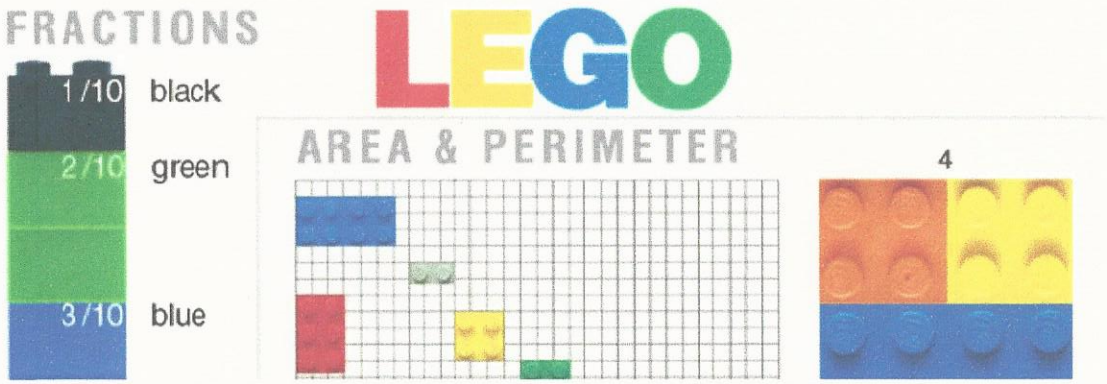
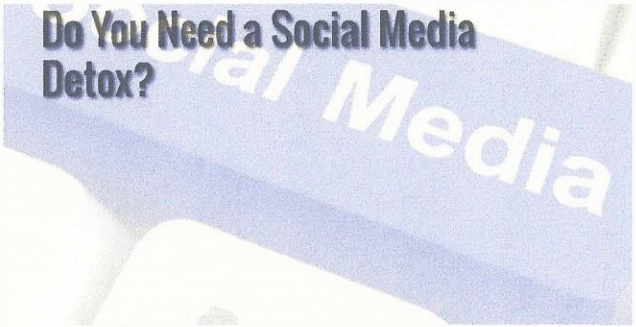
leaving a comment below, mentioning @Edudemic on Twitter or leaving your thoughts on our Facebook page.

Using Legos To Teach Math

- **Fractions:** Using bricks of the same size but different color, have the students count out the denominator (total bricks) and the numerator representative of each color. You can employ any size bricks for this task.
- **Area and Perimeter:** Using bricks of any color, construct a rectangle or square. The students can use the nubs on top of the bricks to calculate the area and the perimeter of each shape they create.
- **Multiplication:** Using bricks of various sizes (ie 4 nubs on top, 8 nubs on top), students can calculate how many total nubs there are based on the number of same-sized bricks. Thus, a group of 4 'size 4' bricks would yield 16 nubs)
- **Mean, Median, Mode, and Range:** Using groups of different sized bricks (ie, 8, 6, 4, 2, 1) and totaling the nubs on each group, students can calculate the mean, median, mode, and range.
- **Place Value:** Using a bullseye visual or other type of visual (like this one), place different 'sized' bricks in each category, and the students can use that information to write out the number indicated. This could make for fun group work in class.





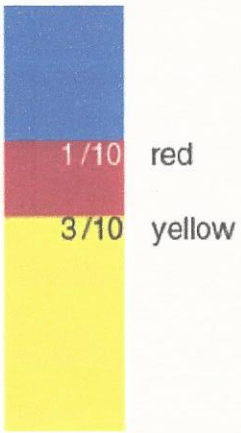
A Scary Look At How Busy You Are On Facebook

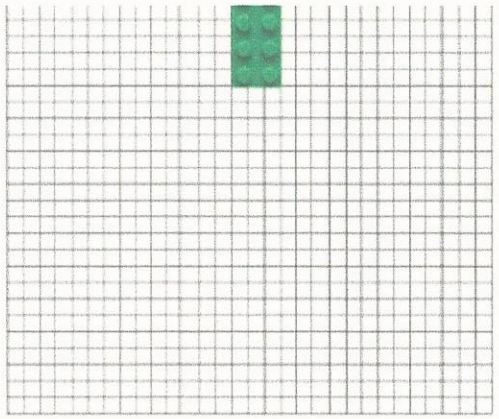

How Teens Are Really Using Social Media

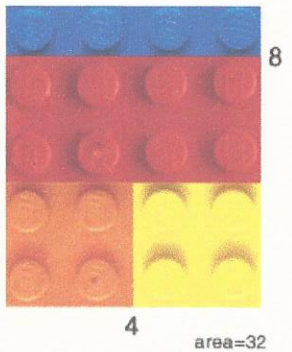

How To Use Social Media As A Learning Tool For Homeschoolers

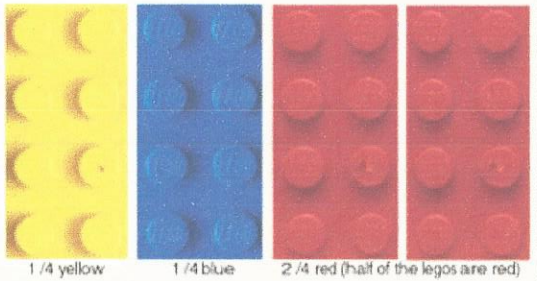

Which Universities Are Effectively Using Social Media?


Should EdTech Have An Animal Mascot?

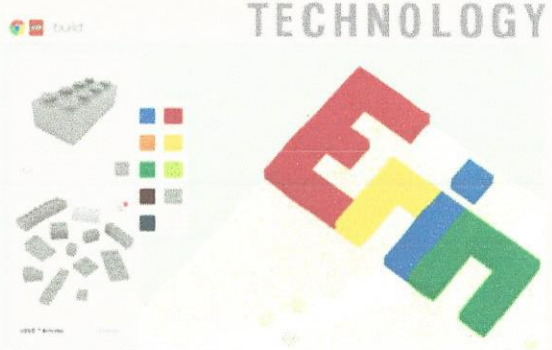






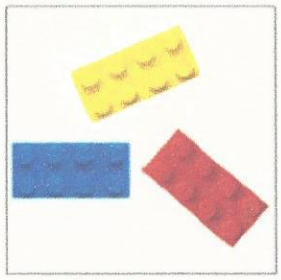


TECHNOLOGY

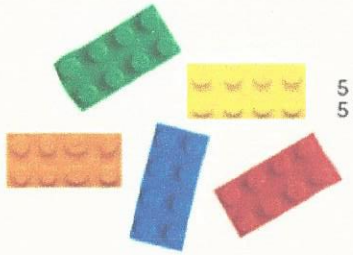


MULTIPLICATION

ARRAY 2 rows of 4 = 2 x 4

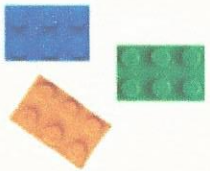


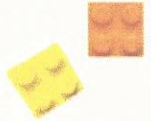
3 groups of 8
3 x 8 = 24



5 groups of 8
5 x 8 = 40

3 groups of 6
3 x 6 = 18





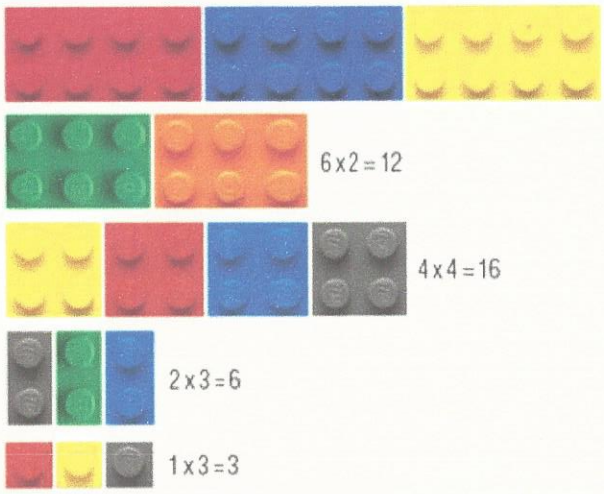
2 groups of 4
2 x 4 = 8

Affordable Online Colleges in America: Rankings & Report

Edudemic Staff | **July 23, 2014**

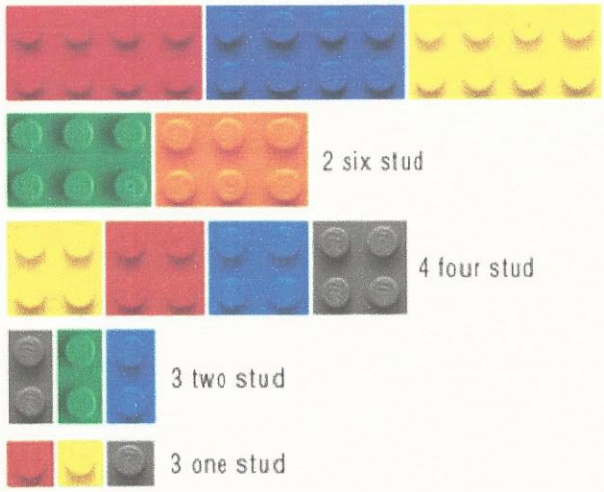
At long last, online learning is maturing to the point of being a viable option for many. Let's uncover the truth about cheap online colleges and if they're right...

