven persistent myths from the minds of teens and parents today, they will be closing the tech employment gap for us tomorrow. ©

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Nashville Convention & Visitors Corp.

Get Inspired at CareerTech Vision

THE Association for Career and Technical Education (ACTE) will hold its annual convention Dec. 6–9 in Nashville, TN. As always, this year’s CareerTech VISION promises much of value to CTE educators, including:

- 300+ concurrent sessions covering every aspect of secondary and postsecondary CTE.
- CareerTech Expo and interactive exhibitor workshops.
- Career Pavilion providing essential resources on several CTE career pathways.
- Wednesday workshops and tours offering insights into focused topics and CTE programming.
- Awards Banquet, a heartwarming and inspirational gathering of dedicated and passionate CTE professionals and supporters.
- STEM is CTE Symposium, addressing access to STEM-related career paths through CTE programming for all students and especially for young women.
- Opportunities to connect, collaborate, and build lasting friendships with CTE professionals from around the globe.

New This Year

ACTE is going green and will no longer print a program guide. They

will utilize their easy-to-use VISION app. The VISION app will allow you to set your own agenda, connect with speakers, receive critical alerts, and thoroughly navigate VISION 2017.

To download, search “ACTE CareerTech VISION” in the App Store for Apple or Google Play for Android.

General Sessions

On **Thursday**, Dec. 7, Isaac Lidsky gets things started at the Opening General Session. This empowering entrepreneur brings an eclectic resume of accomplishments—from child television star and Supreme Court clerk to entrepreneur transforming a failing concrete subcontractor to a multi-million-dollar construction services company. Isaac’s story is not what you expect—he did all of this as he was going blind. His personal journey taught him to live his life *Eyes Wide Open*, also the title of his new book. From his inspiring story, you’ll learn how to harness your strengths, overcome obstacles, and cast your goals into sharp focus!

Friday’s information-rich general session will feature a panel of state officials showcasing exemplary state CTE policies and practices—pioneering solutions for the challenges facing the nation’s career educators. More than a decade of attention and policy innovation at the federal,

state, and local levels has produced a revolution in thinking about career and technical education—new ideas that can now be replicated across the country.

Saturday, Kayleen McCabe, host of DIY Network’s *Rescue Renovation*, will provide the closing keynote. McCabe will share her wealth of experiences to illustrate how CTE is truly art in the eye of the beholder. From concept to construction, she uses her unique combination of gutsy innovation and expert trade skills to tackle any home improvement project.

Expanded Secondary and Postsecondary CTE Programming

Offering numerous sessions, VISION provides the postsecondary community with a venue for exploring multiple pathways to college and career readiness, networking with postsecondary CTE professionals, and leveraging business and industry partnerships to enhance your CTE programs.

Career Clusters

ACTE and Advance CTE are pleased to offer sessions focused on career clusters and programs of study, a comprehensive framework for organizing high-quality CTE programs and cultivating collaboration

between secondary and postsecondary CTE.

Pre-Convention Workshops

ACTE has scheduled several informative workshops for Wednesday, December 6. They include:

- **A Cohesive Team Starts with Cohesive Leadership Presented by the U.S. Army**—Leadership is more than accomplishing the mission. Army leaders inspire their soldiers, build their morale, support their goals, and ensure a good work life balance. Learn how readiness on all levels is important to successfully completing the mission and how you can apply these valuable lessons to your offices and classrooms.

- **Admin 101: A Bootcamp for New Administrators**—This half-day session is especially designed to help new administrators at all levels more clearly understand what CTE is and why it is such a successful program for student success.

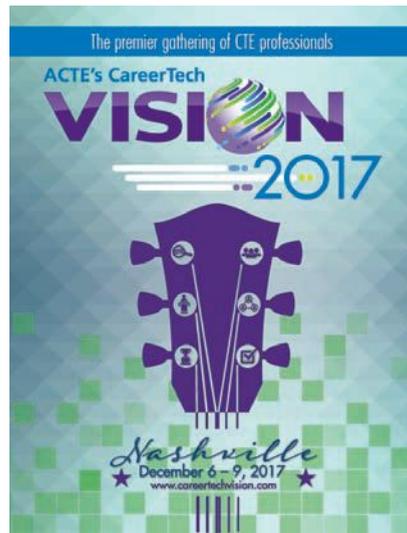
- **Admin 201: Advanced**—This workshop is targeted to experienced CTE administrators. Round-table discussions will be held on topics such as Perkins funding; how to mentor teacher-leaders; creating training programs for all teachers; processes used to open and close programs; integrating CTSO in all programs; and work-based learning in all programs.

