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linking education to careers

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JANUARY/FEBRUARY 2020

## Mobility for Children Students Adapt Ride-on Cars

## Chandler Vincent and the Future of Welding

ITEEA Conference Preview  
STEM Literacy for All





**Vanessa Revelli** [vanessa@techdirections.com](mailto:vanessa@techdirections.com)

In the continuing trend of partnerships to provide training to students to get them immediately into the workforce, NOCTI and zSpace are one of the most recent additions. This partnership will deliver AR/VR training aligned to career technical education industry certification exams.

NOCTI ([www.nocti.org](http://www.nocti.org)), one of the most respected certifying institutions in the United States, and Silicon Valley edtech company zSpace Inc. ([www.zspace.com](http://www.zspace.com)), recently announced a partnership that will offer NOCTI career and technical education (CTE) certification opportunities as part of the teaching and learning content provided through zSpace.

NOCTI is the nation's largest provider of industry partner certifications and industry-based credentials for career and technical education programs. Through the use of various assessments, NOCTI provides credible solutions for assessing both student and teacher competence, for data-driven instructional improvement, and for regulatory requirements.

zSpace® powers the global delivery of spatial content. A privately held, venture-backed company located in Sunnyvale, CA, it has more than 50 patents. zSpace has already disrupted the education market—more than a million students have benefited from learning with zSpace. Its technology also has applications in health care, entertainment, shopping, social media, gaming, and more.

The ability to incorporate NOCTI credentials as an extension of a zSpace CTE program empowers schools to better prepare students for high-wage, high-demand

careers and leverage the comprehensive data provided by NOCTI that can be used by students, teachers, and administrators for individual, instructional, and program improvement opportunities.

"NOCTI's mission is to build a competent workforce through creative learning solutions—we must be preparing students for technology-driven careers utilizing cutting-edge learning opportunities," said John Foster, Ph.D., NOCTI and Nocti Business Solutions president and CEO. "Our partnership with zSpace delivers even more training advantages to students seeking our certifications, who will enter the workforce and be on an immediate path toward career success."

"When CTE programs embrace AR and VR technologies, students are not only more engaged and motivated, but also directly exposed to training that will set them on the path to job and career success," said Paul Kellenberger, zSpace chief executive officer. "AR and VR are transforming the teaching and learning processes for CTE programming, and our partnership with NOCTI will easily extend those experiences to valuable industry certifications."

*Vanessa Revelli*

## techdirections

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**About the cover:** Go Baby Go cars get children with mobility issues moving. See article on page 12. Photo courtesy ITEEA. Cover design by Sharon K. Miller.

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Finding funding for CTE programs can prove challenging. Here are a few resources to check out:

## Welding Workforce Grant

<https://webportalapp.com/sp/login/awsgrant>

**Deadline:** April 1st

The AWS Foundation is committed to securing the future of the welding industry by positively impacting welding education. The Welding Workforce Grant is the latest effort to ensure a skilled workforce is ready when industry calls.

Grants of up to \$25,000 are available to improve and expand training programs and institutions to increase the number of welding graduates across the country.

Please note that applicants must be both AWS Educational Institution Member and SENSE Registered to apply for the Welding Workforce Grant.

### What Assistance Is Available?

Grants up to \$25,000 are available for secondary and postsecondary education/training institutions to enhance and improve welding programs resulting in an increase in the number of welding graduates and/or the number of graduates successfully placed in welding or welding-related jobs.

Funds may be used for:

- welding or metalworking equipment purchases or upgrades
  - facility improvements
  - capital items
  - computers, computer-based training systems
- Funds cannot be used for:
- any program or area not related to welding education/training
  - travel expenses
  - personnel or to expand teaching staff
  - student tuition or scholarships
  - textbooks or teaching materials
  - classroom or lab materials and/or supplies
  - personal protective equipment
  - indirect costs

No grants will be given to individuals.

The application consists of the following components:

- Project summary
- Details of matching support
- Project description and outcomes
- Three years of data on number of welding students, graduates, and placement in welding jobs
- One-page itemized budget (Sample budget can be found at <https://www.aws.org/library/doclib/Grant->

*Vanessa Revelli is managing editor of techdirections.*

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2018-Sample-Budget.pdf)

- Letter of Commitment from Education/Training Institution

- Letters of Support (preferred but not required) from local employers, community groups, local AWS section, etc.

### Perkins V Funding

<https://cte.ed.gov/grants/funding-opportunities>

**Deadline:** Varies

The Strengthening Career and Technical Education for the 21st Century Act, which amended the Carl D. Perkins Career and Technical Education Act of 2006 (Perkins IV), was signed into law on July 31, 2018. The amended act, now Perkins V, brings changes to the \$1.2 billion annual federal investment in career and technical education (CTE). The U.S. Department of Education is looking forward to working with states to implement the new legislation, which went into effect on July 1, 2019. It provides new opportunities to improve CTE and enables more flexibility for states to meet the unique

needs of their learners, educators, and employers.

### Workforce Development Grants – GrantWatch

<https://www.grantwatch.com/cat/40/workforce-grants.html>

**Deadline:** Varies

GrantWatch is a grants search engine. It currently provides information on nearly 20,000 grants. Workforce development grants assist veterans, youth, displaced workers, and immigrants to enter, remain in, and advance in the workplace. With this search engine, you can find grants to provide programs for career education and career training, solve workforce shortage, and promote workforce health.

### The NEA Foundation Student Achievement Grants

<https://www.neafoundation.org/for-educators/student-success-grants/>

**Deadline:** Applications are reviewed three times per year; applications can be submitted anytime.

This grant is available to current members of the National Education Association (NEA), and it supports in-classroom initiatives with the aim of improving student outcomes. The award can fund resources, technology, experiences, and other materials specifically for students. This grant is offered at two levels of funding—either \$2,000 or \$5,000.

### McCarthy Dressman Education Foundation Enrichment Grant

<https://mccarthydressman.org/academic-enrichment-grants/>

**Deadline:** April 15 (or when 350 applications have been received)

These grants support the McCarthy Dressman Education Foundation’s belief in the value of continuous learning, training, and growth for educators. Awards fund small groups of teachers in the development and implementation of forward-thinking instructional approaches in K–12 instruction and offer as much as \$10,000 per year for up to three years ☺

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## Invisibility Is No Longer Just Science Fiction

In a recent presentation that I gave titled “From Science Fiction to Reality” I asked my audience to identify, from a PowerPoint Slide list of science fiction predictions, which technology still doesn’t exist. Everyone quickly identified invisibility. My next slide showed a video clip of the Harry Potter cloak and I could see the disbelief on their faces when I told them that the technology had now been achieved.

Before we can explore invisibility technology, a basic understanding of how we see objects is needed. If you are in a room that contains no light whatsoever you cannot see the objects that exist in the room. We need light to see objects, and we see them because the natural or artificial light that strikes the objects is reflected back into our eyes.

The information contained in the patterns and frequencies of this reflected light is transmitted from our eyes to our brains where these signals are deciphered into three-dimensional color images. If the light that is normally reflected off an object could be redirected around the object, so the reflected light from the object never reaches our eyes, the object would become invisible.

HyperStealth Biotechnology Corp, located in British Columbia, Canada, is a major supplier of military camouflage clothing with patterns that match the natural landscapes of jungles and deserts. Their clothing is used by soldiers, law enforcement, and hunters to better blend into the natural environment of their locations. Their clothing lines do not render anything invisible.

On October 8, 2019 HyperStealth

*Alan Pierce, Ed.D., CSIT, is a technology education consultant. Visit [www.technologytoday.us](http://www.technologytoday.us) for past columns and teacher resources.*

announced to the world that they have patented their Quantum Stealth invisibility cloaking material (Photo 1). Their Invisibility cloak that the girl in the picture is holding with



**Photo 1—The invisibility cloak that the girl is holding bends the light so it moves around her body. The upper part of her body is visible only because it is not covered by the invisibility shield.**

Photos courtesy HyperStealth Biotechnology Corp.

her left hand bends the light so it moves around the lower part of her body. This redirection of the light makes it look like the lower half of her body is hidden in the bushes when she is actually standing in front of the foliage seen in the picture.

It is easy to find the cloaking shield if you look at the gravel of the path in front of her. The light rays that are hitting the invisibility shield were moved completely around the girl to render the

lower half of her body invisible.

Photo 2 makes it easy for you to see the rectangular invisibility cloak which is hiding the part of the man’s body that is behind the cloak. The way he is standing behind the shield makes it look like the rest of his body is somehow behind an invisible doorway in the wall.

The HyperStealth invisibility cloak has two layers of lenticular arrays throughout its surface that require no power source to create invisibility. The cloak’s lenticular lenses work in



**Photo 2 —Without the foliage background seen in Photo 1, it is easier to see the rectangular invisibility cloak. The part of the man’s body that lies behind the cloak is completely invisible.**

concert to move the light that is striking it completely around objects that lie a short distance behind its surface.

The cloak is still under development; the goal is to go from its



current shield format to a flexible blanket that could easily be draped over soldiers to allow them to hide in plain sight. One can expect many military applications for this technology once manufacturing in its present format begins. HyperStealth engineers are now working on developing more flexible formats such as blankets and perhaps clothing.

I am writing this column one month after the technology has been patented and until the patent process was completed Guy Cramer, president/CEO of HyperStealth, my contact for this column, and the developer of the technology couldn't risk sharing the material's fabrication process with a manufacturer. These HyperStealth videos can further your understanding as to how, and to what extent, this technology can render objects invisible:

<https://vimeo.com/367347300/ef68b94ec3>

<https://vimeo.com/371435874/c090a69fe3>

<https://vimeo.com/371440586/ae3d44bdc1>

### Taking It a Step Further

1. Research how airplane stealth technology hides an airplane from radar. How does airplane stealth redirect the radar signal so it doesn't return to the sender? How is this approach different from the HyperStealth invisibility shield? In your opinion what are the similarities and differences between these two technologies?

