Bent County 4-H

August 2018 Newsletter

Volume 8, Issue 14, August 2018

State 4-H News

www.colorado4h.org
Project Resources
StateFairExhibitReq.pdf.

We're on FACEBOOK! Please **LIKE** our pages to stay up-to-date with all the upcoming events & share with your friends, let's get to 500 likes!

- ♦ Bent County Extension
- ♦ Bent County Fairgrounds

What to Look For:

1. State Fair Entry
2. 4-H T-Shirts
3. Record Books & Sale Checks
4. Award Letters
5. New Staff
6. Pick-Up Raffle Tickets

County News

Opportunities and Deadlines

August 1—State Fair Shooting Sports Entry Deadline
August 10—State Fair Entries to Extension Office
August 13—State Fair Food Entries to Extension Office
August 15—Record Books Due & Sale Checks Available
August 15—Award Forms Due to Extension Office
August 22—4-H Council Meeting (MUMC)
August 24—State Fair Begins

State Fair Entry

If your 4-H project qualified for State Fair, and you intend to enter it in the State Fair, you will need to let the Extension Office know by August 8th. Any changes that need to be made need to be done by August 10th, and you project needs to be at the Extension Office by August 10th. If you have a food project, you will need to have that to the Extension Office by 8:00am on August 13th. All recipes that accompany food projects will need to be submitted electronically to Coopext_bent@mail.colostate.edu by August 8th. It is the responsibility of the contestant to read and abide by the State Fair guidelines/syllabus for your individual projects. Please be sure your projects are labeled properly, and that all information required is present on your label!

Bent County 4-H T-Shirts

Bent County 4-H t-shirts have been printed and delivered to the Extension Office. A remind was sent out to all leaders that these shirts are at the office. If you have not picked up your shirts and paid for them, please do so ASAP at the Extension Office. I have one invoice left and accompanying shirts, and the printer needs to be paid for these!

Record Books & Sale Checks

COMPLETED record books need to be turned in to the Extension Office by August 15th. If you have a check from the sale to pick up, you can do so at that time if you have completed your thank you to the buyer and your record book is finished. Those checks will be at the Extension Office.

Award Forms

If you received a form to choose an award, please be sure you return that form with your thank you to the Extension Office by August 15th in order for those awards to be ordered and delivered on time. They will be handed out at the 4-H Banquet in October. Please keep watching for more information about that date and time for the Banquet!

Projects

There are a few general projects and record books left in the exhibit barn. Please have them picked up by August 13th at noon. Any projects or record books left after that time will be discarded.

4-H Pick-Up Raffle Tickets

Raffle Tickets are available for members to sell! Leaders can pick up and sign for tickets that can be distributed to members. All tickets, sold and unsold must be returned to the Extension Office to given back to the 4-H Foundation. Bent County 4-H sees a significant profit from each ticket sold! If you have questions or would like tickets, please contact your Club Leader or the Extension Office.

New Staff

Bent County has a new Administrative Assistant in the Extension Office. Kylie Miller, a recent Las Animas High School graduate has filled that role. She isn't new to the county fair scene because she had been enrolled in 4-H for 11 years and in FFA for the last 4 years. You may have seen her at our county fair in the goat show ring, in the general projects building with her shooting sports display boards, and even down at the gun range competing with in shotgun or archery. With experience of her own she knows what experiences can come along with being involved in the county fair and she wants to help in whatever way possible to continue making sure that when those individuals look back their memories of the countless hours spent preparing their exhibit and showing in the ring, they won't be able to do anything but smile. Please take a minute to give Kylie a warm welcome if you see her around!

The Arkansas River: From Leadville to Lamar

See the attached flyer for details on this presentation. They would like as many 4-H youth there as are available. It would be outstanding to have our Bent County 4-H well represented if you can make it!

THE ARKANSAS RIVER

FROM LEADVILLE TO LAMAR

AUGUST 16, 2018

THE ARKANSAS RIVER: FROM LEADVILLE TO LAMAR

Follow the Arkansas River from its headwaters to the Eastern plains in this renowned Rocky Mountain PBS Documentary.