- **CTE CORE Administrator**—As instructional leaders for teachers, CTE administrators serve a key role in implementing proven instructional approaches such as project-based learning (PBL). This highly interactive workshop will build administrators' skills in implementing and managing PBL in their buildings and districts. Administrators will have the opportunity to explore essential online and face-to-face resources for creating a plan to help teachers implement PBL as a part of their CTE curricula.

- **Developing a College and Career Pathways System**—An excellent opportunity for anyone interested in creating a high-impact college/career pathways model in their schools. This session focuses on uncovering assets and gaps, assessing regional workforce needs,

forming a community-wide leadership structure, creating meaningful programs of study, and developing an actionable phase-by-phase plan for implementation.

- **Perkins IV to Perkins V Crosswalk**—The Perkins IV to Perkins V Crosswalk, in conjunction with the EDGAR rules, will explain what is allowable or unallowable with federal funds and highlight policies related to supplanting, costs of student organization travel, meals, memberships, computers, equipment, supplies, consumables, professional



development, tuition, as well as the “braiding” and “blending” of Perkins funds with the Workforce Innovation and Opportunity Act (WIOA) and the Adult Education and Family Literacy Act (AEFLA).

- **What Skills Will Students Learn Through Project Management?**—Whether you teach using project-based learning or other approaches, class projects can be a powerful learning method. Students can learn so much from leading and managing their own projects with guidance and support of teachers familiar with the practices of successful project management. Project management teaches skills such as time management, organization, and planning—all critical life and professional skills.

- **Your Introduction to Teaching in CTE: Essential Things to Know**—CTE teachers are a unique group. They have to be bilingual, understanding both the language of

education and the workforce. They also differ in prior work experience, work environments, teaching strategies, and the atmosphere in which they will be teaching the youth of tomorrow.

Tours

Tours organized for this year's CareerTech VISION include:

- **Nissan's Smyrna Vehicle Assembly Plant**—The opening of the Nissan Smyrna Vehicle Assembly Plant in 1983 was a groundbreaking moment, bringing automotive production to Tennessee for the first time. The plant has become a force for economic development, creating thousands of well-paying jobs and inspiring other auto companies and suppliers to set up operations in the state.

- **U.S. Army Corps of Engineers Lock and Dam and Power Plant**—The group will visit Old Hickory Lock and Dam and receive a briefing and tour of the exterior. They will then travel to J. Percy Priest Dam and tour the interior of the J. Percy Priest Power Plant. Participants will see a hydroelectric dam and power plant in operation as well as a navigation lock in operation. Registration deadline Nov. 24.

School Tours

- **McGavock High School**—Two-time wall-to-wall model career academy school and host to President Obama in 2014, this school demonstrates the intersection of business and community engagement, small learning communities, career-themed instruction, project-based learning, college and career readiness, and student voice and choice.

- **Stratford STEM Magnet School**—A grades 5-12 public school in Nashville, Stratford provides students with a comprehensive STEM experience. The Upper Campus, grades 9-12, includes the Academy of Science and Engineering which offers a variety of career pathways classes. In addition, this school's students are supported by 42 active business partnerships that offer pathway-related field trips, job shadows, and internships. ©

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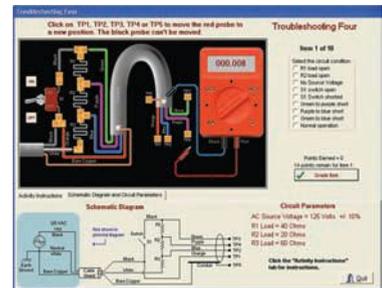


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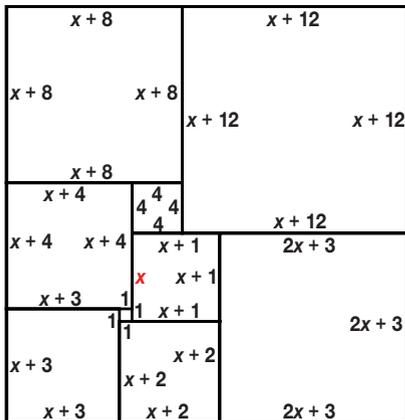
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More than Fun Answers

Problems Squared

The dimensions of the squares are 1×1 , 4×4 , 7×7 , 8×8 , 9×9 , 10×10 , 14×14 , 15×15 , and 18×18 .