2. Mirages occur under certain weather conditions because light moves at different speeds through hot and cooler layers of air. Research mirages and create a presentation that uses images and/or videos from the internet that shows why they occur.

3. Light also moves faster through the air than it does through water. Research online for classroom experiments that show how light slowed down by water or other liquids can change or distort what we see. All experiments must be approved by your teacher before they are performed in your classroom. ©

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## Narcis Monturiol and the First Modern Submarine

There were several attempts to build submarines during the 19th century. The submarines were typically operated by military personnel turning cranks inside a sealed vessel. The first to use an engine while submerged was launched by Narcis Monturiol in Barcelona, Spain, in 1859. It was the first modern submarine.

Monturiol was born about 90 miles northeast of Barcelona in 1819. His father was a successful barrel maker for the wine, oil, and milk industries in the Catalonia region of Spain. Monturiol was raised with four siblings and his older brother was in line to inherit the family business.

Political upheaval during Monturiol's youth influenced him to become a political activist. He earned his liv-

ing working for publications that supported his beliefs. Monturiol married his wife, Emilia, in 1843 and they had eight children.

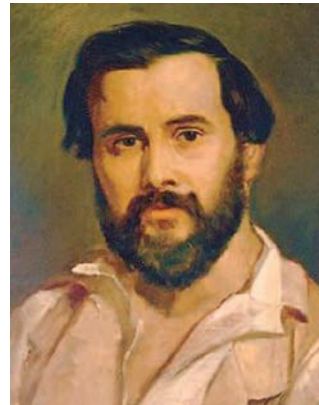
Monturiol built some small mechanical devices in his youth but he had a limited background in technology. One of his friends was a civil engineer who encouraged him to read technical books. Once, while walking along a beach, he saw people attempting to revive a swimmer who had been diving for coral in the Mediterranean Sea. That event directed him toward technology.

Monturiol felt that coral harvesting could be made much safer with a proper submarine. He discussed it with friends and found 20 who agreed to finance a venture to construct one.

Monturiol rented space at a Barcelona shipyard that also agreed to provide some construction assistance.

Monturiol named his wooden prototype *Ictineo I* from the Greek words: "ict" for fish (*ichthus*) and "neo" for boat (*naus*). He designed its exterior to mimic the shape of a fish. It was the world's first double-hulled submarine—that design helped withstand water pressure.

*Ictineo I*'s interior space had an oval cross section measuring about 6' by 3'. Launched in 1859, the 23'-long vessel performed almost flawlessly during its 2-1/2 year life. Four men turning a long crank powered it to a speed of about 1 knot (1.15 mph). It could dive to 65' and stay submerged



**Narcis Monturiol**

for up to two hours.

*Ictineo I* had coral-harvesting tools on its front for testing during several of its 50 dives. The submarine was destroyed in a hit-and-run accident by a passing freighter in 1862. The Barcelona Maritime Museum has a replica on display.

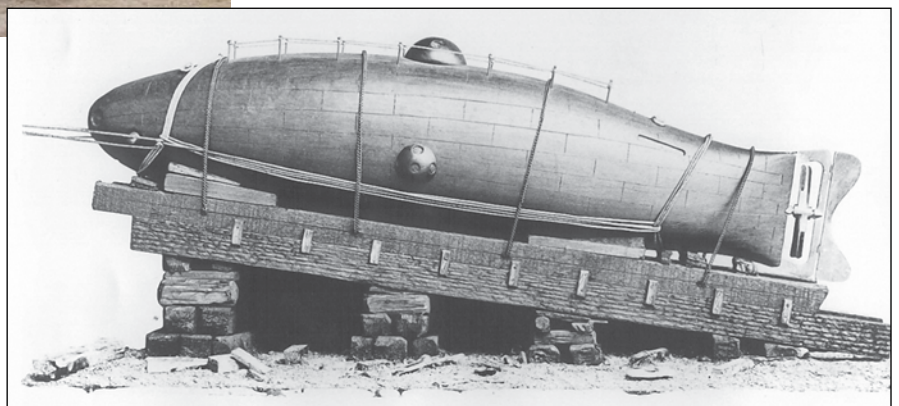
Monturiol then built a better version funded by the public. He launched *Ictineo II* in 1864. It was over twice as long at 55' and far heavier because Monturiol clad the wooden exterior with copper sheets.

*Ictineo II*'s outstanding feature was its underwater steam engine. Instead of burning coal while submerged,



**Left, A replica of *Ictineo I***

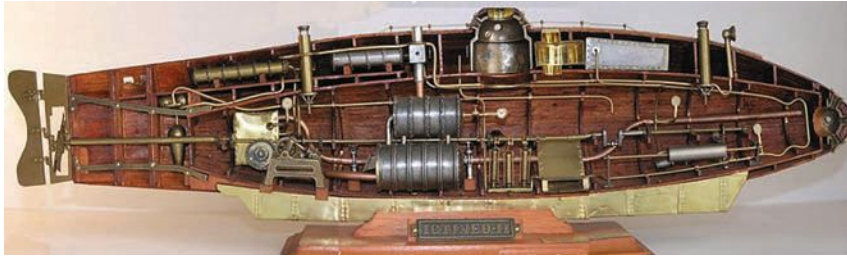
**Below, *Ictineo II*, prior to launch**



ing working for publications that supported his beliefs. Monturiol married his wife, Emilia, in 1843 and they had eight children.

Monturiol built some small mechanical devices in his youth

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



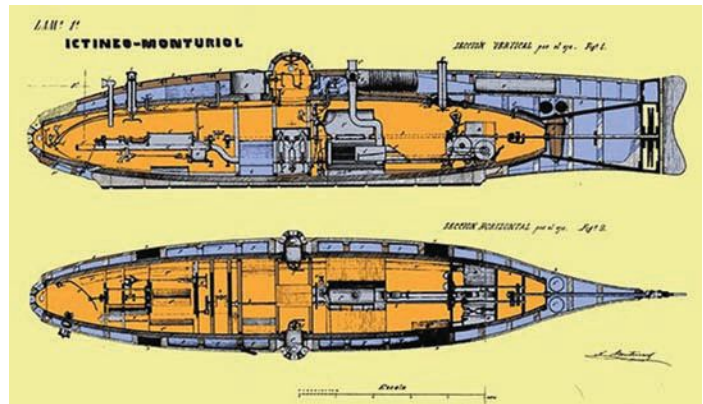
A model of the interior of *Ictineo 2*

which would have quickly consumed all the interior air, Monturiol used a reaction with zinc and other chemicals. It produced enough heat to convert water to steam, which pushed pistons that turned a propeller. The modified 6 hp engine was from a textile factory and gave *Ictineo II* a top surface speed of over 4 knots.

While the submarine was tied to the dock for safety in December 1867, Monturiol operated the engine under water several times. But he was out of money and on the verge of being arrested for his continued political activities. His creditors seized *Ictineo II* a few weeks later and broke it up for scrap.

Monturiol was at odds with the government during his entire life, but was briefly elected to a national office in 1873. He later found em-

***Ictineo 2***  
plans,  
published  
in 1890  
(colorization  
added later)



ployment as a bank clerk, a magazine translator, and in other minor positions. He died in 1885. Electric motors later replaced Monturiol's complicated underwater engine design. But his idea of air-independent underwater steam generation is used by all nuclear submarines. ©

### References

Holian, Thomas. (2005, Spring). Monturiol—The forgotten submariner. *Undersea Warfare*, 7 (3).  
Stewart, Matthew. (2003). *Monturiol's dream*. Pantheon Books.

## More than Fun Answers

### Save! Save Even More!

(A) Use coupon 3 for any bill up to \$35. Use either coupon 1 or coupon 3 for any bill from \$35 to \$39.99. Use any of the coupons for a \$40 purchase. Use coupon 2 for all bills over \$40.

(B) All three coupons will save you \$10 on a \$40 bill.

The chart helps to see why you should use which coupon. It shows the savings with each coupon for various bills.

If bill is:	Coupon 1	Coupon 2	Coupon 3
\$0 - \$20	NONE	\$0 - \$5	\$0 - \$10
\$20 - \$35	NONE	\$5 - \$8.75	\$10
\$35 - \$40	\$10	\$8.75 - \$10	\$10
\$40	\$10	\$10	\$10
\$40 - \$100	\$10	\$10 - \$25	\$10

### Penny for Your Thoughts

A pencil costs 20¢ and an eraser costs 50¢.

Let  $p$  = cost of a pencil.

Let  $e$  = cost of an eraser.

Then  $3p - e = 10$

and  $5p - 2e = 0$

Multiply the first equation by  $-2$  and add to the second equation:

Multiplying by  $-2$ :  $-6p + 2e = -20$

Then adding to the second equation:  $-p = -20$ .

Therefore,  $p = 20$  and  $e = 50$ .

### If I Were a Rich Man . . .

You have \$2.50.

Let  $x$  = how much money you have

Then  $x + .20x = x + .50$ . So,  $.20x = .50$ ,  $x = 2.50$

### Word Scramble

SEVAW    INSEP    GROJAN    SHWICT  
WAVES    SPINE    JARGON    SWITCH

When unscrambled, the letters in the squares should read:

### JOSEPH SWAN

Though earlier inventors had tried with limited success, Sir Joseph Wilson Swan, of Britain, invented the first practical incandescent light bulb in 1860. The efficiency of his first light bulbs was severely compromised by their carbonized paper filaments, which limited bulb life to a few hours. Later, he would improve the filament, first by using carbon fiber, then by using slim carbon rods. Though these later bulb designs consumed considerable amperage, they lasted long enough for practical commercial use. In 1881 Swan founded a company to manufacture and market his light bulbs.