MEAN MEDIAN MODE & RANGE



3 6 12 16 24

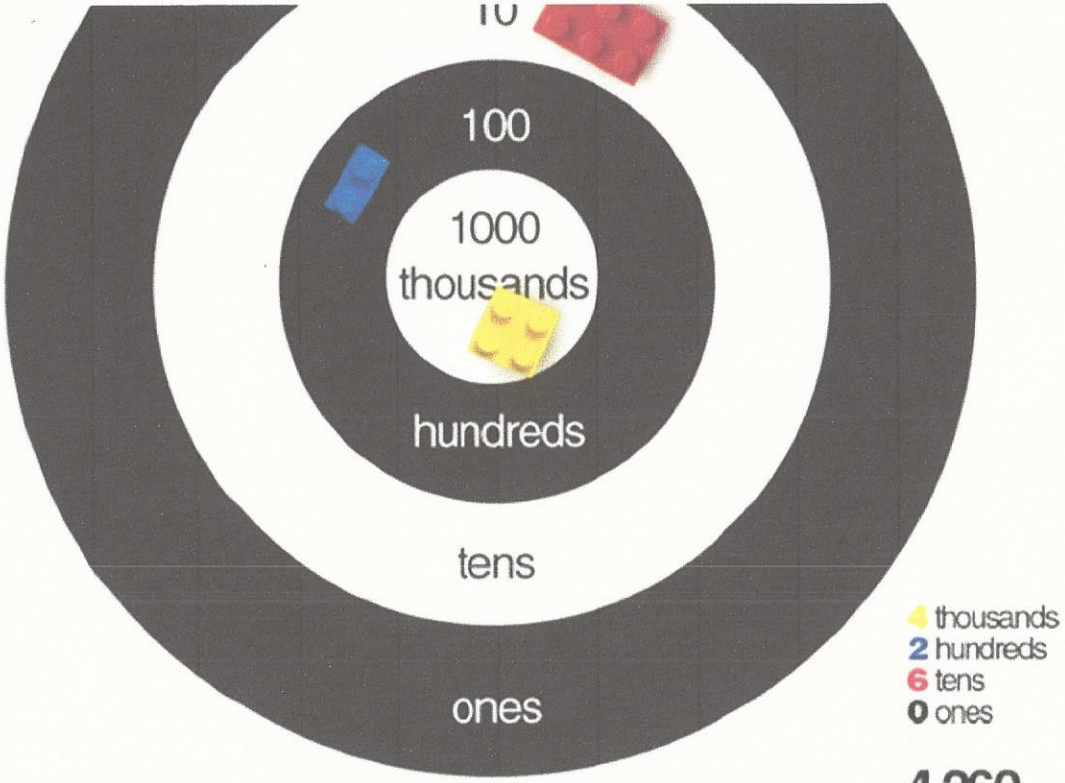
Mean = (3 + 6 + 12 + 16 + 24) / 5 = 12.2
Median = 12
Mode = none
Range = 24 - 3 = 21



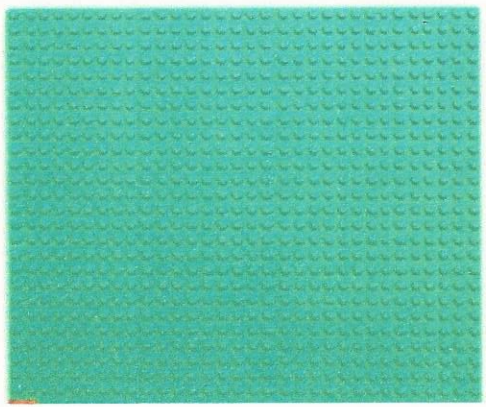
2 3 3 3 4

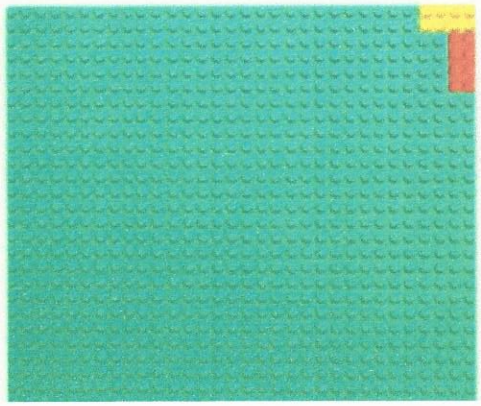
Mean = 3
Median = 3
Mode = 3
Range = 2

PLACE VALUE



SPATIAL AWARENESS





10 Things You Didn't Know Your iPhone Could Do

8 Great STEM Apps For Younger Students

Trying Out Gamification In the Classroom? These Tools Are For You

The Device Debate: What Tablet Is Right For Classrooms?

10+ Tools To Bring Robotics (And Other Real Objects) Into Your Classroom

Place an 8 studded red lego to the left of the yellow lego. Lay the lego horizontal, touching the green border edge.

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5 COMMENTS

David Lee
September 8, 2014 at 7:14 pm

Quick question: Why didn't you at least mention the person who created the infographic? Also you linked the source with an incorrect website address.

Shop Class Not for Slackers as Mechanic Out-Earns Peers

By Jeff Green and John Irwin Aug 25, 2014 10:55 AM ET **106 Comments** **Email** **Print**

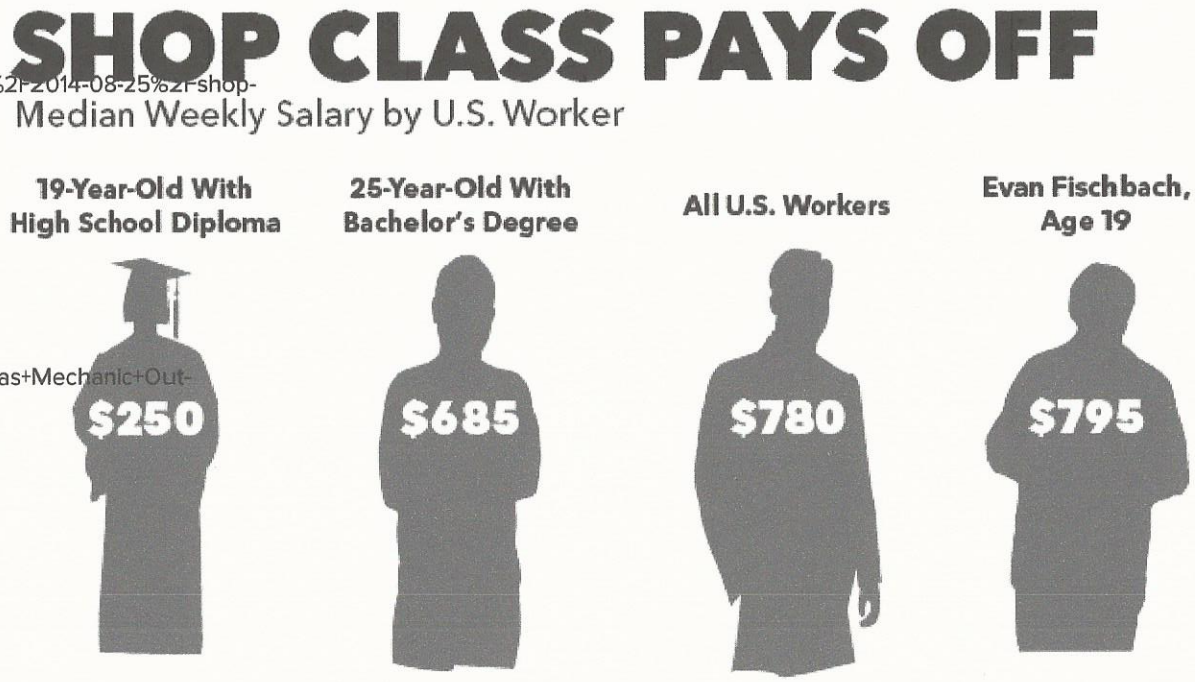
Two years out of high school, Evan Fischbach is earning $40,000 a year. His secret: shop class.