To solve, let x = the length of the segment indicated in the diagram below. Then represent the lengths of other segments in the diagram in terms of x .



Since the opposite sides of a rectangle are congruent, you can solve for x by setting the two expressions

for the top and bottom sides equal to each other:

$$(x + 8) + (x + 12) = (x + 3) + (x + 2) + (2x + 3)$$

$$2x + 20 = 4x + 8$$

$$2x = 12$$

$$x = 6$$

Now go back and substitute 6 for x in all the expressions for the sides.

The dimensions of the rectangle are 33×32 .

State of the Estate

There were six sons and the estate consisted of 36 coins.

Let G = total number of gold coins and N = total number of sons.

We know the first son gets 1 gold coin and $1/7$ of what is left (which is now $[G - 1]$ because he took one). Therefore, the first son gets $\{1 + (1/7) \times (G - 1)\}$ gold coins.

Simplify the above expression to $\{6/7 + G/7\}$

We also know the second son gets 2 gold coins and $1/7$ of what is left, or $\{2 + (1/7) \times (\text{what is NOW left})\}$

The key is realizing that what is NOW left for the second son is $\{G -$

$[6/7 + G/7] - 2\}$ because it is the total amount minus what the first son took minus the 2 gold coins that the second son took.

Therefore the second son receives $\{2 + (1/7) \times (G - 6/7 - G/7 - 2)\}$, which simplifies to:

$$6 \times G/49 + 78/49$$

Set these two expressions equal to one another because we know that each son receives the same amount.

$$6 \times G/49 + 78/49 = 6/7 + G/7$$

$$G = 36 \text{ gold coins.}$$

To find the number of sons, N , note that the first son got 6 gold coins by plugging in $G=36$ into the first expression $6/7 + G/7$.

This means that every son received 6 gold coins. $36 \text{ total gold coins} \times 1 \text{ son} / 6 \text{ gold coins} = 6 \text{ sons.}$

Inventor/Invention Match Up

1 - A 4 - J 7 - F 10 - D

2 - E 5 - H 8 - G

3 - I 6 - B 9 - C

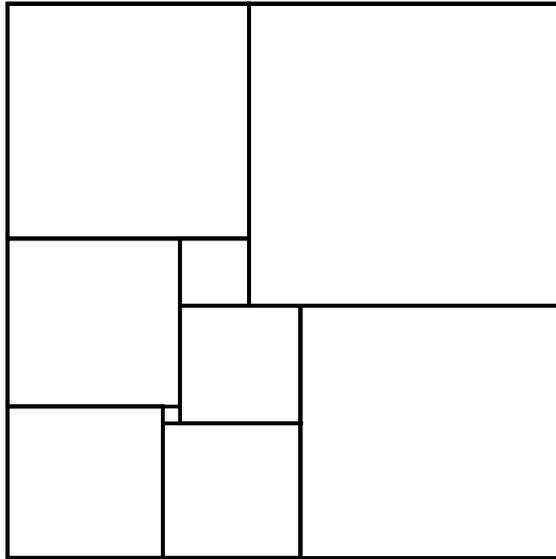
Does Anybody Really Know What Time It Is?

It is 26 minutes until six o'clock.



Problems Squared

The rectangle below is made of nine squares, each of a different size. The dimensions of the two smallest squares in the figure are 1×1 and 4×4 . Use math to determine the dimensions of all the other squares.



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

Inventor / Invention Match Up

See how many inventions (1-10) you can match up the with their inventor (A-J).—**Harry Roman**, East Orange, NJ.

- | | |
|----------------------------------|-----------------------------------|
| 1. Automotive electric starter | A. Charles Kettering |
| 2. Lightning rod | B. Alfred Vail |
| 3. Dynamite | C. Karl Jansky |
| 4. Triode amplifier vacuum tube | D. John Roebling |
| 5. Solid-body electric guitar | E. Ben Franklin |
| 6. Telegraph dot-dash code | F. Edwin Armstrong |
| 7. FM radio | G. Shockley, Brattain and Bardeen |
| 8. The transistor | H. Les Paul |
| 9. Radio astronomy | I. Alfred Nobel |
| 10. Wire cable-stranding machine | J. Lee de Forest |

See answers on page 33.

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.

State of the Estate



Italian mathematician Leonardo Fibonacci (c. 1175 – c. 1250) posed the following problem:

A man whose end was approaching summoned his children and said: "Divide my money as I shall prescribe."

To his eldest child, he said, "You are to have 1 gold coin and $\frac{1}{7}$ of what is left."