Meanwhile, across the Atlantic, Thomas Edison had purchased a rival—although far inferior—light bulb patent for \$5,000. Edison and his team at Menlo Park spent much time experimenting with better filaments until eventually they found a filament material superior to Swan's. Edison founded his own light bulb manufacturing company, which later merged with Swan's company—and eventually bought Swan out.

# ITEEA Dream Ride— Go Baby Go Style

## *A Guide for Educators*

By Jennifer Buelin

**H**AVE you ever watched a toddler scramble across the room, crawling to nowhere in particular, but moving like lightning? Sometimes crawling and toddling are so much fun for children that they laugh out loud and squeal with

communicate. Unfortunately, many children experience delays in their abilities to move, which in turn affects their abilities to explore and learn about their world, interact and maintain social relationships, and identify as independent individuals. When participation in activities is

limited from decreased mobility, assumptions are often made that the immobile individual has less to contribute.

Assistive technologies can make significant impacts in the quality of life for the millions of people with physical limitations. However, in 2019, a toddler unable to move independently may face a wait of up to two years for a

power chair that can cost between \$10,000 and \$40,000. While waiting, many months of formative physical experiences are lost, and the child's development is significantly delayed.

Go Baby Go is an international grassroots open-source movement focused on real-time, real-world solutions for mobility. GBG looks at low-tech, low-cost solutions to increase independent movement ex-

periences that provide children with opportunities for expression, play, socialization, and exploration leading to learning.

The intersection of GBG and Integrated STEM Education brings this real-world mobility challenge to teams of students and teachers uniquely positioned to create solutions. One popular low-tech intervention begins with the platform of a powered ride-on car intended for use by toddlers and preschool age children. Using light adaptations, these cars can be modified for use by children with mobility impairments.

The adaptations include changes to the wiring and on/off switches to create individualized access matching the child's strengths, as well as alterations to the car's seating area to increase the seat's postural support.

This unique approach for mobility is a social justice mission that highlights the diversity of children with developmental delays and connects the school with the greater community.

The Go Baby Go movement began at the University of Delaware with Dr. Cole Galloway. The mission of GBG is centrally focused on the concept that mobility is a human right. The program thrives on disruptive innovation, academic research, and community outreach. Modified ride-on cars provide social mobility experiences, thereby creating opportunities for independence and self-expression.

The International Technology and Engineering Educators Association's (ITEEA) STEM Center for Teaching and Learning™ has partnered with



**A child with limited mobility takes his first spin in a ride-on car that was adapted specifically for his needs.**

delight. It's a universal human act to dance, tap our toes, or jump up and down in response to the stimuli around us.

Movement is a human instinct that enables us to engage deeply with our surroundings, demonstrate self-expression, make choices, and

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*Jennifer Buelin is the former director, ITEEA STEM Center for Teaching and Learning.*

GBG to develop a course guide for teachers, higher education faculty, and Technology Student Association (TSA) advisors. The course makes it easy for teachers and advisors to

standard Level 1 car that can be kept at a daycare, library, or other shared space for children to use as needed on site. At this level, the electrical modifications involve replacing the

helpful to provide a contact person in the event the car needs future repairs or replacement parts.

### Safety of the Driver

It's important to ensure a good match between car and driver. Most Level 1 cars require the addition of a seat belt at the child's hips, an extended back/head support, and PVC side supports.

Level 1 cars require the following physical characteristics of the driver: able to sit on the floor without any additional supports

between 1-2 years of age and of measurements appropriate for the Level 1 car

does not require supplemental medical technology to be with them at all times that would need to be accommodated in the car (Tackle this in later, more advanced builds!)

A clinician such as a physical or occupational therapist from the community can be a huge asset to a team. A specific family/child will most likely already have a PT or OT and involving them in your group during the collaboration plan and fitting can



**Volunteer students and faculty brainstorm before tackling their next ride-on car modification.**

plan, fund, and successfully execute their GBG events. Dr. Galloway and his colleagues provided recommendations to ITEEA for bringing modified ride-on cars into the Engineering byDesign™ Integrated STEM curriculum. Recommendations were gathered from sources within and outside of Go Baby Go chapters, representing years of experience within a growing community of experts eager to share what they've learned. The course package is the transformation of the "best of GBG" into a STEM project for middle and high school classrooms and clubs.

The Modified Ride-On Car is an enormously impactful project. Benefits extend beyond the boundaries of the technology and engineering laboratory, and beyond the walls of the school building to include the community, the medical industry, recreational spaces, and places of worship, bringing diversity awareness to a larger audience, and all while creating fun and rewarding experiences for students.

When considering modified ride-on cars for a classroom or TSA chapter, it is critical to think ahead about the full scope of the project: several kinds of ride-on cars can be built by students, beginning with a

standard drive mechanism (usually a small button on the steering wheel) with a large switch, making the car easier to activate for children with less accuracy in their movements. Projects featuring more complex cars, highly customized to a child's unique needs and abilities, and reliant on the participation of a local physical therapist, can follow. Course materials include a Car Use Safety Assessment, a Sample Liability Waiver, and a Parent Training Form template, helping to ensure that parents leaving with a new ride-on car have been shown how to properly plug and unplug the battery, use the on/off switch, and safely secure their child into the car.

### Safety of the Car

A functional, safe modified ride-on car is one of the required outcomes prior to delivering a car to a family, hospital, or clinic. Most facilities serve many children with different ability levels. Included in the safety section of the curriculum are guides for safety testing the vehicle after the modifications are complete. Sign off by an engineer is required prior to delivering the car to any destination. Most groups find it



**Middle school students from Arlington, VA make modifications specific to the child who will receive the car.**

increase comfort for all. If not designing a car for a facility, input from staff should be welcomed. Having a therapist on the team can be beneficial for



Once children begin testing the cars, additional adjustments may be required.

students, offering the opportunity for them to learn about careers in PT and OT.

## Engineering oversight

Engineering oversight is required prior to delivering the project to a clinic, organization, or child and can be useful throughout the project. This oversight could come from an individual local to your school, or through a partnership with a local business, community member, or university engineering program. Engineering sign off is required at a minimum of two phases of the process: 1) participation in the signed agreement on user-centered design principles and 2) final sign off on electrical and structural safety.

## ITEEA Dream Ride . . . Go Baby Go Style FAQs

**How long does it take to modify a car?**

A Level 1 build can be completed by a team of 1-2 students in a single afternoon. It is recommended to run a GBG build event for a whole class or TSA chapter with multiple small teams (2-4 students per car) that build cars simultaneously. The event can culminate in a “test drive” celebration, bringing students, families, and the greater school community together.

**How much does it cost to modify a car?**

\$500 per car is recommended as a starting framework. This allows sufficient funds for the car, modifications, and a few mistakes along the way. Car and component prices fluctuate so this is a healthy estimate to allow for these fluctuations. If this program is integrated year to year, costs may decrease as leftover resources are stockpiled and can be used for future builds.

Integrate the community into the funding process: Fundraising projects such as car washes, bake sales, or contributions from a fundraising night at a local eatery can raise needed funds as well as create awareness of the project. In addition, consider more specific requests to individual businesses or organizations within and outside your district.

Examples of organizations that have donated for partial or complete builds include: Lowes, Home Depot, Toyota, car dealerships, insurance agencies, and professional sports teams.

Sponsorships from local businesses, families, or corporations can be recognized in many ways. Some organizations have created custom “license plates” for the cars, recognizing the donors while others create banners that are visible in media coverage of the build or driving event. Another idea is to create custom “title paperwork” for the car, which recognizes the donor’s contribution. This creativity can come from the building students or can be a way to include additional students not already involved in the mechanics of the build.

High visibility of your program through social media as well as more traditional media channels can increase your funding sources for future builds!

**What tools or specialized equipment is needed for modifying a car for a child?**

Only basic tools are needed: a

power drill, PVC cutter, and wire strippers.

**For what grade levels is GBG appropriate?**

The project is recommended for students in middle and high school; upper elementary students are able to participate with increased supervision.

**How can I get access to the EbD™ course Guide for ITEEA Dream Ride . . . Go Baby Go Style?**

The beta version of this course is currently available at no cost to teachers and TSA advisors. Request access at <https://goo.gl/forms/Ue-3dropxDJMT89EO2>.



An adapted car awaits its new owner to take it for a test drive.

### Additional resources

International Technology and Engineering Educators Association: [www.iteea.org](http://www.iteea.org)  
 Engineering byDesign™: <https://www.iteea.org/STEMCenter/EbD.aspx>  
 Go Baby Go on Facebook: <https://www.facebook.com/UDGoBabyGo/>  
 TEDMed Talk with Dr. Cole Galloway: <https://www.tedmed.com/talks/show?id=292991>  
 ITEEA Safety Resources: <https://www.iteea.org/Resources1507/Safety.aspx?source=generalSearch>  
 ITEEA Go Baby Go Microsite: <https://www.iteea.org/Resources1507/gobabygo.aspx> ©

# Chandler Vincent: A Conversation with the Future of Welding

By Michael Riobueno

**A**WS Learning is excited to bring you this interview with welding wunderkind Chandler Vincent, one of the most skilled and decorated welders on the planet. If this is the first you're hearing of Mr. Vincent, allows us to fill you in: Chandler's love of welding began as a freshman in high school, and it wasn't long before he was winning SkillsUSA competitions in his home state of Utah.

He went on to compete in the national championships twice, and at just 19 years old, was chosen to represent the United States at the 2017 WorldSkills competition in Abu Dhabi. Chandler was gracious enough to chat with the AWS Learning team, discussing various topics, including his history, educational background, and plans for the future. Read on to learn more!