Fischbach, 19, has known he wanted to work on cars ever since he took an automotive class in his junior year of high school in Saline, Michigan. His college-educated parents wondered if he was aiming too low.

Then when Fischbach was still a junior, a local auto dealer desperate for mechanics hired him as an apprentice in the service bay. Now he's earning about three times as much as the average 19-year-old high school grad and slightly more than the national **median (http://www.bls.gov/news.release/pdf/wkyeng.pdf)**, according the Bureau of Labor Statistics.

"Friends weren't interested in auto shop when I suggested it and now I think they wished they had tried it," said Fischbach, who works at the LaFontaine Chrysler Dodge Jeep Ram dealership. "I'm not rich, but I'm not hurting, either."

Aug. 25 (Bloomberg) -- Evan Fischbach, an auto mechanic who works at the LaFontaine Chrysler Dodge Jeep Ram dealership in Saline, Michigan, talks about the advantage of taking shop class in high school. Two years out of high school, Fischbach is earning $40,000 a year, about three times as much as the average 19-year-old high school grad. (Source: Bloomberg)



Fischbach is an all too rare success story that educators, legislators and executives are eager to replicate. With schools focused on preparing kids for college, shop class has gone the way of stenography class in much of the U.S. Companies from **Toyota Motor Corp. (/quote/7203:JT)** to Siemens AG and International Business Machines Corp. are pushing high schools to graduate students with the real-world skills business needs.

The message is getting through. This year, for the first time in a decade, the U.S. government boosted funding for high school and college vocational education, though the $1.125 billion war chest is $188 million smaller than it was in 2004.

Middle-Class Trajectory

Proponents say re-emphasizing vocational education will help reverse the hollowing out of America's middle class and combat rising inequality. Wage growth since 2009 has been the weakest since World War II even as the rich get richer.

(/photo/shop-class-not-for-slackers-as-high-school-grads-

slackers-as-mechanic-out-earns-peers.html&title=Shop+Class+Not+for+Slackers+as+Mechanic+Out-Earns+Peers&summary=Two-years-out-of-high-school%2C+Evan+Fischbach+is+earning+%2440%2C000+and+his+secret%3A+shop+class.&source=Bloomberg.com

There are 29 million "middle-education" **jobs (/quote/USHEMANS:IND)** that pay more than $35,000 a year, considered a threshold to the middle class, according to Georgetown University research. Of those, 22.9 million require only high school or some post high-school training. Fischbach's job pays enough to launch him on a once-familiar trajectory: start a family, buy a home, pay taxes.

out-earn-peers-/-iuXoOyJ4gtPs.html)

Photographer: James M. Thresher/The Washington Post via Getty Images

Students during an auto body repair class at a high school in Dumfries, Virginia.

Fifty years ago most American kids in middle and high school attended shop class, where they learned to make ash trays, rebuild engines, weld metal and even market products. As the space race gave way to the high-tech era, policy makers decided such skills were unnecessary. College prep classes gradually supplanted shop, which by then was perceived as a place for slackers and stoners.

The average number of high school credits earned in career and technical education fell 15 percent from 1990 to 2009 at the same time core academic credits in study areas such as English, math and science rose 20 percent, according to the U.S. Department of Education.

(/photo/shop-class-not-for-slackers-as-high-school-grads-out-earn-peers-/-igrfjbzVFL4U.html)

Photographer: Daniel Acker/Bloomberg

Janet Yellen, chair of the U.S. Federal Reserve, center, and Charles Evans, chairman of... **Read More**

My Kid?

"It became seen as a dumping ground for kids the regular school couldn't figure out what to do with," said James Stone, director of the **National Research Center for Career & Technical Education (http://www.nrccte.org/)** in Louisville, Kentucky.

Those prejudices are even more prevalent now that many parents expect their offspring to attend a four-year college. While many parents agree that more students should attend vocational training, the prevailing attitude is: Not my kid.

"For a lot of parents, and policy makers, it's easier to say we need to send more kids to college," Stone said. "Parents go, 'Yes, that's what I want to do. My kid will be successful.' Then after four or five years they come back with a lot of bills and they're **sleeping (/quote/USURBTHS:IND)** on the couch."

Yet businesses can't find enough people to fix cars and work in factories. Mike Hughes, the service manager who hired Fischbach, finds himself competing with rival dealerships to recruit kids right out of high school. If he can't find candidates there, he has to train

them from scratch.

"Nobody wants their kid to be a mechanic," said Hughes, who estimates Fischbach eventually will pull down $60,000 a year. "They just don't know how good of a living it is."

Bird Houses

Like many of his contemporaries, Mike Dales, 28, didn't bother with shop class because he was told college prep classes were more important than building bird houses. His school even charged an extra fee to take shop.

After graduating, Dales dabbled in trade school before realizing that he wasn't going to grasp the math needed for mechanical engineering. He ended up slinging crab claws at Red Lobster before taking a job last year at Area Tool & Manufacturing in Meadville, Pennsylvania, where he's now making parts for the medical, automotive and tech industries.

"It always amazes me what I can come up with" after starting with a "chunk of steel," said Dales, who wishes someone had pointed him toward a vocation when he was a teen.

The parents most likely to be dubious about shop class held down manufacturing jobs themselves, only to watch them disappear. The U.S. lost 6.1 million such jobs from 1997 to 2009. Only 644,000 have been added since, according to the BLS.

Laid-Off Parent

"I mean, how do you walk into the classroom and talk to a 16- or 17-year-old kid about getting into the shop when he had a parent who used to work there but was laid off 10 years ago?" said Ashleigh Smith, office manager of the shop where Dales works. "It's difficult to explain that the industry is coming back when you have that kind of personal experience."

Advocates of vocational education are pushing high schools to identify students' career interests earlier and guide them to both vocational and other classes to support that career whether the ultimate goal is college or not. Progress is patchy, and many of the newer programs require students to leave their neighborhood schools altogether or travel to class.

Rather than incur the expense of technical training classrooms in each school, New Jersey operates 60 public magnet schools in 21 counties where students can take classes on culinary arts and cosmetology, engineering, computers, landscape design, auto body

repair and more. Eleven companies including Mercedes Benz USA, BMW of North America, **Lockheed Martin Corp. (/quote/LMT:US)** and Novo Nordisk A/S partner with the schools.

Higher Caliber

Last year, 32,254 kids enrolled, up 30 percent since 2000. The program has become so popular that some kids are being turned away, said Judy Savage, executive director of the New Jersey Council of County Vocational-Technical Schools.

"There's lots of interest in new programs that focus on both college and career," Savage said. "We're starting to attract a much higher caliber of students."

Three years ago, New York City started the Pathways in Technology Early College High School (P-TECH) in conjunction with IBM, New York City College of Technology and the City University of New York. The six-year high school was designed to help students apply classroom work and real-world skills toward an associate degree in computers or engineering at graduation. IBM provides internships.

Even degree colleges are starting to see the benefits of vocational courses. Seth Bates, who teaches applied engineering at San Jose State University, started a remedial shop class for aspiring engineers who can't use a power drill properly.

Clueless Students

"By 1995, a student who came to us who had actually worked with tools was exceedingly rare, and now it's almost unheard of," he said. "Maybe it's one out of 50 today. Most of them come in without a clue."

Kyle Jennings, an advanced placement student at Saline High School, is determined to know his way around a machine shop by the time he starts an engineering degree. His dad, a Ford Motor Co. engineer, persuaded him to take shop. His friends mostly think it's an "easy A" and has zero career value, he said.

"These classes really will help," said Jennings, as he ferreted out a pressure leak in a Jeep Liberty one day in auto class. "You need to know how to work with machines."