After the film, a discussion will be led by several water experts including Bill Long, former Bent County Commissioner who has been an advocate for water rights through the Southeastern Water Conservancy District; Ryan Hemphill, a local farmer who has worked to keep farming viable for his family and future generations while working for other farmers to operate irrigation efficiency through rule 10 plans; and Rena Brand, Colorado Parks and Wildlife employee who has a recreational and non-consumptive interest for the Arkansas River.

PEPO WORKGROUP
ARKANSAS RIVER BASIN

Free and Open to the Public!

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The Arkansas River: From Leadville to Lamar Documentary

———

August 16, 2018

———

6:30 pm

———

Community Center, Las Animas

QUESTIONS? CONTACT:
AMBER WEBER
719-688-9941

arkvalleywps@gmail.com

OR JEAN VAN PELT
arkpepo@gmail.com

What is Project Butterfly WINGS "citizen science" ?

WINGS, Winning Investigative Network for Great Science, is a partnership between 4-H youth and professional scientists. Participating youth are "citizen scientists" who collect data on butterflies to help professional scientists determine:

- The presence or absence of specific butterfly species
- The abundance of butterfly species by state and county throughout the country

The information helps butterfly scientists better understand and conserve butterfly populations.

How do I participate?

Youth who participate in WINGS need not be part of a 4-H club or group. The 4-H leader or adult can register participating youth to use the Project Butterfly WINGS website, where the youth will enter their butterfly monitoring data. Instructions for monitoring can be found in the 4-H WINGS project book.

What are the benefits of WINGS citizen science?

The citizen science data collection process benefits the field of butterfly science:

- WINGS gives participants have an opportunity to further the scope of butterfly research throughout the country.
- WINGS is a long-term monitoring project. The data will grow into a comprehensive database for comparisons and trend assessment.

Your county 4-H agent can order Project Butterflies WINGS Youth and/or Facilitator Guide for you.

STEM Connections

Connecting Science, Technology, Engineering, and Math concepts to our everyday lives.

BUTTERFLIES!

Help scientists collect data on common butterflies in your county. Become a scientist today!

https://www.flmnh.ufl.edu/wings/index.asp

Project Butterfly WINGS is a GREAT project! It incorporates the entire scientific process, is fun, engaging, and what you do WILL make a difference! Not only that, you will have an artistic blast while learning about the butterflies in your county!

In this project, you actually collect data for a scientific experiment that is tracking the common butterflies all across the United States. These data are sent to scientists at the University of Florida.

The project has lots of different, fun activities for you to do as you learn to identify the butterflies in your county. For example, you can make a 3 dimensional butterfly out of paper of fabric!

You can do this project as an individual, or as a club. It would count towards your service, since you are collecting data for scientists!

EXPLORE IT - DESIGN IT - DO IT

In our activity this month, we will be setting up your transect for the project. Scientists don't even try to collect data from each individual in a **population**. That would be impossible in almost every study ever conducted. Instead, they collect data from a small **subset** of the population, and then use those data as representative of the entire population. The transect is the method you will be using to collect the data on your subset. It is an area you pick, and then identify any butterfly that lands in your transect. If a butterfly lands anywhere inside the transect, count it as "In." If a butterfly lands on the rope, count it as "In." If the butterfly lands next to, but outside the rope, don't count it.

First, and most important, get permission to set up the transect. If you are on your own property, ask your parent. If you would like to set your transect on county, state, or US property, find the right people to get permission. (Your county agent can help you.). You may want to design a sign to let people know what you are doing if you are on public lands. The transect is marked by 2 **parallel** lines (made from string) that are 300 feet long and 15 feet wide.

Once your transect is set, you can collect data on your butterflies by walking outside the transect along one of the lines. You don't want to walk inside the transect because that will disturb the vegetation. Take a photograph of each butterfly that is inside the transect (including sitting on the string). Be sure that your photograph is clear so that you can identify your butterfly when you get home.

At home, go to the website: http://www.butterfliesandmoths.org/checklists. In the boxes, select Species Type: "butterflies" and for Region: "United States," "Colorado," and your county in the last box (each will appear as a separate box). This will give you a list of butterflies found in your county. If you click on the individual species, you will open a page with lots of information and photos of them.

You will have to spend time learning your butterflies, but you will get better. You could make your own guide book with information and photos of the butterflies by copying the information into a word document, and then saving it. This personalized guide book will help you as you collect your data.