**AWS Learning:** Thanks for taking the time to sit down with us, Chandler. Let's start with the most fundamental question: When did you start welding?

**Chandler Vincent:** I started

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*Michael Riobueno is an instructional designer at the American Welding Society. Reprinted with permission of the American Welding Society, Miami, FL, from <https://awo.aws.org/2018/09/chandler-vincent-a-conversation-with-the-future-of-welding/>; and <https://awo.aws.org/2018/09/chandler-vincent-a-conversation-with-the-future-of-welding-part-2/> All rights reserved.*

welding at a vocational college connected to my high school in Utah. The college was UBTech. I had an uncle who was a welder and did all kinds of work. I got into a welding class during freshman year. Everything started when I struck that first arc and I figured that was what I was born to do.

**AWSL:** That's great! Most people wish they would be so lucky to find an activity that they truly connect with. Your reputation and ties to SkillsUSA precede you. Could you talk to us about that experience a little bit?

**CV:** In my high school program, I heard about SkillsUSA. I saw the older kids competing. These were seniors and juniors that I looked up to as friends and people and I wanted to do the same. I trained, went and won state, and got to the national level as a sophomore.

I was doing the four main processes, MIG (GMAW), stick (SMAW), TIG (GTAW), and flux core (FCAW). That's when I figured out I could compete nationally. I was 16 years old at the time and I told myself that's what I was going to do no matter what.

In high school, I started my own welding business. It was going well, but I shut that down to train. The next four years of my life were nothing but training to represent the United States of America.

What shaped me as a person and the welder that I am now is SkillsUSA. The amount of time I put into training, and the people I met... there's not a price tag that can be put on

that. It was phenomenal. Even today, the relationships I have across the world are priceless.

**AWSL:** SkillsUSA is definitely a wonderful organization. Can you tell us a little bit about your business?

**CV:** It's a general fabrication business. I got started in small-scale rural repair, like gates, and it went up from there.



Utah State University Eastern

**Chandler's love of welding began as a freshman in high school, and it wasn't long before he was winning SkillsUSA competitions in his home state of Utah.**

**AWSL:** Now, let's focus on education. Did you have a particular instructor that inspired you?

**CV:** I had an instructor who turned my life around. I didn't plan

on going to high school. I was going to be a dropout. I didn't see a reason for the math and the science and the English, because I didn't see first-hand in life how valuable it was. My instructor, Kevin Mitchell, basically took me in and showed me what the

**CV:** I competed in '17, so I'm done now. My current role is to tell my story and promote the next WorldSkills, like an ambassador. Now, when the next person is chosen, I'll help train them, and get them prepared for the international competition.

of kids turn their lives around for the better because of SkillsUSA. It's good because they can look up to someone like me or the people I looked up to before me, and they can see the future and see what you can do. And they have the right opportunities and connections with people to help them get better. It's a great environment for our youth.



SkillsUSA

**While he didn't medal in Abu Dhabi, Vincent was named Best of Nation as the U.S. team member with the highest overall total score.**

math is used for, what the English is used for, and that motivated me to stay in school. I went to college, finished college, and basically turned my life around, 180°.

**AWSL:** That's wonderful! Teachers really can be unsung heroes. Of these academic facets of welding that you found a new appreciation for, what's the one you found the toughest? Was it the math? Maybe metallurgy?

**CV:** Metallurgy is quite tough. I struggled with it. Math didn't always come easy. But English, I would say, was the hardest for me. That's definitely where I've lacked. There's not a whole lot of good grammar in my small-town community with its southern drawl. [Laughs]

**AWSL:** It's definitely not an issue for you now! So, are you going to be at WorldSkills in Kazan, Russia?

**AWSL:** Do you have any experience training others now? Have you taken somebody under your wing?

**CV:** Definitely! A lot of [effort] goes into training my own employees and helping them improve. I regularly stop by my past high school and college and help groups that are struggling. A lot of people just contact me for things like that, so I do demos.

**AWSL:** Do you think your story is unique, or do you think it's common for people to stumble into welding and find a passion for it through education?

**CV:** In some respects, my story is unique, and in others, absolutely not. SkillsUSA is promoting an advancement in the trades and training young people with the skills for the jobs of

**AWSL:** Apart from [your high school welding instructor] Kevin Mitchell, did you learn welding in any other way? For example, many students watch YouTube videos to supplement their formal education.

**CV:** I did watch a little bit of YouTube, like "Welding Tips & Tricks," but where I learned most of my stuff was from my college professor. His name is Mason Winters. I got a two-year degree in Welding from Utah State. After I was chosen to be a U.S. representative, I had a chance to work with a welding expert, Ray Connolly, and that's where I received the very advanced training to get me to place at the world level. It was phenomenal!

**AWSL:** When you were going through the advanced and more rigorous training, was there ever a moment where you learned something or saw something that,



**Vincent also received a Medallion of Excellence in his trade. These are awarded to competitors who earn 700 or more points out of a maximum possible total of 800.**

Utah State University Eastern

the future. So, you get into SkillsUSA and you do see kids that are inspired in the things that they do and the things they've learned.

I've seen hundreds and hundreds

even though you've been doing this a long time, made you say "Whoa! That's new"?

**CV:** Oh yeah! Especially when I was travelling. I got to travel to Aus-



tralia, Abu Dhabi, the Middle East, and I got to train and weld against the best people from every country in the world.

We all had projects and standards and blueprints that we had to weld to, but not a single one of us did it the same way. We all had our own style, our own signature work that you could tell came from a certain person. So, every welder would amaze me with how they did it. For example, the Chinese, they do everything we would do, but they do it on the ground. They wouldn't use any workbenches or chairs.

The beautiful thing about welding, and what I love so much, is that even to this day, running the business, doing work, you're always learning something new. You're studying different definitions, and the arc and the weld pool, the way liquid metal flows, and what metals bond with other metals, and what they look like when you're doing it properly. That's one of my favorite things about welding: there's always, always something new to learn.

**AWSL:** Is there anything about welding that's not exactly your favorite thing? Maybe a process or material that you're not that good with? Or maybe the administrative work that comes with running a business?

**CV:** No, I love it all. I absolutely hate when I can't do it and when I'm not doing it.

**AWSL:** Have you ever been hurt doing it?

**CV:** I've had a lot of burns. I've worked myself to the point of hospitalization. I was so into it, and I'd get so deep into the training and enjoy it so much that I'd forget to eat or sleep. I was just focused on what I was doing.

**AWSL:** That's intense! Is there something you haven't done yet, something you're looking forward to doing or learning? A new process? Traveling someplace? Building something? Working with someone?

**CV:** I look forward to doing more research with Lincoln Electric and helping them build new welding programs and develop new welding

processes. I'm also interested in going more in-depth into what we know and figuring out new ways to do things.

I'm always, always excited to work with new people and learn what they know because everybody's had their own experiences in life and have had different failures that they've learned from. Nobody has the same story, so I really enjoy learning from new people.

**AWSL:** You're young and have so much first-hand experience in the industry. What are some trends, either

technological or otherwise, that you expect to see in the near future?

**CV:** The biggest trend that I see is the lack of welders we have in the United States. We have a big skills gap, and I can't find anybody to weld for me.

**AWSL:** That's really unfortunate. Thanks for taking the time to sit down with us, and for doing the things you do to combat the skills gap. It's been a pleasure, Chandler.

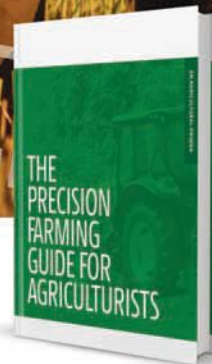
**CV:** Thank you! 🙏



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# Welding Projects Spark Creativity

By Kristin Campbell

**T**AP into your creative side by welding various home-made projects. You can keep them for yourself, save them for future gifts or even donate them for fundraisers. Fun summer creations from a hot-water tank BBQ grill to a brazed fighter plane (as described in this article) can be crafted using a variety of skills and materials.

Before you start, please remember safety comes first. Be sure to follow practices outlined in the American National Standards Institute (ANSI) Standard, Z49.1:2012, Safety in Welding, Cutting, and Allied Processes ([www.aws.org/standards/page/ansi-z491](http://www.aws.org/standards/page/ansi-z491)).

Now, just like mixing a fresh batch of lemonade to keep you hydrated on a sunny day, here are recipes to build unique projects.

## Darth Vader TIE Fighter Fire Pit

Daymon Gast ([dgast@lw210.org](mailto:dgast@lw210.org)), who has 18 years of high school welding teaching experience in Illinois, wants the force to be with you while creating a Star Wars inspired, Darth Vader TIE fighter fire pit. He works at Lincoln-Way Central and East High Schools, where his students are used to making various welded projects and is an adjunct welding in-

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*Kristin Campbell is features editor of the Welding Journal, for the American Welding Society. Reprinted with permission of the American Welding Society, Miami, FL, from <https://insights.globalspec.com/article/12191/step-by-step-diy-summer-welding-projects-part-1>. All rights reserved.*

structor at Joliet Junior College.

“Any Star Wars fan instantly connects with what we’ve built here. It gets immediate attention and instant requests for the opportunity to own the next one we build,” Gast said. He also knew it would motivate future students to begin thinking of what their welding skills could create.

Gast provided the following instructions on making this 28" long × 21" high × 12" deep fire pit. It weighs 45 lb. (Photo 1).

## Building Process

Because the fire pit is made from a propane cylinder, Gast recommends purchasing a new tank never filled with propane. These retail for \$25-30.

If you prefer to use

a previously filled propane cylinder, even though it is empty, never cut into it without consulting AWS F4.1:2017, Safe Practices for the Preparation of Containers and Piping for Welding, Cutting, and Allied Processes (<https://pubs.aws.org/p/1759/>)



Daymon Gast

Photo 1—Star Wars-inspired, Darth Vader TIE fighter pit is 28" long × 21" high and 12" deep.