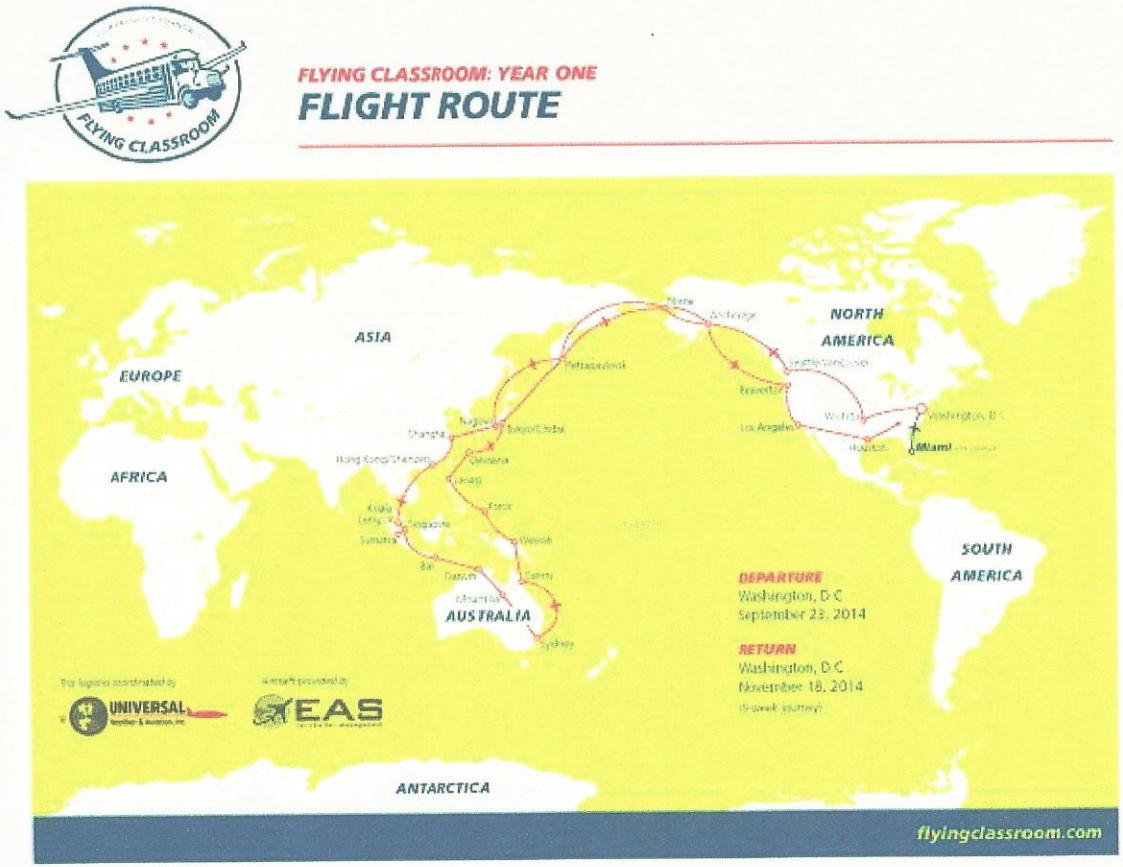
(An earlier version of this story corrected the spelling of Mercedes in the 21st paragraph.)

Instructure Launching Free Learning Object Repository, Canvas Commons
NBC News Archives Now Available via Pearson

STEM | News

The Flying Classroom Launches on a Mission to Teach STEM+

By Christopher Piehler | 09/23/14



The Flying Classroom, an interactive STEM+ learning adventure, launches today from Ronald Reagan Washington National Airport. National Geographic Emerging Explorer Captain Barrington Irving, who holds the Guinness World Record as the youngest person to fly solo around the world, will pilot the jet Inspiration III to North America, Asia, Indonesia and Australia.

Along the way, he and his crew will explore real-life applications of science, technology, engineering, mathematics, history, geography and the humanities. The Inspiration III crew will take 16 ground, air and sea expeditions, and an online portal originating on board the plane will share videos and a real-time storytelling blog with students around the world.

Inspiration III will travel to all seven continents over three consecutive school years. Students in schools that use the Flying Classroom curriculum, which is aligned to the Common Core State Standards and Next Generation Science Standards, will study STEM+ subjects relevant to each expedition as they track the Flying Classroom team. In Montana, for example, Captain Irving will meet a chef with a bionic arm and see how the human brain can control robotic limbs. In Australia, Captain Irving will illustrate how to balance an ecosystem by eradicating a poisonous toad. In Palau, he will track poisonous snakes to extract life-saving venom. Challenges during each journey will invite students to solve problems that may lead them to discover a career path in STEM+.

Teachers and students can follow Irving from today through Nov. 18 on the website, via Facebook or on Twitter at @CaptainIrving and using #flyingclassroom.

About the Author

Christopher Piehler is editor in chief of *THE Journal*.

Technology To Help At-Risk Students

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THE OLATHE NEWS

Story published: Thursday, Apr. 24, 2014

Ambitious bio-science club makes leap to become a full class at Olathe East High School

By JENNIFER BHARGAVA

Special to The Star

They diligently conduct scientific research in the morning. They perform intricate experiments in the late afternoon. They even work through their lunch break.

They're not biologists in lab coats. They're not graduate students at a prestigious university.

They're high school kids.

The Olathe East students in the Advanced Biotechnology Research Group take their club seriously, and now the Olathe School District does, too.

After two years of being an extracurricular activity, the biotechnology club will become a class at Olathe East in the fall.

Anastasia Weston, an Olathe East senior in the Advanced Biotechnology Research Group, is conducting her own research on plant genetics.

The club, which has about 20 members, is researching the culture and regrowth of methanotrophic bacteria, using a wide variety of experiments and individual projects. The students meet every Thursday with their advisor, Michael Ralph, and they also work during their own time.

"It's exciting to see youth so dedicated to science," said Ralph, an AP biology teacher. "They're doing research projects that most college students don't get their hands on until graduate school."

He started the club in 2012 as a way to encourage his students to take science seriously, and he wants the scientific community to take dedicated high school students seriously, as well.

One of Ralph's goals for the club, and the upcoming class, is for his students to compose scientific documents about their research for academic journals. Plus, he wants to prepare them for the science world.

"We're learning to write lab reports in a professional manner, conduct our own experiments and be creative problem solvers," said Anastasia Weston, a senior in the club. "I'm definitely not going to be intimidated next year when I have to take a chemistry lab in college."

For the past year, Weston has been working on her own plant genetics research project for the club.

Last summer, she spent most of her days holed up in a science lab at the University of Kansas working on plant genes and interacting with grad students. She plans on doing the same this summer before she heads to Kansas State University in the fall.

"At first, I was intimidated working at KU because I was just a little high school student among some really impressive people earning their PhDs," she said. "But I quickly learned that there are a million people there who are willing to help and answer any questions I had. They treated me with respect."

Weston, and her fellow club members, are treated with that same respect within the walls of their high school.

They've received a serious peer review from an Iowa State University science professor via Skype and they have received tips about grant writing from a professional science administrator. They even have a mentor from the University of Kansas, a PhD student who stops by every Thursday morning to teach the business side of science, such as the importance of social media and networking.

Last year, the Olathe Public Schools Foundation gave the biotechnology club a $1,000 grant, which was used to build a lab computer. Donations were raised to help buy the club a 3D printer. Some local businesses have also donated services and

materials for experiments.

The club even has its own marketing department in the form of 17-year-old Jeremy Johnson.

He joined the research group in January when he heard the students needed a videographer to document their projects. Over the past few months, he has created a short documentary of the club, an informational video for the club's website, and a Twitter feed. He also helps recruit new members.

He couldn't be more proud of his new friends.

"These guys, in my opinion, are geniuses," Johnson said. "Watching them work is incredible because they're doing things not a lot of people can do, and you can tell they're really passionate. I have no doubt all of them are going to majorly impact the science community one day."

Next year, when the club becomes a class, Ralph hopes to keep that passion alive.

"These students will be able to tackle bigger problems and work collaboratively," said Ralph, who will teach the class. "There will be a curriculum, but I'm not going to let go of that hands-on nature of the club, because that's its core. The assignments will be things like writing papers to communicate their work and conducting peer reviews."

Although many members of the group, like Weston, will graduate in the spring, others are excited to earn school credit for something they started doing out of love.

"In high school, they sit you down and teach you what people have already done and then they quiz you about it," said Reed Schimmel, a junior in the club. "Now, I'm doing work that no one else has done. I feel useful, like I'm actually applying my mind to something beneficial."

Vocational High Schools: Career Path or Kiss of Death?

Education professionals are split on whether vocational training in high school helps or hurts students.

Biotechnology students from Dayton, Ohio, examine a waterway as part of their coursework.