The last step is to report your data to the Florida scientists. A parent (or if your club is working on this project, your leader) will need to registered on the website. That website is https://www.flmnh.ufl.edu/wings/index.asp. This website has lots of information to support you in your project. Not all the butterflies you find will be reported, because the scientists are keeping track of only the most common species. All this information can be found in the project book and facilitator's guide.

Have a blast being a butterfly scientist this summer!

Age Appropriate:
4th—HS grades

Time Required:
Spring to Fall

Materials: (supplies are at home improvement stores)
- 30—60 stakes
- Hammer
- 610 feet string (surveyors' string works really well)
- Measuring tape
- Flagging tape
- Camera

The Set-up:
- Get permission to set up transect
- Scout area for butterflies.
- In a space that is at least 300 feet long and 15 feet wide, hammer a stake into the ground.
- Use the measuring tape from that stake, in a straight line, measure 300 feet, hammering a stake every 10—20 feet
- Tie the string on the first stake, and walk down your line, looping the string on each stake. Tie the string to the last stake.
- Measure 15 feet across from each stake, and hammer in another stake.
- Measure the second row of stakes to make sure that they are 300 feet long.
- Tie the string on the 2nd row's first stake, and walk down your line, looping the string on each stake. Tie the string to the last stake.
- You should have 2 parallel lines that are 300 feet long and 15 feet wide.

The Clean-up:
- Remove stakes and string in the Fall after butterflies leave

Power Words
- **parallel**: side by side, having the same distance continuously between them.
- **population**: group or type of animals living in an area
- **subset**: part of a larger group of related things

BACK TO THE FUTURE™

by Jean M. Wallace

1950's image of the future

Every career requires **STEM** skills

"I do not plan to be an engineer or scientist."

I do not plan to be an engineer or scientist, so STEM is not for me. Becoming knowledgeable about STEM is not about the 0.01% who might become Ph.D. researchers or the 1% who might become engineers. In this data-informed, technology intensive 21st Century, the entire populace needs to become STEM literate. **We all need STEM thinking skills.**

Many apparently non-STEM jobs have become STEM jobs, especially in the trades. Do you know that the average new car has about 50 microprocessors? Forget about crawling under it with a few of your Dad's old tools to fix it! and Moore's Law of computers, which has resulted in the iPhone being equivalent to a multi-ton super-computer of the 1970's, has affected most other trades as well.

But perhaps the most important reason for everyone to become STEM literate is to build a more informed citizenry. In that way we individually and collectively become better decision makers about all the options that our world and we face. STEM is not only for Ph.D. researchers. *It's for all of us!*