## Materials—TIE Fighter Fire Pit

**A cylinder tank (either a new propane or an old, no longer working air compressor cylinder tank)**

**One 24" × 24", 16-gauge sheet metal**

**Approximately 14' of 0.120" wall thickness, 1" square tubing**

**2.5' of 5" × 5" thin-wall square tubing, or more sheet metal, to make the two horizontal wing supports**

**3' of 7/16" smooth rod**

**A very small section of 6" pipe for the top**

**A short amount of 2" Schedule 40 pipe, and perhaps some small-diameter Schedule 40 pipe, to make the blasters in front**

**Expanded metal for the fire pit's top**

**High-temperature paint (meant for BBQs)**

f412017-safe-practices-for-the-preparation-of-containers-and-piping-for-welding-cutting-and-allied-processes).

An alternative to the fuselage of the fire pit would be a used air compressor tank. "You will, at a certain point in this project, want to burn off the factory-applied paint using an oxyacetylene rosebud heating torch tip," Gast explained.

Cut the project parts with a plasma arc cutting device or small tip oxyacetylene torch.

Because the metal is relatively thin, he recommends using gas metal arc welding (GMAW) with a 0.030" wire and 75%/25% argon/CO2 gas.

"You'll have some great welds on clean metal with this arc process, as long as you remember to burn away and clean off all the original paint from the cylinder," Gast said. "Later, you'll want to use a high-temperature BBQ paint in black on the outside to be able to have a hot fire in it."

The welds on the wings need to be flush ground. Use angle grinders fitted with an abrasive grind wheel to perform the heavy work, and a 40-grit zirconia flap disk to polish it.

Don't forget to cut holes through the blaster guns, where they are attached to the tank, as they will glow red with flames.

The geometry of the angles is difficult, but if you end up with joint openings, they can be filled using a stitch-weld technique with your GMAW gun.

"The other major challenge you'll face is propping the fighter wings up in order to spot weld it temporarily. If you don't get the wings even, you can use your angle grinder cut-off wheel to cut the tacks. Be sure to put the tacks in open areas, so that they can be cut if needed," Gast said.

Expanded metal to put on top of the fire pit makes a convenient place to heat a few hot dogs at a time.

"Budget a week to build, and it's a good team-building exercise; you'll need someone to help with it," Gast said of this project.

### Hot-Water Tank BBQ Grill

Tim J. DeVargas (faulknerweld@yahoo.com), a welding instructor



Tim J. DeVargas

**Photo 2 (above)—This hot-water tank will be turned into a grill.**

at the T. L. Faulkner Career Technical Center in Prichard, Alabama, and past AWS Mobile Section chairman, detailed how to construct a hot-water tank BBQ grill.

This model features thicker, durable and long-lasting metal, DeVargas explained, because in the U.S. South, BBQs are popular. The benefits of building it are two-fold for students; they learn to work one step at a time and gain cutting/measuring experience.

"You can also make some good money for your program," DeVargas said, given the grill costs about \$50 to make and sells for \$100.

### Building Process

1. Remove all fittings from your hot-water tank (Photo 2). Also, remove the outer shell from the tank, and use a plasma cutting device to cut this into pieces. Caution: Insulation is flammable and will flare as you cut this outer shell, so remove all foam insulation using a scraping tool. Using a plasma cutting device, cut out all the fittings.

2. Weld cap all the fitting holes, previously cut, using gas metal arc

welding (GMAW) with a 0.035" or 0.045" wire. Grind and clean all the edges and welds.

3. Cut, four times, 1-1/4" or 1-1/2" square tubing for the legs, approximately 36" long (one side 45°, the other side flat). Measure the tank to lay out and weld the four legs to it.

4. Measure and cut 1-1/2" angle iron for a bottom shelf, approximately halfway between the floor and bottom of the grill. Weld (angle up) to all four legs, and weld in cross member (angle iron down) for mesh support. Cut and weld 1/2" or 3/4" flat expanded metal inside of the bottom tray.

5. Use two, 6" to 8" bearing-type,



Tim J. DeVargas

**Photo 3—The finished, painted hot-water tank BBQ grill.**

hard-rubber wheels on one set of legs, marking and welding the bolts to put on the wheels (cut off excess with a band saw). For stability, weld caps to the bottom of the other legs.

6. Mark and cut out a grill door, just above half of the tank, using a plasma cutting device.

7. Measure the length and width of the tank, approximately 3" to 4" above the bottom. Using 1" angle iron, cut and build two square/rectangle shelves (for charcoal). Cut and weld (angle up) 3/4" raised expanded

**Continued on page 22.**



# A Hybrid of Old and New Art and Anatomy, Using a CNC Router

Blair hand paints her artwork after it has been carved.

By Maryann Valentine

**M**ARNIE Blair, a mother, an artist, a wife, a professor, a cardiac arrest survivor, and more, is one of the most fascinating and captivating practicing artists I've ever encountered. At only 19 years old, she became a cardiac arrest survivor. Inspired by her own story, she became fascinated by the human body, and began incorporating anatomy into her print making. Her own experience represents the specific and direct physical relationship that exists between her Implantable Cardioverter Defibrillator (ICD) and the electrical activity of the heart.

Also an art instructor at Red Deer College in Red Deer, Canada, Blair has found herself utilizing the Techno CNC Systems LC 4896 from the Red Deer College, and creating one-of-a-kind art like I've never seen before. She uses her ICD as a starting point to examine questions that surround the intersection of technology and humanity. Her work explores the natural and the artificial, and what it means to be dependent on a machine in order to live. This reliance on tech-

*Maryann Valentine is the marketing manager at Techno CNC Systems in Ronkonkoma, NY.*

nology references our own increasing dependence on technology and its impact on our daily life.

Blair shares, "I'm a print maker. I do wood cuts, etchings, and screen prints. Across the United States, print makers do not have access to a CNC router normally, but after I had worked at Red Deer College for almost four years, they built the Center of Innovation and Manufacturing,

facturing to utilize the Techno CNC router. My students and I made a 4x8 wood cut, printed it, and the rest was history. I was so fascinated with what the router could do, and how wonderful each piece was carved."

After spending about four months in the studio learning the software and practicing how to carve, Blair was fully trained on how to use the router. She began routing images



After spending about four months in the studio learning the software and practicing how to carve, Blair was fully trained on how to use the router.

which then allowed for a CNC router. The President of Red Deer College gave access to all students and faculty, allowing for anybody to utilize the router in its fullest potential. So naturally, I brought my students to the Center of Innovation and Manu-

inspired by the imagery in an old textbook she bought from an antique store. Her dual purpose was to try to recreate books where people can go into a gallery and flip through her art, and with the router available, her vision could become a reality.

“So far, I’ve spent this entire summer with the router, and I love the entire process. I love carving and then hand painting each piece after.”

router carves so beautifully and adds another layer of information and aesthetic beauty to my work.”

When she first attempted to route,

I didn’t want to go back to carving each piece to by hand. The router created this mesmerizing pattern on the wood that I would have never gotten if I had carved it by hand. I learned how to reduce my file size, in order to make my operating time a lot faster.”

Blair has carved a number of body parts, including a shoulder, a hip bone, lungs, rib cages, a liver, intestines, a womb with a fetus, and more. “I want to carve every single organ I can find in my vintage medical textbook. I love the abstract ideas that scientists had about the human body many years ago, and am inspired by the different thought process, the colors they used. . . the phenomenon about how the human brain is separated into different layers. . . I love it all, and I plan to recreate it using my knowledge and creativity paired with the Techno CNC router.”

This work is the beginning of a larger body of work. Blair has started to carve more large pieces that will be painted—the seven layers of the brain, eyes, ears, hands, and feet, all based on medical flip charts. These pieces will be hinged like a book for viewers to flip through! “I am so happy with where I am with my art. I couldn’t work like this without the CNC router.”

**“The router created this mesmerizing pattern on the wood that I would have never gotten if I had carved it by hand.”**  
—Marnie Blair



**“Before the router, it would take me about a week to carve each one of my pieces. Now, I can make my art in half the time, and the carve is so much cleaner, neater, and faster.”**  
—Marnie Blair



Blair programs the router based off an image from her 1900s textbook, routes the image, hand paints the wood cut to match the colors used in the textbook, and then stamps the painted wood carving, creating a fascinating yet vintage inspired piece of art. Her work is meant to be a hybrid of old and new—woodcut is a traditional print-making process that dates back to the Han Dynasty before 220 AD, and new technology, using the CNC router to carve the imagery. “I am interested in how relying on a computer and machine in my artistic practice is similar to my own experience of relying on a machine, an implanted defibrillator, to ensure my body functions as it should.”

“Before the router, it would take me about a week to carve each one of my pieces. Now, I can make my art in half the time, and the carve is so much cleaner, neater, and faster. The

Blair was practicing using 3D carving techniques. Due to long cycle times, she quickly learned that these techniques were not sufficient for her project. After playing around with the software capabilities and learning the ins and outs of the router, Blair was able to reduce the file size, resulting in a reduced cycle time to complete her project. The time lowered from days and weeks, to hours and minutes.

“I wanted to create a large back panel of the human body with a bunch of assembled pieces, like the lungs, the uterus, and the intestines, on top of it, yet when I input the large back piece into the router; it said it was going to take hours to route. I absolutely loved the beautiful pattern the router created on the wood.