To his second child he said, "Take 2 gold coins and $\frac{1}{7}$ of what remains."

To the third child, "You are to take 3 gold coins and $\frac{1}{7}$ of what is left."

He continued to give each child 1 gold coin more than the previous child and $\frac{1}{7}$ of what remained, and to the last child all that was left.

After following their father's instructions, the children found that they had shared their inheritance equally.

How many children were there, and how large was the estate?

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



Does Anybody Really Know What Time It Is?

How many minutes is it until six o'clock if 50 minutes ago it was four times as many minutes past three o'clock?

Celebrate Black History Month!

Inspire your students with posters of African Americans who have had a major impact on the course of American history, from the research lab to the battlefield to the courtroom.

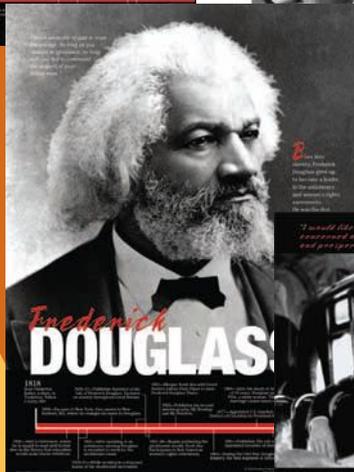
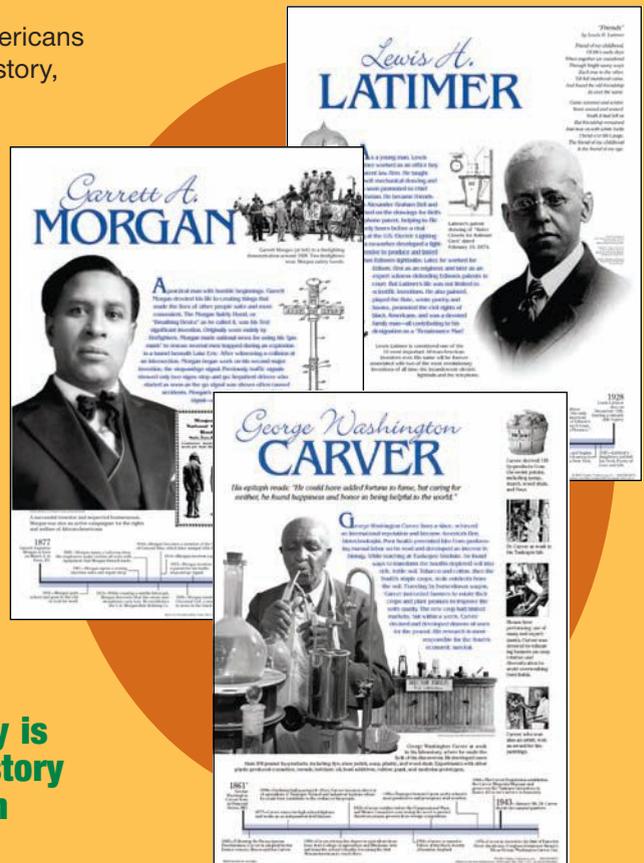
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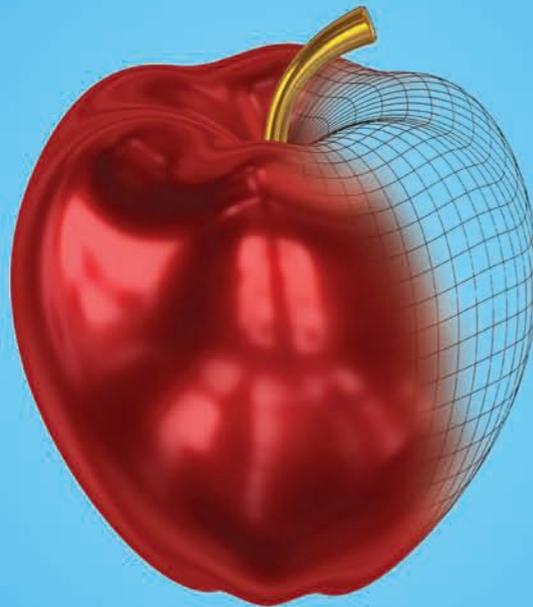


**February is
Black History
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Black Technologists:
George Washington Carver
Lewis Latimer
Garrett Morgan

Black History Pioneers series:
W.E.B. DuBois
Frederick Douglass
Martin Luther King, Jr.
(Portraits)
Martin Luther King, Jr. (March)
Thurgood Marshall
Rosa Parks
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