Dr. Richard Larson
Mitsui Professor of Engineering Systems at MIT
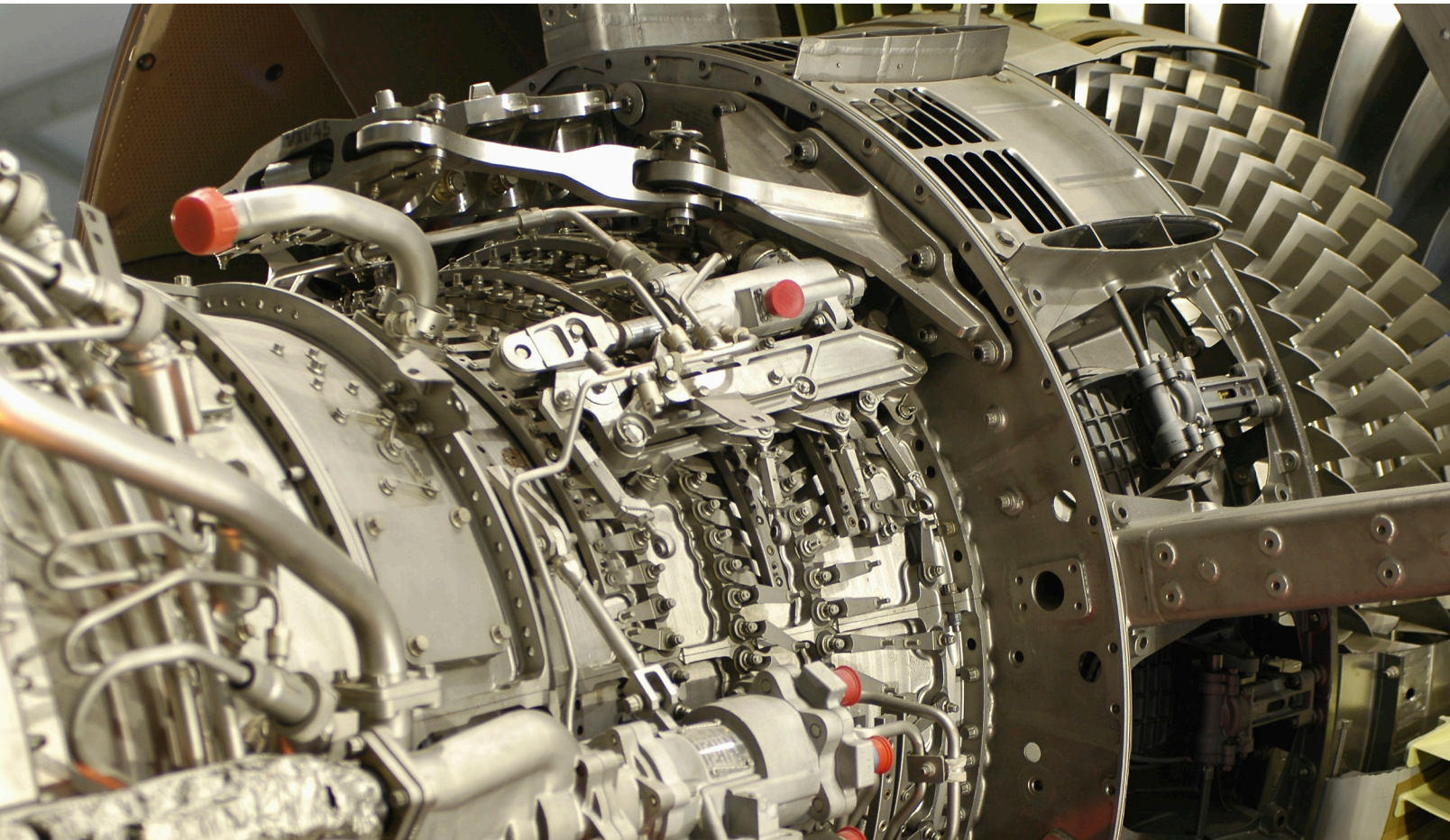
We believe that the key to success in seeing higher graduation rates, improved testing results, student inspiration, creativity, excitement and career satisfaction rests in the hands of the teacher. The example and inspiration of individual educators carries tremendous weight on a daily basis, greatly impacting the quality and effectiveness of the classroom environment.

Our mission: Encourage curiosity, investigation, inspiration, creativity, and innovation; the foundations of every career passion.

STEM Magazine is a monthly subscription non-profit education publication for educators, students, their parents and industry professionals.

Read monthly in 67 countries, STEM Magazines strive to encourage the educator to better understand the importance of STEM skills, their use in every school subject, the need and ease of integration into curriculum and the urgency for students to embrace STEM.
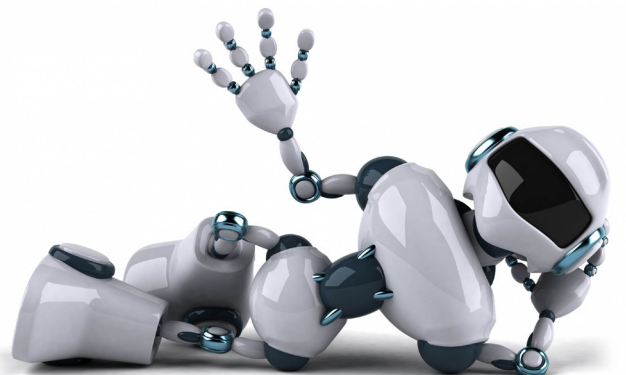
To understand ST≡M...

...you must DEFINE STEM, but you cannot define an acronym using the words it stands for; you must define the words the acronym stands for.

Universities and organizations around the world continue to debate what a STEM career is. There is no doubt that "every career" uses STEM skills and this observation remains the focus of STEM Magazine.