Blair’s artwork being installed in a gallery



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## Materials—Hot-Water Tank

Four pieces of 1-1/4" or 1-1/2" square tubing for the legs, approximately 36" long

1-1/2" angle iron for a bottom shelf, additional piece to make a cross member

14- or 16-gauge metal for leg caps, circle with vent holes, circle for vent cap

1/2" or 3/4" flat expanded metal for the inside cooking surface tray, along with another piece of this material to fit in the tank's end pieces, then one more piece for the utensil shelf

Two 6" or 8" bearing-type, hard-rubber wheels

1" angle iron for the top and bottom shelves, shelf supports, cross braces and utensil shelf

3/4" raised expanded metal for the charcoal trays

Two bolts and nuts (length and size of the wheel bearings) with one 5/16" bolt and nut, one 1/4" bolt, nut and spring and two bullet-style hinges

3' to 4" pipe for an exhaust vent approximately 6" to 8" long

1" square tubing to make handles for the vent side

1/2" to 1"-flat bar to both frame the door and make a doorstep

An old chipping hammer to fabricate a door handle

High-heat paint (meant for grills)

### Continued from page 19.

metal. With the expanded metal, cut two half (moon) pieces to cover the curve in the tank, and weld one to each charcoal tray.

8. Fabricate a 3" circle with vent holes, then line it up on the bottom of the tank, and using bolt in center, bolt it to the tank. Tack weld the nut as well.

9. Cut two pieces of 1" angle iron the length of the tank, excluding the curve. Clamp the first piece of angle iron to the door opening, approximately 1-1/4" below its lip (angle down), and spot weld using GMAW or shielded metal arc welding. Use a small level to mark the tank's back-side resting on the front angle. Hold up the other previously cut angle iron, upside down, and spot weld in place.

10. Cut two pieces of 1" angle iron across the tank's width, weld (angle down) the bottom of the angle at the top level of the front and back pieces. Also, cut a 1/2"-flat expanded metal to fit in the tank's end pieces, from the curve to the cross, and tack weld in position.

11. Measure the distance on the

cooking surface, length and width, then cut and build two square/rectangle shelves, loose enough to be easily lifted up. Invert (angle down) and cut and weld 1/2"-flat expanded metal to the shelf (grilling surface).

12. Cut 3"-4" pipe for an exhaust vent approximately 6" to 8" long. Also, cut and fabricate a cap, using a 1/4" bolt and nut with spring, weld to the inside top of the vent pipe to keep pressure on it.

13. Weld handles, using 1" square tubing, on the vent side.

14. Using bullet-style hinges, weld the door into position.

15. Using 1/2"- to 1"-flat bar, frame the door to cover the opening from cutting out the door.

16. Fabricate a doorstep, for when lifting the door, from 1"-flat bar.

17. Fabricate a handle out of an old chipping hammer that's modified for this purpose and weld it to the door.

18. Build a rectangle, three-sided shelf, to weld in front using 1/2"-flat expanded metal.

19. Sand and paint the hot-water tank BBQ grill with high-heat paint designed for grills (Photo 3). ©

# What if We Hired for Skills, Not Degrees?

By Lawrence Lanahan

**R**YAN Tillman-French sat at his seventh-floor desk early on a Thursday morning, the skyscrapers of downtown Boston crowding the windows behind him.

On a laptop in the nearly empty office, he worked on code for a webpage he was developing for his employer, the learning materials company Houghton Mifflin Harcourt. In half an hour, he needed to join a conference call about changes to the company's website.

He had been at Houghton Mifflin Harcourt for four months. Coding he liked. Meetings, not so much.

"That's one thing I wasn't warned about when it comes to the corporate world," he said. "So many meetings."

Tillman-French, 26, grew up in a Detroit neighborhood where few people around him had jobs. He received an associate degree, hoping to eventually get a bachelor's and work as a financial adviser. Instead, he bounced from one unfulfilling job to the next in the hospitality and restaurant industries. In the fall of 2017,

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*Lawrence Lanahan is the author of "The Lines Between Us: Two Families and a Quest to Cross Baltimore's Racial Divide." This article was originally published on The Hechinger Report website, [www.hechingerreport.org](http://www.hechingerreport.org). The Hechinger Report is a nonprofit, independent news website focused on inequality and innovation in education.*

**The last decade has seen widespread 'degree inflation.' But a growing movement of employers, workers, and training groups offers a rebuke to a culture that exalts a bachelor's as the gold standard for upward mobility.**

he moved to Boston and enrolled in a community college, planning to transfer to a four-year program.

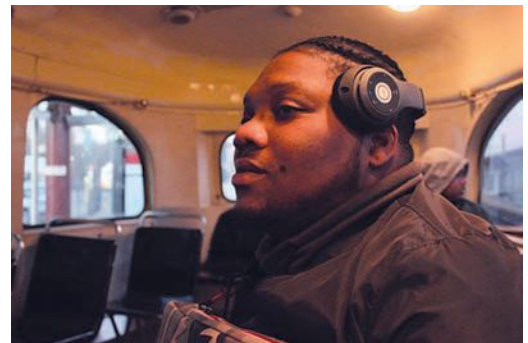
One day, a friend forwarded an email about Resilient Coders, a boot camp that trains people of color for web development and software engineering jobs. On a lark, Tillman-French went to a Resilient Coders hackathon, and the passionate staff there sold him on the opportunity. After he finished the 14-week program, he said, he had over two dozen interviews. Three employers asked him back. Only Houghton Mifflin Harcourt made an offer.

Several years ago, Tillman-French's résumé would likely have ended up in the trash. Until last summer, Houghton Mifflin Harcourt screened out web developer applicants who lacked a four-year degree.

Houghton Mifflin Harcourt wasn't alone in that practice. The previous decade saw a spike in the number of job listings requiring a bachelor's degree, even for so-called middle-skills jobs—think executive secretaries, production

supervisors, IT help-desk workers—that have traditionally been filled by workers with an associate degree or less. Analysts say that this "degree inflation," as they call it, has shrunk opportunities for upward mobility for Americans without four-year degrees.

But now some workforce organizations, researchers, and regional civic leaders are pushing back—persuading companies to look beyond academic credentials and to instead hire people based on their skills. A growing number of businesses



Photos: Lawrence Lanahan/The Hechinger Report

**Ryan Tillman-French rides the Mattapan Trolley on his commute to work at the Boston office of Houghton Mifflin Harcourt. The publishing company recently stopped requiring job applicants to hold a bachelor's degree, opening the door for workers like Tillman-French, who has training in coding and a two-year degree.**

are listening. In the past few years, Apple, Google, IBM, and other high-profile companies have stripped the bachelor's degree requirement from many of their positions. ▶

If this movement continues to gather steam, researchers say, it could aid not only individual job seekers but also the U.S. economy by helping businesses hold onto workers and by boosting the middle class.

## Degree Inflation

In 2014, the labor market analysis firm Burning Glass Technologies tried to capture the extent of degree inflation. The firm compared the percentage of people in a given occupation (say, executive assistant) who have a bachelor's degree with the percentage of job listings for that occupation requiring a bachelor's degree.

"Who you have working for you and who you want to have working for you in the future aren't always the same," said Burning Glass CEO Matthew Sigelman.

Sigelman found that 19% of current executive assistants had a bachelor's degree, but that 65% of job listings for the position asked for one—a "credentials gap" of 46%. In surveying broader groups of occupations, Burning Glass found a credentials gap of 26% for management jobs, 21%

**"For decades, at many companies that I worked for, I wasn't allowed to hire unless somebody had a four-year degree."**

**—Trish Torizzo,  
chief information officer  
for Houghton Mifflin Harcourt**

for computer and math jobs and 13% for sales jobs.

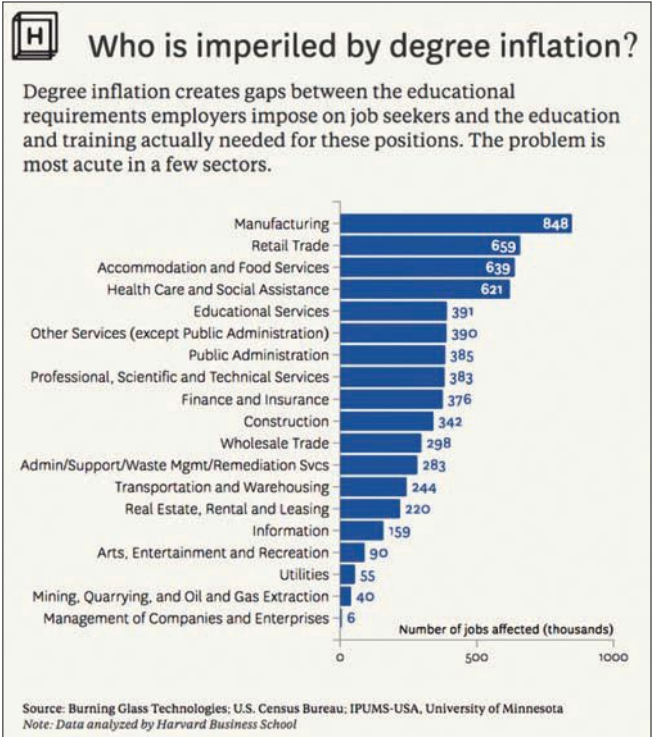
In late 2017, a research project led by the Harvard Business School, a workforce organization called Grads of Life and the consulting firm Accenture concluded in a report, "Dismissed by Degrees," that employers "appear to be closing off their access to the two-thirds of the U.S. workforce that does not have a four-year college degree." The researchers estimated that 6.2 million jobs were at

risk of degree inflation. They cited research showing that the proportion of job listings requiring a four-year degree increased by more than 10 percentage points from 2007 to 2010.

That timespan should look familiar: The Great Recession lasted from December 2007 to June 2009. Unemployment spiked, and employers stocked

up on college graduates without having to pay a premium in wages. "Some of that is legitimate, where the job is getting more technical," said "Dismissed by Degrees" co-author Joe Fuller, a Harvard Business School professor. But employers want more than technical skills; they want characteristics like attention to detail, problem solving, working with a team. "One of the major reasons degree inflation is so common is because employers use it as proxy for those kinds of soft skills," Fuller said.