By Allie Bidwell | May 2, 2014 | One comment SHARE

When William Fuller graduates this spring, he'll be leaving with more than just a high school diploma. He'll also have a carpentry certification and a full-time job offer from his current employer, a custom cabinetmaker in Lester, Pennsylvania.

That's because Fuller is graduating from Philadelphia's Mercy Vocational High School, which aims to ensure that students leave not only with the basics they need to earn a high school diploma in the state, but also an industry certification.

Working while he was younger with his uncle, who was a construction worker, sparked Fuller's interest in carpentry.

"I always liked taking apart things and putting them back together," Fuller says. That's why the career-training programs at Mercy were appealing to him. "It shows you how the world is, and what to expect when you're going to be going out there to work."

[**ALSO:** Education Leaders Say It's Time to Rethink What a College Degree Promises]

High schools like Mercy – known as career and technical schools or vocational schools – are increasing their presence throughout the country, at a time when support for career and technical education is picking up steam as an alternative route to the middle class. There are roughly 90 career and technology schools and centers in Pennsylvania, at least 70 vocational high schools each in Ohio and Massachusetts, and similar numbers in other states.

Engineering students work on a project at the David H. Ponitz Career Technology Center.

Vocational education historically has been prevalent in European countries, such as Finland and Germany, but often comes with a stigma in the U.S. that suggests only low-performing and troublemaking students end up in such schools. In Germany, children of middle school age take tests and either move on to apprenticeships or a university preparation route, says James Stone III, director of the National Research Center for Career and Technical Education at the University of Louisville.

"We look at that and say, 'Oh, isn't that terrible?' Because we're condemning kids based on a test at that age," Stone says. "But when you actually look at what they do and how they do it, the system works extraordinarily well. They have one of the lowest youth unemployment rates in the industrialized world, and going through an apprenticeship in no way prevents one from moving on to college."

While the rhetoric of the last few years has centered around encouraging every young person in America to go to college as a way to find gainful employment and a guaranteed route to the middle class, some are increasing their calls for multiple pathways to those outcomes.

Even President Barack Obama has called for more robust job training at both the high school and college levels, saying it's not enough for students to get an education past high school – they also must have the skills needed for in-demand jobs. The president in April announced more than $100 million in awards to redesign high schools to better prepare students for college or specific career industries, such as health care, technology and engineering.

[MORE: Obama Wants Students Trained for 'In-Demand' Jobs]

Not every student is suited to go to college, and not every student necessarily wants to go, some education advocates say.

"We've done a disservice in this country by suggesting that there's only one path to success, which is to get a bachelor's degree," says Mark Edwards, executive director of Opportunity Nation, a campaign to increase economic opportunity in America. "There are many good-paying jobs available today that, quite candidly, a four-year bachelor of arts degree does not prepare them for."

"We've done a disservice in this country by suggesting that there's only one path to success, which is to get a bachelor's degree.

–Mark Edwards
Opportunity Nation

Georgetown University's Center on Education and the Workforce estimates that by 2020, nearly two-thirds of all jobs will require some sort of postsecondary education or training beyond a high school diploma. But how and where that training takes place – whether in a college classroom or an auto shop – can be quite varied, Edwards says.

"We need to expand how we think about success," he says. "It's just a smarter, more nuanced way of thinking about workforce development."

At the David H. Ponitz Career Technology Center in Dayton, Ohio, students can choose between 14 different career pathways such as cosmetology, culinary arts, banking and finance, dental assisting, automotive technology and digital design. In each program, they have the opportunity to earn an industry certification, Principal Ray Caruthers says.

"This model is very much the model that needs to go across the country, because all students are not of the mindset that they want to go to a four-year college," Caruthers says. "This gets the options out early,

and those students can get right into the field ... and become contributors to society."

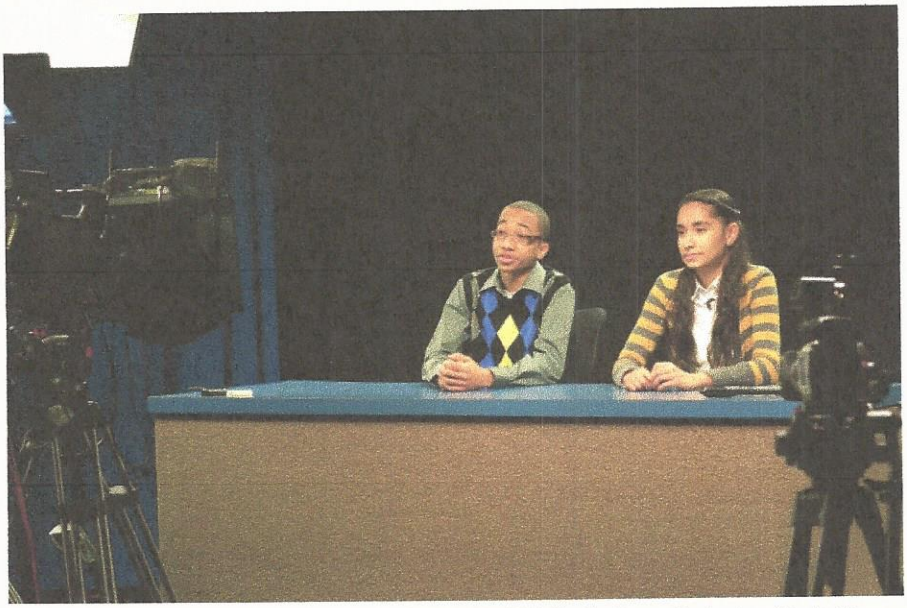
Vocational high schools, Caruthers says, are effective in preparing students for success because they provide a hands-on and engaging environment for learning. In 2013, at least three-quarters of the school's 11th-grade students scored as proficient in reading, writing, mathematics and social studies on the state graduation test – higher in every category than the district average, according to the school's report card.

"Families sometimes that have been hit with stories that are not successful are looking for some evidence whereby their students can live out some sort of dream the family has had, or that a student has a personal aspiration to become," Caruthers says. "Here, that dream can start to become a reality."

[**RANKINGS:** Technical/Vocational Schools]

Caruthers says many of his school's graduates still continue their education – whether at a two-year community college or a four-year university – but have the flexibility of added income should they need or choose to work part-time. It's not about discouraging students from going to college, he says, but making sure they have options should they choose to pursue another path.

Ponitz senior Da'Qeayce Swain, who is studying in the school's radio and television pathway, says he plans to study mass communications and education at Baldwin Wallace University in Berea, Ohio. Swain says he wanted to go to the technology center specifically because he thought learning a certain trade would benefit him in college. The major difference between a vocational high school and a traditional high school, he says, is the experience students have with teachers.



Radio and television students work in the studio at the David H. Ponitz Career Technology Center in Dayton, Ohio.

"In career tech, you have teachers who were in that industry and can give you the insight into what you can look forward to in your future industry," Swain says.

Shemari Hale, a senior at Ponitz, says while she plans to study pharmaceutical sciences at the University of Toledo next fall, studying cosmetology in high school – and becoming certified – will allow her to work flexible hours while in school.

"You're not just leaving with a diploma, but a diploma and a license and certification," Hale says. "The most fun thing is being able to be hands-on and not just being taught from a book."

Because Ponitz is a public high school in Ohio, students still have a full, core curriculum. After taking a career-exploration course in the ninth grade, they choose a pathway that begins their sophomore year.

[**STUDY:** Income Gap Between Young College and High School Grads Widens]

But having students make such an early career choice is why the expansion of vocational high schools is concerning to some, says Carol Burris, principal of South Side High School in Rockville Centre, New York, and a noted expert on equity in education.

"The big fear I have is that we are going to go back to where we were at the beginning of the last century, where we start sorting and selecting students, and putting them on life paths that may foreclose their options," Burris says, arguing that big decisions about separating students based on test scores – whether academic or career-oriented – should not happen before the age of 16.

"Why are we saying that we have the right to start to put our kids on career paths when they haven't experienced that much of the world?" Burris says.

A high school design student mocks up a graphic.

There's also an important distinction between preparing students for "college and career" and preparing them for "college or career." Burris, who identifies as being of the former mindset, says the skills needed to excel in college are not so different from the skills needed for a true career.

Catherine Glatts, vice principal for technology and career and technical education at Mercy Vocational, disagrees. Before joining the private school, which serves a largely low-income and at-risk student population, she worked as a systems engineer for defense contractor Lockheed Martin, where she also hired recent college graduates.

She says she was particularly amazed at how the younger generation was dressing: Many would come to work in jeans, hoodies and baseball hats.