Science: "The systematic accumulation of knowledge" (all subjects and careers fields)

Technology: "The practical application of science" (all subjects and careers)

Engineering: "The engineering method: a step by step process of solving problems and making decisions" (every subject and career)

Math: "The science of numbers and their operations, interrelations, combinations, generalizations, and abstractions" (every career will use some form[s])

For a moment, set aside any preconceived notions of what you think a STEM career is and use the above dictionary definitions to determine the skills used in any career field you choose.

These definitions are the "real" meaning of STEM and STEM careers.

Taking Teacher Education -

BACK TO THE FUTURE™

by Jean M. Wallace

Our future is in the hands of our children, and our children's future is shaped and molded by their learning experiences in our schools. "Every road to a sound economy and a more civil society runs through our education system...it is our ability to think, plan and work across disciplines that have been a driver for our economy and a civil society", (Marx, 2015, p. 84). Where research supports the need for all students to acquire knowledge and skills for the future, (Weld, 2005), those not prepared for a new economy could be among "the new disadvantaged", (Marx, 2015, p. 43). But for some, has that future already come and gone? "As we enter the 1990's thoughtful educators everywhere are calling attention to the importance of developing students thinking skills through their experiences at school", (Resnick & Klopfer, 1989, p. 11).

Sadly, the year is now 2018 and today's research still points to a profound gap between the knowledge and skills most students learn in school, and the knowledge and skills they need in typical 21st Century communities and workplaces (Ait, Rannikmae, Soobard, Reiska & Holbrook, 2014).

One reason for this gap is attributed to teacher education programs. "Even as progress has been made, new knowledge has frequently been ignored, misinterpreted, or misused—sometimes by teacher educators and more often by policymakers—with the result that the discourse and debates about teacher education today eerily resemble those of a half century ago", (Darling-Hammond, 2016, p. 18).

Schools need to transform in ways that will enable students to acquire the sophisticated thinking, flexible problem solving, and collaboration and communication skills needed to be successful in work and everyday life (Ait et al., 2014). Colleges and universities should consider how incorporating STEM in undergraduate, pre-service teacher education programs can close this gap and teach for the future.

In education, this gap in shallow learning can often lead to something I call the "gap cycle:" a gap in learning that begins with students in K-12, carries

with students into college, moves with them into their teacher education programs, and transfers into practice when pre-service teachers enter their own classrooms as teachers. For example, when it comes to teaching science, elementary teachers are often certified to teach K-5 without having a true understanding of scientific concepts themselves, leaving their own students behind academically (Steinberg, Wyner, Borman & Salame, 2015).

With decades of research telling us how children learn and, therefore, how teachers should teach for learning, why haven't we listened? Even with research confirming the power and influence of teacher education on the next generation of teachers, many programs still fall short preparing pre-service teachers.

The power of the pre-service curriculum is its multiplier effect. Where one teacher has the potential to impact the number of students taught throughout a career, a methods course has the potential to impact many future teachers and, ultimately, a far greater number of students", (Powers, 2004, p. 3).

One way to close this "gap cycle" is for colleges and universities to incorporate into all pre-service teacher education programs the components of what researchers call, "A Thinking Curriculum." The Association for Supervision

and Curriculum Development (ASCD) publication, Toward the Thinking Curriculum: Current Cognitive Research (1989), reviewed much of the research underlying the concepts for a Thinking Curriculum. Similar to the benefits realized through STEM, STEAM, and

other interdisciplinary programs, a Thinking Curriculum weds process and content, a union that demonstrates real-world situations: that is, students are taught content through processes encountered in the real world (Fennimore & Tinzmann, 1990).

If most pre-service programs do fall short of providing experiences consistent with the science of learning (Bransford et al., 2000), how might K-12 experts in STEM work more directly with higher education pre-service programs and bridge the gap between thinking and learning?

According to a 2012 report by the National Science Teachers Association (NSTA) STEM Education is defined as, "an interdisciplinary approach to learning where rigorous academic concepts are coupled with real-world lessons as students apply science, technology, engineering, and mathematics in contexts that make connections between school, community, work, and the global enterprise enabling the development of STEM literacy and with it the ability to compete in the new economy."

A Thinking Curriculum is, "one that is high in cognitive demand, embedded in specific, challenging subject matter, and requiring systems engineering where the quality of the end product and the processes used to produce it are both continuously measured" (Resnick, 2010, p. 186). While there is a misconception in teacher education programs that general teaching strategies transfer to all content areas (Bransford, Brown & Cocking, 2000), thinking processes actually do apply across content areas and all areas of life (Fennimore & Tinzmann, 1990).