Using a four-year degree as a proxy for employability shuts out the most economically vulnerable job seekers. It hurts employers, too, Fuller and his Harvard colleague, researcher Manjari Raman, found in their report. Degree-holders command an 11 to 30% wage premium yet fail to justify that premium in productivity and other outcomes. It takes longer to fill jobs when filtering for four-year degrees, and degree-holders change jobs more quickly. Nonetheless, according to Harvard's survey of 600 business and human resource leaders, 61% of respondents reported tossing resumes without four-year degrees, even if the applicant was qualified.



That survey also revealed that 63% of respondents had trouble filling middle-skills jobs. Andy Van Kleunen, CEO of the National Skills Coalition, attributed that trouble to public policies that push bachelor's degrees as a one-size-fits-all solution rather than training workers for specific middle-skill positions. The National Skills Coalition, which lobbies policymakers and employers to invest in workers' skills, wants federal Pell Grants to be available not just for students seeking degrees but also for workers who want to take short-term courses that they could apply on the job immediately.

But part of employers' inability to fill middle-skills jobs can be attributed to degree inflation. Fuller's report encouraged employers to push back against the trend: "Once the logic of resisting degree inflation takes root in an organization, it soon permeates different aspects of the organization's culture—and eventually embeds itself at the heart of its strategy," the report states.

## A '1% market'

After years of being criticized for a lack of diversity, companies—especially in the technology world—are looking for ways to make their



workplaces more inclusive. And a tight labor market—there were more than 7 million job openings in the U.S. as of February 2019—has employers in many sectors scrambling for talent.

**63%**  
**Percent of business and HR leaders in a recent survey who had trouble filling middle-skills jobs**

“For decades, at many companies that I worked for, I wasn’t allowed to hire unless somebody had a four-year degree,” said Trish Torizzo, the chief information officer for Houghton Mifflin Harcourt. But today, she said, “supply is so low that people are almost being forced to think more creatively about how they operate.”

Houghton Mifflin Harcourt stripped the four-year degree requirement from information technology positions—including web developer—last summer, and the number of applications that made it through their initial screening doubled. To screen candidates, the company looks for a “tech stack”: a list of programming languages and tools a candidate knows.

Houghton Mifflin Harcourt then revisited hiring practices for sales positions, which are heavy on soft skills, at the urging of Roberta Rainville, the vice president for talent acquisitions.

Rainville knew it was time for a change when the company found itself unable to hire a great candidate for a sales position. “They interviewed splendidly,” she said, “and then it was, ‘Well, I want to hire them,’ and I was like, ‘Yeah, you can’t.’ And they’re like, ‘Why not?’ And I’m like, ‘Because your job description says, “Bachelor’s degree required.”’ I said, ‘That’s got to go.’”

Rainville had to persuade 10 people from the sales leadership team before she could make the change. “Some folks were like: ‘We can’t take the bachelor’s degree off.

We’re sending the wrong message to our teacher population that we’re selling to,’” she said. Ultimately everyone signed off, and in September the company stripped the four-year degree requirement from some of its sales jobs, and three months later did the same for software engineering jobs. Now, 11% of applicants who make it through the interview process for an entry-level sales position have no credential beyond a high school diploma; another 11% have an associate degree. Previously, all had bachelor’s degrees.

As the company retools its pipeline, it is working with organizations in Boston communities, hoping to attract job applicants it had previously failed to reach. So far, Houghton Mifflin’s relationship with Resilient Coders has resulted in the company hiring Tillman-French and another web developer. Resilient Coders’ founder David Delmar has offered to tailor part of the organization’s curriculum to Houghton Mifflin Harcourt’s needs.

Resilient Coders has already built a curriculum for Wayfair, a rapidly growing home furnishings company that generated \$6.8 billion in revenue last year.

“A goal that we’ve set—something

**7.1 million**  
**The number of job openings in the U.S. in February 2019**

we think it’s reasonable to achieve in the next couple of seasons—is to have potentially as much as half of entry-level software developers come from boot camps, whereas historically it’s been 100% out of universities,” said Deborah Poole, Wayfair’s global head of talent acquisition.

In late March, Wayfair hosted researchers, employers, and representatives of Boston’s economic

development office at an event called “Untapped” to release a research report on redefining hiring in the area. The report is part of a regional effort to bring economic opportunity to Bostonians who lack a four-year degree—more than 50% of adults in the city. “There is a huge amount of talent in this market that we are not talking to,” Poole said.

When the time came for audience questions, the first to speak up was Delmar from Resilient Coders. He asked a panel including city leaders, researchers and executives a question that was met with silence



**Gina Plata and Miriam Ortiz at the offices of Just-A-Start, a workforce training organization that is helping prepare people without college degrees for middle-skill jobs in fields like medical technology.**

followed by nervous laughter: “Is it time—will it ever be time—to ban the B.A. requirement from coding jobs?”

### Closing the gap

With more than 20 four-year colleges and universities, Boston is known as “America’s college town.” But only 25% of the city’s black and Latino adults have a bachelor’s degree, and the Boston metro area ranks sixth in the nation for income inequality. The regional economy might be thriving, but many of its jobs are taken by people who come from outside Massachusetts. When it comes to the labor market, said Marybeth Campbell, executive director of Skillworks, a workforce group dedicated to low-income, low-skilled Bostonians, “our two-year community colleges are competing with our four-year schools, and those

four-year schools are competing with three or four schools here: Harvard, MIT.”

The staff at Resilient Coders sees this racial and economic inequal-

**6.2 million**  
Estimated number of  
American jobs at risk of  
“degree inflation”

ity up close. “If you’re looking for someone, you’re going to use your networks,” said Rouguiatou Diallo, chief of staff at Resilient Coders. “In a segregated America, your networks are going to be looking the same as you, most of the time.” The four-year degree requirement is a habit, Diallo said, but habits change. “So what if it becomes a habit that one of your pipelines is a boot camp program?”

Faisal Africawala, 29, a Cambridge resident who emigrated from India in 2010, worked for years at 7-Eleven convenience stores and a Whole Foods Market, making \$8.50 to \$11 per hour. In 2018, he entered a free nine-month program at a workforce organization called Just-A-Start, training for the biomedical industry. Halfway through the program, a pharmaceutical manufacturer in the Boston suburbs hired him as a manufacturing technician on the second shift. He wears protective gowns and fills vials with medicine in sterile rooms, and is checked for microbes every time he goes through the door. Africawala said he earns \$19.26 per hour and gets health insurance, life insurance, and a retirement plan.

“I’m already looking to buy a house, which I never thought I would even have,” said Africawala, who takes what overtime he can get. “It’s only been six months, but I’ve managed to save ten thousand bucks.”

In a survey of its alumni dating to 2004, Just-A-Start said the 143 respondents indicated that they have seen an average salary increase of \$14,778 per year compared to their

previous jobs. The program reaches out to employers and encourages them to consider candidates who don’t have four-year degrees, said Gina Plata, Just-A-Start’s director of education and training.

Newer programs have harnessed technology to draw employers’ attention to job candidates’ skills rather than their degrees. After coming across eye-tracking research showing that recruiters spend an average of just seven seconds skimming a resume, Grads of Life developed the “7 Second Resume,” a video in which job seekers highlight one skill they can bring to a job. The developers of the job-listing portal Skillist encourage users to highlight their skills rather than degrees, and they persuade employers to shape their listings around skills. Wayfair and about 10 other employers have signed on.

New research shows that employers are recognizing that degree inflation can work against their interests, preventing them from finding the workers they need. Economist Alicia Sasser Modestino, an associate professor at Northeastern University, and two colleagues found that employers loosened educational requirements when the economy recovered following the

**61%**  
Percent of business and  
HR leaders in a recent  
survey who reported  
tossing resumes  
without four-year  
degrees, even if the  
applicant was qualified

Great Recession: From 2010 to 2014, the proportion of listings asking for a four-year degree dipped a quarter of a percentage point for every 1% drop in a region’s unemployment rate.

That raises a troubling question: If

employers turn to skill-based hiring during a tight labor market, will they start hiring based on four-year degrees again during the next economic downturn?

“That’s the question that keeps me up at night,” Grads of Life principal Elyse Rosenblum said with a chuckle, “and why we are working so hard and so fast to try to instill these practices.”

The other lingering question is whether nondegree hires will stay and advance at their workplaces.



**Rouguiatou Diallo and Stephanie Castaños of Resilient Coders, a boot camp that trains people of color for web development and software engineering jobs.**

“That is absolutely critical,” Rosenblum said.

The future is always on Ryan Tillman-French’s mind—both his own future and that of the community that raised him. He’s collecting backpacks to give out to children in his old Detroit neighborhood, and eventually he wants to buy a house there, even if he doesn’t move back right away. One day, he’d like to run his own company.

In the meantime, Tillman-French believes there’s a path for advancement at Houghton Mifflin Harcourt. He already makes \$65,000 a year, a rebuke to a culture and an economy that exalts a bachelor’s degree as the gold standard for upward mobility while young adults stagger under the weight of the nation’s record \$1.5 trillion in outstanding student loan debt.

“My success is truly determined by me,” Tillman-French said. “How much work I put into this is how much success I’m going to get.” 🗣️



# Technological and Engineering Literacy for ALL!

## ITEEA's 82nd Annual Conference in Baltimore, MD - March 11-14, 2020

**J**OIN the International Technology and Engineering Educators Association (ITEEA) at the beautiful Inner Harbor area of Baltimore for ITEEA's 82nd Annual Conference on March 11-14, 2020. The 2020 conference theme focuses on Technological and Engineering Literacy for ALL.