"They understood their technical skills, if they [earned an] engineering degree, they did that well. But the skills they don't always get in college … are on the people side," Glatts says. "We work very hard … with making sure we develop a well-rounded – they look you in the eye, they shake your hand, they engage with you – kind of student."

Glatts says it's always a challenge asking a teenager what he or she wants to do for a potential career, but graduating with a skill they can use to earn income is an advantage. That flexibility also is helpful for students who aren't sure if they want to immediately go to college: Glatts says she promotes "the nontraditional path to college," wherein if students don't go, they still have a ticket to an occupation through which they can support themselves and become more marketable to future employers.

For example, cosmetologists earn $27,540 annually on average, according to the Bureau of Labor Statistics. An electrician – another option for Mercy students – can earn more than $53,500 each year.

Mercy also has a program through which seniors who have completed a certain amount of their career-training requirements can spend afternoons working in their field. Currently, more than half of the senior class is taking advantage of this option, Glatts says.

Erica Zabala is one of those students. Not yet out of high school, she is already a certified nursing assistant and spends her afternoons working at St. Ignatius Nursing Home in Philadelphia. Although she plans to continue her education and pursue a bachelor's degree in nursing from La Salle University in the same city, Zabala says having a vocational education will give her a leg up in college.

"Ever since I was young, I knew I wanted to do something in the nursing field because I was so used to

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About 26 percent, or one in four graduating seniors, went on to full-time employment in 2013.

—Mercy Vocational High School

helping my grandmother when she was sick," Zabala says. "But I want to build up my career. I don't want to just stay as a nurse's aide."

[**DISCONNECTED NATION**: 5.8 Million Out of School and Out of Work]

At Mercy, Glatts says about 60 percent of graduating seniors had full-time job offers last year, but many chose to continue their education. Overall, 38 percent of the class of 2013 continued to postsecondary education – including colleges, trade schools and training programs – and another 35 percent worked while also continuing their education. Twenty-six percent entered full-time employment.

Still, proponents of vocational education say there's a balance that needs to be maintained between expanding opportunities for students and inadvertently pushing them down one road or another, which Burris says simply creates "fodder for business."

"More and more, as businesses get involved, that's what they want, and that's exactly the same kind of thinking that occurred at the beginning of the 20th century," Burris says. "I feel as though we're just reliving all of that again, in a smoother package, but it's still that same kind of philosophy."

New high school diploma in the works

High school students may be able to earn credits towards graduation from industry certifications earned through vocational training.

SunSentinel

TAGS: high school, employment, colleges, graduation rates

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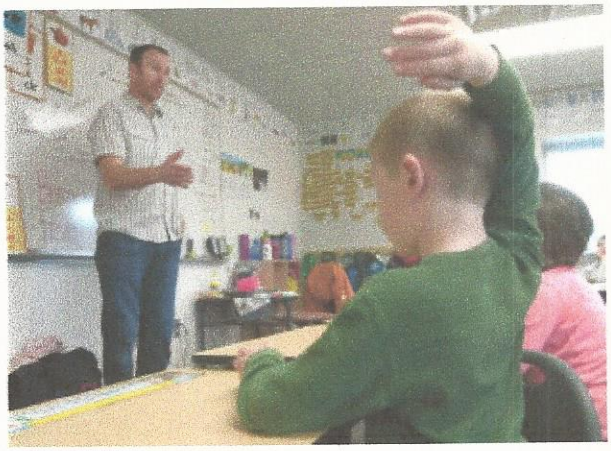
MUSHER IN CLASS

Lessons from the trail: North Dakota musher says next year could be his final Iditarod



19 HOURS AGO • BY BRIAN GEHRING

Kendra Clark's first- grade class had a special visitor Tuesday, and it was a good fit for a couple of reasons.

This year, Clark's Liberty Elementary students, who go to class at the Hughes Education Center, learned about geography, math and landforms.

Their guest, Iditarod musher Kelly Maixner, knows a little about those subjects. Maixner, a Golva native who lives in Big Lake, Alaska, traveled across the landforms the students studied.

Of course, they were mostly frozen at the time.

Clark and Maixner also happen to be cousins and students spent part of their day during the recent Iditarod tracking Maixner's progress.

Clark said she used the race as an opportunity to teach her students how skills like math can apply to everyday life.

It's a basic story problem; Maixner goes 100 miles in 12 hours — how fast did he and his team travel?

"We spent a lot of time on top of rivers," Maixner said; "about 600 miles of frozen rivers."

And, there were questions like how far did he race?

"The Iditarod is 1,000 miles," Maixner told the class. "That's like going from Bismarck to Fargo about five times."

Maixner, who is a pediatric dentist, recently visited Haiti where he volunteered his skills.

"It's a very poor country," he told the students. "Most of the people don't live in houses like you or I do ... some are just mud and sticks."

Maixner said he spent about 400 hours running his team preparing for the race and logged more than 3,500 miles, almost half again what he had done in his first three attempts.

Clark said she also wanted her cousin to talk to her class about goals and about what it takes to reach those goals.

Maixner said it was always one of his goals to win the Iditarod and this year he came close.

He was in the top 10 teams much of the race until a brutal wind storm hit and forced him to scratch less than 100 miles from the finish line.

But, he told the students he won't give up, but next year might well be his final attempt at winning the race.

Maixner said with two small children, he wants to take more time to be a dad — at least for the next few years.

"Maybe when the kids are in their teens and they can help me I'll rethink things," he said.

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PROJECT-BASED LEARNING

Maximizing Profit: The PBL Classroom Without PBL

MAY 6, 2014

Photo credit: Edutopia

Facilitating problem-based learning (PBL) in the classroom requires a shift in pedagogy from a "stand and deliver" class. The problem presented at the beginning of a PBL cycle must create an authentic need for students to develop 21st century skills such as:

- Collaboration
- Communication
- Problem solving
- Reflection skills

A problem we presented in our math classroom is: "How can the student store maximize profit?" This question serves as a strong avenue to facilitate collaboration, meaning that when students try to work alone, it is too hard or too large of a task. PBL requires students to communicate their understanding of the problem, helping them develop critical thinking skills and increasing academic discourse in the classroom. Reflection is also an important part of a PBL cycle. Students should reflect on their process of solving the problem, but also on how collaboration, strong communication skills and thinking critically with peers made the process more manageable. Once students see value in these skills, they can begin making them part of everyday work, whether or not a PBL-focused problem is present.

Take caution, however. These skills are not simply present just because of a PBL cycle -- they must be taught.

Student Collaboration

Once students see a need for collaboration, it becomes the teacher's role to set the foundation. Establishing group norms can be an opportunity for students to become familiar with their peers as learners. As we consider our math problem about maximizing profit, students will have to discuss important vocabulary such as *profit* and *income*. Collaboration also provides a space for students to talk about how they will hold each other accountable. Another important aspect is helping them be aware of equity in their group, how are they communicating with others, helping group members to

understand their point of view and vice versa. As they think about maximizing profit, students will have to make sure they have a common understanding of the zeros in the parabola representing the "break-even points." After establishing expectations, the teacher must work to maintain high collaboration standards through giving feedback and helping student groups sort out conflict. This can include checking for understanding or facilitating discussions about why everyone in the group hasn't built a common understanding.

Communication

Productive group work involves communicating with team members, a 21st century skill. Communication is also very important when thinking about how the work will be completed, because the workload could become unevenly distributed if group members do not communicate often. Modeling how to ask questions to clarify statements, gain others' perspectives and check for understanding is an important part keeping communication open.

Problem-Solving Skills

Modeling how to solve a problem can be a very powerful way for students to make inferences about what skills are needed. During a problem cycle, teachers can ask questions to help students develop and use their problem-solving skills. For example, teachers could have groups formulate a plan for solving the problem, then ask clarifying questions about both the problem and their process as students work to solve the problem. When thinking about maximizing profit, students will have to work with their group and apply the mathematical definition of a vertex in the context of the problem. This will require students to build understanding about the x-axis representing the number of price changes based on their price interval. It can also build confidence for students to talk about their errors or misconceptions and the process their group used to correct the error. An error may include thinking that the axis of symmetry represents the price change or the price to produce the maximum profit. Ultimately, teachers need to help students recognize the skills they are building throughout the process by being transparent.