But university faculty contend they do not have the time to develop courses that teach pre-service teachers how to unlearn, relearn, and teach for deeper learning. Thus, the problem of transferring theoretical knowledge and facts from teacher education programs to professional teaching - the "theory-practice divide" - is well documented in teacher education research (Hemker, Prescher & Narciss, 2017). "Greater than 50% of all new elementary teachers feel ill-equipped to teach the basics of K–8 science when they graduate" (Kirst & Flood, 2017, p. 49).

It's time to end this divide and break the gap cycle. The system needs to prepare future educators, at all levels, to adopt a significantly different way of teaching than most of them experienced in the course of their own

schooling (Resnick, 2010). "Because deeper learning takes time and repeated practice, instruction aligned with these principles should begin in preschool and continue across all levels of learning, from kindergarten through college and beyond", (National Research Council, 2012, p. 9). It is rare, however, in undergraduate teacher education programs, to find courses that take the time to teach future teachers how to learn and, by extension, how to teach for learning.

"Typically, future teachers spend more than 100 hours in college classrooms with instructors who model traditional pedagogy. In addition to not modeling effective teaching, "most pre-service programs fall short of providing experiences consistent with the science of learning", (Bransford et al., 2000, p. 204).

Teachers design the environment in which students learn, and the depth of their own content knowledge can have a profound influence on the strength of their teaching practice. That said, elementary teachers often come to teaching with a huge gap in content knowledge, as well as an understanding of the skills that experts, such as scientists and engineers, need to practice in the real world.

"Incorporating these pedagogical practices is challenging, particularly for teachers with limited content knowledge or learning experiences in this domain", (Macalalag & Parker, 2016, p. 110). While it is important for teachers to come to teaching having experienced an in-depth study of the subject area themselves (Bransford et al., 2000), research has shown that many elementary teachers have weak science content backgrounds and had poor experiences as students of science, resulting in a lack of confidence regarding teaching science (Knaggs & Sondergeld, 2015).

Strong content knowledge is especially critical when teaching concepts related to Science, Technology, Engineering, and Math, since science and technology skills ensure competitiveness in a global society (Turiman, Omar, Daud, & Osman, 2012). While historically taught as separate disciplines, "STEM

has 'shifted' from a subject-based, rigidly scheduled, unintegrated system to become one that is defined by subject integration, project-based learning, relevancy for the lives of children, and structural flexibility." (Myers & Berkowicz, 2015, p. xv). To apply knowledge effectively, requires students to be able to know how concepts are interrelated. "Problems of society and their solutions can rarely be contained within the boundaries of one single discipline." (Stentoft, 2017, p. 53).

Schools of education must provide beginning teachers with opportunities to learn, and teacher programs must involve teachers in the kinds of learning activities similar to the ones they will need to use with their own students. (Bransford et al., 2000). To achieve this, teacher education programs must also put a curriculum of known effectiveness, along with materials and procedures for classroom implementation, in the hands of all teachers (Resnick, 2010).

Providing integrated methods courses over multiple semesters and engaging school districts as partners in pilot studies for reforming science instruction would also help to align teacher education with what teachers need to know and do in their future classrooms (Lewis et al., 2014).

To accomplish this, it is important that pre-service teachers feel confident in teaching STEM concepts to their future students which, in turn, means that university faculty must also have this same level of confidence. One program that offers a continuum from elementary school through higher education is STEM Studio at Hofstra University. STEM Studio is located on Hofstra's campus and is a place where children and teachers are supported as they discover new ways of teaching and learning in a university setting.

STEM Studio was born out of a problem: Pre-service teachers were not transferring pedagogical understandings and practices learned in university methods classes to their practice. A starting point was creating a vibrant classroom on campus that brings together elementary pupils with pre-service elementary teachers and secondary pupils with secondary pre-service teachers in a setting that offers problem-based curriculum and just-in-time instructional mentoring. (Plonzcak et al., 2014, p. 52). To ensure we are teaching future teachers to teach students for the future, integrating the components of a Thinking Curriculum with the concepts of STEM offers the best approach to redesigning our pre-service teacher education programs. "Much of what we'll need to know and be able to do in the future

may not even show up on our radar, because we'll have to incite the curiosity of students to invent it." (Marx, 2015, p. 78).