Providing access and equity for all PreK-12 students to become technologically and engineering literate through high-quality STEM instruction is imperative. Students who study technology and engineering through an integrative STEM education approach learn about the technological world that inventors, engineers, and other innovators have created.

The goal is to produce students with a more conceptual understanding of technology and engineering and its place in society. These students must conceptualize and evaluate new technologies that they may have never before seen. By "doing and making," children become "makers" for the future.

With over 100 professional learning sessions, preconference workshops, STEM Showcase, the latest products and services, dedicated Integrative Administrator, Elementary STEM, International, and Girls/Wom-

en in STEM sessions, STEM competitions, and MORE, the 2020 Baltimore conference offers an unparalleled Integrative STEM Education professional learning opportunity.

### **Highlights Include: Keynote Presentation by Freeman A. Hrabowski, President, University of Maryland, Baltimore Campus (UMBC)**

Hrabowski will discuss "The Culture of Science and Teaching." Freeman Hrabowski, President of UMBC since 1992, is a consultant on science and math education to national agencies, universities, and school systems. He was named by President Obama to chair the President's Advisory Commission on Educational Excellence for African Americans.

He also chaired the National Academies' committee that produced the report, *Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads* (2011). His 2013 TED talk highlights the "Four Pillars of College Success in Science."

### **STEM4: Initiate Excellence Through Best Practice**

On Wednesday, March 10, listen, learn, and interact with leaders

across all the STEM disciplines and see best practice in action. Last year's "STEM4: The Power of Collaboration for Change" program provided an exciting platform and launching point for this year's special panel session on using the STEM4 principles and now sharing STEM best practice at the elementary, middle, and high school grades.

Nationally recognized STEM education panelists will provide the progression over the past year. The STEM Schools of Excellence will then provide their best practices to share with the audience. The panelists will give their comments and the floor will be open to audience questions. This session will be followed by a sponsored reception.

### **Keynote Presentation by Jeanette J. Epps**

Epps will speak about her career "From Engineer to Astronaut." Jeanette J. Epps was selected by NASA in 2009 as an astronaut. She completed astronaut candidate training which included scientific and technical briefings, intensive instruction in International Space Station systems, spacewalk training, robotics, T 38 flight training, and wilderness survival training.

The New York native was a NASA Fellow during graduate school and authored several journal and conference articles describing her research. Epps worked for Ford Motor Company where she received both a provisional patent and a U.S. patent for her research. After leaving Ford, she joined the Central Intelligence Agency (CIA) for seven years working as a Technical Intelligence Officer before becoming an astronaut. She currently serves in the ISS Operations Branch working issues in support of space station crews.

### **Administrator I-STEM Education Professional Development Strand**

Bring your administrator at no additional cost (refundable registration). A special strand of presentations designed for administrators will be offered to build understanding and support for your program, in-



**Children with limited mobility test drive their ride-on cars.**

cluding a special session by Michael Matthew, ACTE Government Relations Manager.

### **The ITEEA STEM Showcase—Highlighting Best Practices Through Integrative STEM Education!**

The ever-popular ITEEA's STEM Showcase is back with over 100 educators sharing ideas, techniques, and best practices related to learning activities, marketing materials, career guidance, facility design, program design, assessment methods, equity, and classroom and laboratory management techniques. Showcases illustrate a single element of technology or engineering teaching and learning that they feel they have exemplified. Attendees are invited to join ITEEA for our Celebration Reception immediately following the STEM Showcase.

### **Inaugural Presentation of the REACH Challenge Awards**

See the presentation of the first ever REACH Challenge Awards, which will go to teams that use their STEM skills to REACH a member of their community who has a challenge to overcome—and design a solution to help!

### **ITEEA Dream Ride... Go Baby Go Style**

Go Baby Go! provides mobility (and play!) to very young children in the form of adapted toy ride-on cars. At this special showcase event, technology and engineering education educators and students hope to

introduce the larger community to Go Baby Go!

Over the course of the conference, faculty and students will be adapting several motorized ride-on cars near the Exhibit Floor. All conference attendees are encouraged to stop by for as little or as long as they'd like to see the program in action. On Friday the cars will be donated to children with special needs from the area, who will "test drive" their new rides before taking them home.

### **Preconference Workshops**

On Wednesday March 11, 2020, ITEEA offers half-day professional

learning workshops on a variety of topics including: a Design Thinking Crash Course, Literacy Through the Lens of Technology, Implementing Coding and Microcontrollers Through Hands-On STEM Applications, and Implementing a STEM Program in Elementary School.

### **There's a Buzz about Baltimore...**

...that makes people who visit fall in love with its vibe. With the world-famous Inner Harbor, renowned museums and attractions, award-winning restaurants, a locally loved music scene, and hip and historic neighborhoods, get ready to explore a truly authentic American city.

Baltimore is famous for its beautiful waterfront, world-class museums, one-of-a-kind attractions, three centuries of history, and much more. With more than 130 attractions, museums, historic sites, and performing arts groups, Baltimore promises something for everyone.

We look forward to seeing you in Baltimore!

For full conference details, visit [www.iteea.org/ITEEA\\_Conference\\_2020.aspx](http://www.iteea.org/ITEEA_Conference_2020.aspx) 📍

## **ITEEA President, Michael Sandell's Top 10 Reasons to Attend ITEEA's 2020 Conference in Baltimore**

10. An opportunity to experience Baltimore's Inner Harbor.

9. Walk through the Exhibit area and get firsthand information on the newest and best products for Technology and Engineering education.

8. Attend the Celebration Reception in the Exhibit hall and enjoy an outstanding networking event.

7. Invite your building/District administrators to see how they can enhance T&E and STEM programs in their schools by following the Administrator Strand of professional development.

6. Visit the Engineering byDesign™ Learning Lounge and discover the resources available to teachers through ITEEA.

5. Interact with future T&E educators through the TEECA competitions area and presentations.

4. Explore the STEM Showcase and pick up that new activity you can bring back to enhance the learning experience for your students.

3. Attend the general sessions to recognize this year's award winners and hear great presentations from our featured speakers.

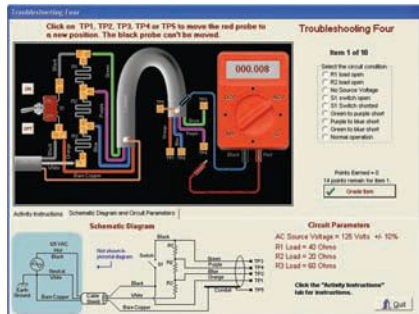
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The Armadillo Restaurant sent me the following coupons:

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3. Buy one entree and get the second one free (\$10 value).

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Give all possibilities.

(B) What total purchase would result in the same savings with all three coupons?



Puzzle devised by David Pleacher, [www.pleacher.com/mp/mpframe.html](http://www.pleacher.com/mp/mpframe.html)

## If I Were a Rich Man ...

If I had 20% more money than what you have, I would have 50¢ more than you.

How much money do you have?

Puzzle devised by David Pleacher, [www.pleacher.com/mp/mpframe.html](http://www.pleacher.com/mp/mpframe.html)

## Word Scramble

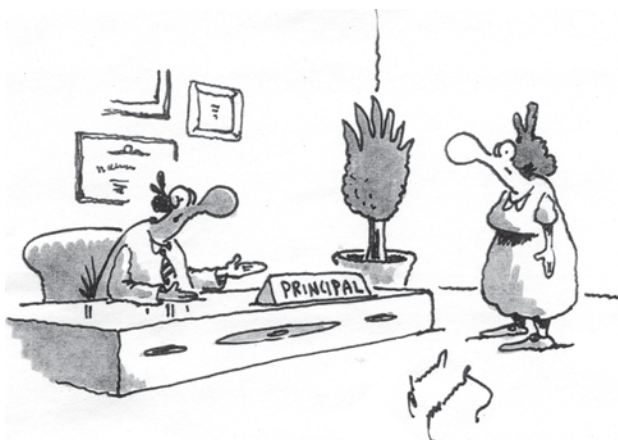
Most people think Thomas Edison invented the light bulb. In fact, he merely discovered a better, longer-lasting filament for light bulbs. To discover the true inventor of the incandescent light bulb, first unscramble the four science-related words below. Write each answer in the row of squares and circles provided below each word. Then unscramble the letters in the squares to learn the answer.

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INSEP

GROJAN

SHWICT



“How do you explain losing someone, Miss March?  
It was a virtual field trip!”

## Penny for Your Thoughts

If Jenny sells three pencils and buys an eraser, she is up ten cents.

If instead Jenny sells five pencils and buys two erasers, she breaks even.

How much is a pencil?

How much is an eraser?

Puzzle devised by David Pleacher, [www.pleacher.com/mp/mpframe.html](http://www.pleacher.com/mp/mpframe.html)

See answers on page 11.

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](mailto:vanessa@techdirections.com) or mail to “More Than Fun,” PO Box 8623, Ann Arbor, MI 48107-8623.

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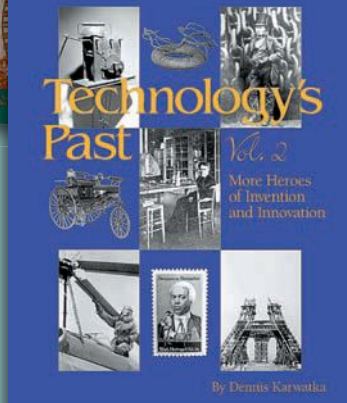
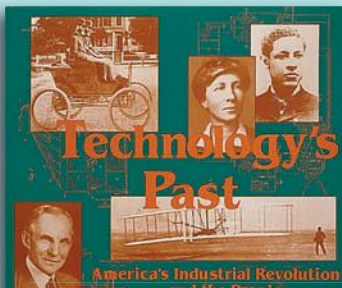
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