Valued Skills Remain in Use

In the video Problems of Practice **(1)**, I address that, in our Algebra 2 PBL Curriculum Writing Team, we found units where an authentic PBL problem would restructure the unit so that students deepen their understanding of math through a real-life application. For those units where we didn't see a strong fit, we left them as a more traditional curriculum. This is where the shift in pedagogy happens. Just because students are not involved in a PBL unit, such as maximizing profit, doesn't mean that they can't use the skills they have gained through working with their peers.

After establishing a classroom where collaboration, communication and critical thinking skills are valued and used by students, the atmosphere of that classroom changes. I saw this in my own classroom through students asking each other questions and working together without having to be prompted. The skills established though PBL units are more evident. Students are more confident about explaining how they solved a problem, or where their point of confusion lies within solving a problem. The teacher can take on the role of thinking about creating opportunities for students to use their skills through the traditional unit.

Overall, the skills established through PBL units have enriched the classroom, creating more of a team approach to learning, versus a classroom where the teacher is the only source of new information.

Source: www.edutopia.org/blog/the-pbl-classroom-without-pbl-danielle-lynch

Links

1 www.edutopia.org/sammamish-problem-based-learning-implementation-video

CAMPUS TECHNOLOGY

Teaching & Learning | News

55% More STEM Students Fail Lectures Than Active Learning Classes

- By David Nagel
- 05/14/14

Traditional lectures are failing students in STEM disciplines (science, technology, engineering and math). According to a new meta-analysis published this week, a staggering 55 percent more students flunk purely lecture-based STEM courses than flunk courses taught with some sort of active learning component.

Active learning — in which students are engaged with their learning through discussion, reflection, collaboration or other types of activities that involve more than just passive listening and notetaking — has long been held up as a model for instruction that has significant potential for improving student outcomes, with several studies pointing to benefits like improved test scores and improved performance on papers, coupled with improved retention (fewer dropouts) — particularly in STEM disciplines.

In the last decade or so, technology has played an increasingly significant role in the implementation of active learning across college and university campuses — impacting teaching practices and even the physical layout of classrooms — and has involved everything from furnishings, equipment and classroom AV to learning software and even social media. In fact, just in the last month, another study was released suggesting that something as simple as a Facebook group can play a meaningful role in engaging students and producing measurable, significant gains in student achievement.

This latest meta-analysis — "Active learning increases student performance in science, engineering, and mathematics," published this week in the *Proceedings of the National Academy of Sciences* — is being billed as the "largest and most comprehensive meta-analysis of the undergraduate STEM education literature to date." Led by the University of Washington's Scott Freeman, a principal lecturer in biology, it examined 250 previously published studies on STEM education and found that, on the

Definition of Lecture

Please note that for purposes of this research, the term "lecture" is used in a limited sense. According to the researchers: "Following [Donald A. Bligh, author of *What's the Use of Lectures?*], we defined traditional lecturing as '... continuous exposition by the teacher.' Under this definition, student activity was assumed to be limited to taking notes and/or asking occasional and unprompted questions of the instructor."

Thus, a "lecture-based course" that contains active learning components is not to be implicated along with lectures that do not incorporate an active learning component.

whole, more than a third of students taking STEM lectures that contain no active learning component fail (mean failure rate of 33.8 percent), while the failure rate for classes incorporating active learning (including lectures that incorporate active learning) was 21.8 percent — a 12-point, or 55 percent difference in mean failure rates.

Those results are consistent across all STEM disciplines "in all class sizes, course types and course levels," according to the report.

Further, in classes involving active learning, student outcomes were significantly stronger. "Students performing in the 50th percentile of a class based on traditional lecturing would, under active learning, move to the 68th percentile of that class — meaning that instead of scoring better than 50 percent of the students in the class, the same individual taught with active learning would score better than 68 percent of the students being lectured to," according to the report. "According to an analysis of examination scores in three introductory STEM courses,... a change of 0.47 SDs would produce an increase of about 6 percent in average examination scores and would translate to a 0.3 point increase in average final grade. On a letter-based system, medians in the courses analyzed would rise from a B– to a B or from a B to a B+."

The academic benefits were particularly pronounced in smaller classes, according to the researchers.

The results have significant implications. Just among the study population of 29,300 students who attended lectures, there were more than 9,900 failures. With active learning, that number would have decreased by more than 3,500, amounting to more than $3.5 million in "saved tuition." On a broader scale, according to the researchers, "increased grades and fewer failures should make a significant impact on the pipeline problem. For example, the 2012 President's Council of Advisors on Science and Technology report calls for an additional 1 million STEM majors in the United States in the next decade — requiring a 33 percent increase from the current annual total — and notes that simply increasing the current STEM retention rate of 40 percent to 50 percent would meet three-quarters of that goal."

Further, the National Science Foundation also weighed in on the meta-analysis, pointing out that the failure rate of STEM lectures could impact as many as 840,000 students. "If the failure rates of 34 percent for lecturing and 22 percent in classes with some active learning were applied to the 7 million U.S. undergraduates who say they want to pursue STEM majors, some 2.38 million students would fail lecture-style courses [versus] 1.54 million with active learning. That's 840,000 additional students failing under lecturing, a difference of 55 percent compared to the failure rate of active learning."

The complete study is freely available via pnas.org.

About the Author

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EDUCATION TRENDS

PBL Meets the Next Gen Science Standards

MAY 12, 2014

(1)

Although the Next Generation Science Standards **(3)** (NGSS) have not yet been fully implemented, more and more states are signing up as early adopters **(4)**. The NGSS call for a conceptual shift in teaching and learning. Along with traditional subject matter, science and engineering are now integrated into the standards, and students will learn about the principles of engineering and engage in the engineering design processes.

In addition, many concepts are cutting across content. For example, the concept of "systems and system models" is used in the exploration of nuclear energies as well as ecosystems. Also, scientific and engineering practices are aligned multiple times with the disciplinary content. The NGSS calls for a deeper understanding and application of content. The focus is on core ideas and practices of science, not just the facts associated with them. This is a great opportunity for project-based learning, because not only can PBL align to the shift in pedagogy, it can also enhance what the NGSS demand.

The Alignment

Just as the draft NGSS calls for deeper understanding and application of knowledge, PBL demands the same -- in-depth inquiry into the content. When teachers design PBL projects, they choose to focus on power standards, or standards that usually take significant time to teach and focus on depth, not breadth. The NGSS will be a similar kind of standards, and thus easily used when designing PBL. In fact, a teacher designing a PBL project might target one of the crosscutting concepts, something that permeates the entire year of content. This is no more evident than the NGSS App available on iTunes **(5)**. Take a look at the Grade Four Earth Systems Standard:

> *Identify evidence from patterns in rock formations and fossils in rock layers to support explanation for changes in a landscape over time.*

This standard focuses on explanation of changes -- not just identifying them, but using them to think

critically about the content. In fact, the NGSS app provides an "Assessment Boundary" that says: "Assessment does not include specific knowledge of the mechanism of rock formation or the memorization of specific rock formations and layers." This is about depth, not rote memorization, which is ripe for a PBL project. In fact, the clarification statement of this standard highlights possibilities for a PBL project:

> *Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.*

Being a Scientist

Most state science standards were linked to the scientific inquiry process **(6)**. The NGSS continue to honor this as a key component to science education. Dimension 1 of the NGSS **(7)** focuses on practices which "describe behaviors that scientists engage in as they investigate and build models and theories about the natural world and the key set of engineering practices that engineers use as they design and build models and systems." Embedded throughout standards is language where students must "use evidence," "make observations," "ask questions," "combine information," and "apply scientific ideas," to name just a few. All of this language focuses on the art of being a scientist to learn the content. PBL calls for students not only to be scientists, but also citizen scientists investigating real-world scientific problems and challenges to make an impact. Like the NGSS, PBL focuses not only on the content of science, but also on the content of *being* a scientist.

STEAM PBL

I wrote about this in a recent blog **(8)**. As we notice the new engineering focus of NGSS, we might consider design challenges, a key component of science, technology, engineering, art, and mathematics (STEAM) education. However, design challenges are not necessarily PBL by default. One can take a design challenge, add some PBL-essential elements to it, and make it into a PBL project, yet there are some components that must be added to make it a true PBL project. In the example from my previous blog, students made recommendations for retrofitting a local bridge and presented this information to city officials and engineers. Yes, the product might be a bridge design, and yes, students might engage in a toothpick contest along the way. The difference is that the work goes outside the four walls of the classroom and is actually an authentic situation where students are engaged in real-world work. As the design process and other components of engineering are leveraged in the NGSS, PBL projects can be designed to teach and assess these standards.