By integrating the well-researched components of a Thinking Curriculum, with the rigorous content of STEM, we can ensure that the theoretical aspects of methodologies taught to pre-service teachers are then transferred into deeper learning experiences for future students in practice. "Today's children, tomorrow's citizens, depend on teachers to help them prepare for a scientific and technological future (Weld & Funk, 2005, p. 189).

The components of a Thinking Curriculum strengthen how we learn. STEM emphasizes what we will need to know and do for the future. Research also verifies that K-12 teachers and teacher educators in colleges and universities face some of the same challenges in implementing programs that support this approach. Thus, the identified gap cycle is a genuine problem that will continue if, at some point in the cycle, how we learn, what is important to learn, and

therefore, how best to teach for learning isn't clearly addressed.

Working together, K-Higher Education can close this gap cycle. It's been close to four decades since Lauren Resnick first coined the phrase, A Thinking Curriculum. To paraphrase one very famous scientist, when it comes to preparing the next generation of teachers, we can't waste any more time doing the same thing over and over again and expect a different outcome.

In conclusion, Marx (2015) said it best when he said that when it comes to the future, 'thinking' is the most important thing we can teach students. To that end, he shares five themes for any thought-filled curriculum: "Learning to think, thinking to learn, thinking together, thinking about our own thinking, and thinking big." (Marx, 2015, p.85).

To achieve this, we need to break the gap cycle of shallow learning by challenging all of our colleges and universities to both embrace the teaching of STEM content, while also going back to the future and incorporating the components of a Thinking Curriculum into all undergraduate teacher education programs. Our future, and our children's future, depends on it.

Jean M. Wallace

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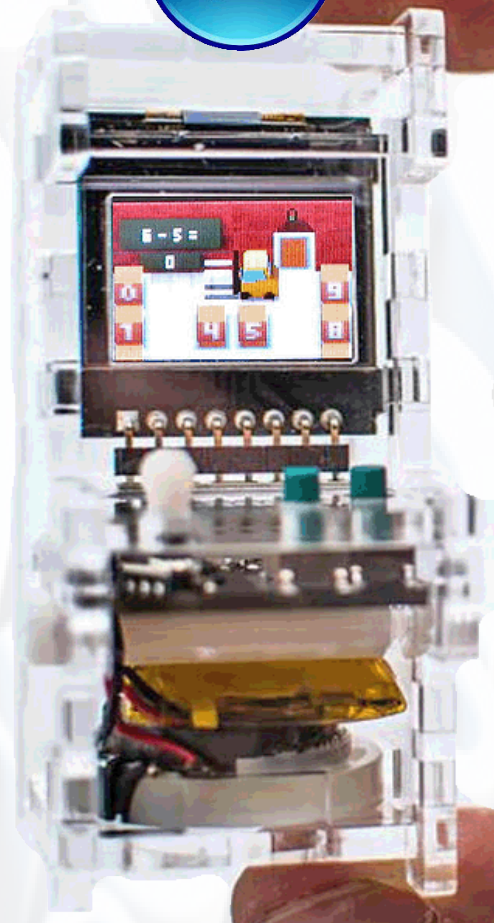
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Think of it as "*electronic flashcards*"

"A key to verbal communication is **listening**.
Not just waiting to speak."

By Thomas A. Anderson

A STEM Skill

Do you remember the telephone game?

In school, you and your classmates try to pick a phrase and "pass it on" by whispering it to the person next to you. Then the phrase is passed from person to person until the last person announces the phrase. How much did the phrase change during the game? As people relay a message from one person to the other the message will often become distorted.

While the game is a lot of fun, it teaches us important lessons.

● If you do not receive information from a reliable source, you may not get the correct information. It is considered gossip.

● If you do not produce information properly, it will not be received as planned.

Communication skills are **vital** to success in your personal life and your career. Poorly delivered messages can turn into misunderstanding, frustration, or even a disaster. By practicing communications, you will understand more of what people say. Your family, friends, and co-workers will have the confidence to come to you when they find themselves in need.

What are the keys to clear communication?

Proper Speech

When speaking, be clear and concise. Speak on important matters directly and do not let the listeners mind wander. Make sure that you are certain they understand and further explain any points necessary. Do not expect someone to "know" what you are saying. Do not assume.