The NGSS will be successful only if we give students the learning models that call for the rigor and depth they demand. Not only is PBL ready for the challenge, but it can create deeper engagement with the content, where students' deeper learning in the classroom makes them real scientists and engineers of the real world.

Source: www.edutopia.org/blog/pbl-meets-the-ngss-andrew-miller

Links

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3 www.nextgenscience.org/three-dimensions
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8 www.edutopia.org/blog/pbl-and-steam-natural-fit-andrew-miller

STATESBORO, Ga. – Soldiers from 1st Battalion, 76th Field Artillery Regiment, 4th Infantry Brigade Combat Team, 3rd Infantry Division, attended Statesboro High School's science, technology, engineering, and mathematics day, or STEM day, in Statesboro, May 9, to explain artillery-related mathematics to students.

Sgt. Bob Yarbrough

Soldiers with 1st Battalion, 76th Field Artillery Regiment, 4th Infantry Brigade Combat Team, 3rd Infantry Division explain to students how to map coordinates for artillery fire by hand at Statesboro High School's science, technology, engineering, and mathematics day in Statesboro, Ga., May 9, 2014. (Photo by Sgt. Bob Yarbrough, 4 IBCT, 3 ID, Public Affairs)

The soldiers were among representatives from other businesses and organizations ranging from energy companies, college science departments, aeronautical engineering companies, representatives from state agencies and entrepreneurs.

Richard McCombs, a science teacher at Statesboro High School, explained how the application of physics and math in field artillery made the Patriot soldiers relevant at STEM day.

"In high school, I didn't really understand what I was learning," said the former artilleryman. "Then I got commissioned and became an artillery officer, and I was shooting big bullets 10 miles down the road where you've got to figure in things like the earth's rotation, powder temperatures, different guns shooting different speeds, and you have to apply all these math skills all at once, really fast."

The Statesboro High School STEM day was not the first time the students met with Patriot soldiers. The STEM class took a field trip to Fort Stewart April 23, where they toured the base and were able to see the field artillerymen load and fire blank training ammunition from the M119 howitzer. The students were able to see a practical application of math and physics as the Patriot soldiers demonstrated the entire process, from the forward observers calling for fire to the artillerymen using the howitzers to simulate an artillery strike.

First Lt. Cody Newsome, the fire direction officer for 1-76th FA, and a native of Greer, South Carolina, was present at both events and explained why it was important for the students to see the live demonstration.

"We illustrated how mathematics, science and technology are instrumental in delivering indirect fire," he said.

The students previously experimented with rockets made of water bottles, using similar calculations to estimate distance.

"There is a correlation, mathematically," said Newsome. "The theory of what we do is ballistics, it's physics, and then we apply it to firing cannons."

During both STEM events, the students also saw how radars, communication, and meteorological and survey data are applied to field artillery operations, and they now have a view of how science, technology, engineering and math are applied as they pursue their future career paths.

Connected Media

Patriot soldiers show...
Soldiers with 1st Battalion, 76th Field Artillery...

Patriot soldiers show...
Soldiers with 1st Battalion, 76th Field Artillery...

Patriot soldiers show...
Soldiers with 1st Battalion, 76th Field Artillery...

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OREGONLIVE

Farmington View Elementary first graders grow their own lettuce then serve it for lunch

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Andrea Castillo | acastillo@oregonian.com By **Andrea Castillo | acastillo@oregonian.com**
Email the author | Follow on Twitter
on May 11, 2014 at 8:00 AM, updated May 11, 2014 at 8:10 AM

First graders at **Farmington View Elementary** recently learned what farm-to-table is all about by growing their own lettuce then feeding it to their peers.

Their teacher Robin Davies called the experience historic.

"I've taught here 27 years and we've never had anybody grow food and serve it in the cafeteria," she said. "I was more excited than the kids."

Students planted three types of lettuce seeds using recycled milk cartons in mid-February. They took a field trip to **Blooming Farm** in Cornelius on March 14 to plant the starts in garden beds.

Davies checked on the plants after a few weeks, then went back Monday, May 5 to harvest. A friend helped her make a video describing the process. Back at school, she showed the video to her students. Their learning experience, based on a math curriculum farm unit, also included lessons about the plant cycle and nutrition.

Young children can be known to oppose eating leafy greens and other vegetables. But Davies said 26 of her 28 students tasted their lettuce in class.

Farmington View students and staff enjoyed a salad bar featuring the lettuce on Tuesday. Davies said her students got excited that other people were eating food they had helped grow.

"The first graders were just beaming," she said.

Davies said she was inspired by First Lady Michelle Obama's **healthy eating initiative** and a gardening workshop she attended in Salem.

"I wouldn't have thought otherwise of even asking the cafeteria to serve the lettuce because I thought they'd tell me no," she said.

Davies wants to expand the salad bar options next year with radishes, carrots and peas. The school has

some new garden beds with those vegetables growing in them now, but they won't be ready for another few weeks.

"I get excited because I'm old," she said, laughing. "I've taught a long time, but I'm learning new stuff too."

--Andrea Castillo

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STUDENT ENGAGEMENT

Uppervention: Meeting the Needs of Gifted and Talented Students

MAY 6, 2014

Photo credit: Thinkstock

I've noticed in education the push to provide or sometimes require intervention programs for students who struggle in the classroom. These students struggling in math or language arts can sometimes become the focal point of school improvement teams and school-based content specialists. I realize that the joint effort of staff members to help these students has to do with standardized test scores -- but what about our gifted learners?

Instead of an intervention, they need an "uppervention." They need to be challenged in new ways and given the opportunity to explore their innate gifts. This requires not only student and parent involvement, but also a dynamic teacher willing to support his or her gifted and talented learners.

Recognize Their Talents

Each and every one of our students is unique. As classroom teachers, sometimes we can become distracted with our daily lessons and not fully recognize all the talents of the individuals we teach. I can remember an activity where I asked my seventh grade students to draw a medieval cathedral and label the important architectural features. Most of their projects turned out great, but one student's stood out from the rest. Her drawing looked like it belonged on the drafting table of an architect. I recognized her artistic talents and tried to modify future activities in order to challenge her natural skills.

Student Centered

Whether the student is talented in mathematics, music, drawing or reading, as educators we need to create opportunities for them to showcase their abilities. Differentiating curriculum to meet the needs of our talented students is critical for developing a stimulating learning environment. For example, if a student is gifted in math but you teach art, try to design an activity using the Golden Ratio **(1)** or creating fractal art **(2)**. Assembling small groups of students that are interested in the same topic is another great strategy to recruit interest and encourage collaboration. Look at your curriculum, and present them with a few different options to deepen their understanding of topics covered within your content.

Develop Deeper, Not Wider

Don't be the bearer of busywork! Just because a student is gifted in your content doesn't mean that you should swamp him or her with "extra" work. Engage your gifted students by allowing them to select a topic that they would like to learn more about. Design activities or projects that develop higher-level thinking around their selected topic. If these students still have an interest in the same topic after they have completed one project, continue to deepen their understanding before moving on to something else that sparks their curiosity. Don't forget to utilize the other staff members in your building. Media and content area specialists are an excellent resource when trying to develop independent or collaborative projects for your gifted and talented learners.

Encourage Curiosity

Sometimes gifted and talented students do not fully realize their skills until someone challenges them. As teachers, we ask hundreds of questions each day in our classrooms -- but are we asking the right questions? Are we encouraging our students to think critically and explore their interests? Have open debates in class that cover both contemporary and content area topics. Try to make connections between real-world events and what is going on in your class. This will encourage students to think critically about the world around them.

Be Realistic and Flexible

Not all of your gifted and talented students will get straight A's or be their class president. Some of my most gifted and talented students are those who come from complex home environments and have to deal with difficult emotional situations at a young age. These issues can lead to anger, frustration, isolation or depression. Remember that even though your student may be gifted academically, he or she is still developing emotionally and socially. Support your gifted and talented students by staying involved beyond just the content. You may need to scale back a project or take a break from it altogether for a period of time. Gifted students can sometimes become hyper-focused on their independent projects and develop unneeded pressure on themselves. Create learning opportunities that are realistic, measurable and within a set time frame.

Also, don't be afraid to use these strategies with *all* of your students. I've learned that what benefits a gifted and talented student can benefit every student in my class.

Source: www.edutopia.org/blog/uppervention-for-gifted-talented-students-josh-work

Links

1 en.wikipedia.org/wiki/Golden_ratio

2 en.wikipedia.org/wiki/Fractal_art