Listening

A key to verbal communication is listening, not just waiting to speak. If you want to really listen to someone, make mental notes of key points when someone is speaking to you. What you would like to say should come second to understanding them. When you have a chance to speak, you can respond to the most vital issues.

When others are speaking, focus on the exact words people are saying. This will help you comprehend more information and have a more successful conversation.

If you are confused, repeat what you think they said and ask if that is correct. This inspires the speaker to clarify their message which will help you to understand correctly.

Consistent Communication

Great leaders practice the ability of effective communication. Each one of us has a different approach to how you explain your thoughts. Find your own voice, then practice consistency. The consistence of your approach will help your family, friends, and coworkers comprehend your information more effectively. Using a consistent approach can also make your tone more successful.

Patience

During your communications give others time to communicate. Stay focused on what they are trying to communicate and stay open to assisting with their concerns. Communication lines tend to break down where impatience gets in the way of the conversation. Every conversation you are involved in is important!

Practicing Communication Skills

When someone communicates an issue to you, your main priority should be to understand the problem. Following up with a problem is the only way to

convince people you have listened to them and that their problems or issues are important to you as well.

Practicing consistent follow-up will leave the impression that you are involved in the bigger picture and people will learn that you are open to future communications. This makes you loyal! Other will be confident they can rely on you.

Business Communication Success

Both written and verbal communication skills are of utmost importance in business. Excellent communication skills are an asset for you and your teams' performance because they provide clear information and expectations to help manage and deliver excellent work.

● Leave communication lines open to those who need you. You can prevent small issues from becoming large ones by retaining open lines of communication.

● Make rules. Make sure people in your business understand what they should and should not be saying.

● Create an open-door policy. Make sure students or employees can talk with you at any time.

● Give feedback. Be genuinely interested in issues, comments, and concerns.

● Communicate the future. Update everyone regularly goals and vision.

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"Communication is a skill that you can learn. It is like riding a bicycle or typing. If you're willing to work at it, you can rapidly improve the quality of every part of your life." *Brian Tracy*

The Light Clock -
A theoretical proof of Special Relativity

What if...

...Einstein Was Wrong?

> **"The greatest enemy of knowledge is not ignorance; it is the illusion of knowledge."**
> Stephen Hawking

Einstein's Light Clock Revisited

BY JOHN LYTTLE III

"Einstein may be wrong!" they say. With modern methods of experimentation, some Physicists are claiming they can disprove Einstein's view on the speed of light being constant. But what if we can disprove Einstein with his very own thought experiment; the Light Clock? I think we can.

In intelligible terms, the Light Clock's main point is that a light shot up to a mirror and straight back down will occur perfectly vertical for a passenger on a train in which the light is located; while, the same light will bounce a longer distance diagonally up and back down to an observer watching the train go by.

In essence, a triangle is formed for the observer while a straight line is formed for the passenger. The thought experiment uses the Pythagorean theorem

to prove that proper time (the time of the passenger) is different from that of dilated time (the time of the observer) marked as:

$$\Delta T_p = \Delta T_d \times \sqrt{1 - \frac{V^2}{C^2}}$$

Change in proper time = Change in dilated time * sqrt(1-(train's velocity^2/ speed of light^2). The reason for this is because the speed of light is constant! But this is erroneous.

Let's create a different thought experiment to show the flaw. Imagine you are viewing a car piston in a V8 engine. Suppose a car is traveling at constant velocity (as the train was) and its pistons are therefore moving at a consistent RPM. The piston is enclosed and therefore definitely not moving further than the cylinder that contains it; and yet, the very same phenomenon will occur. The observer will view a triangular motion which is a longer distance than the driver of the car will see (given the piston is enclosed in a see-through material). There are therefore two conclusions we can draw.

First, we do not need light to observe the same result. Hence, the same is true as you observe from the train platform your friend jump on a constantly moving train from his seat down to the floor and back to his seat again.

Second, Einstein is encouraging an optical illusion of the light's distance traveled to the observer as being true when it is false. Hence, an observer located behind the train will visibly see the same distance traveled as the passenger on the train; in fact, the distance may look rather smaller since the train is moving away from the observer.

Let's prove this with the piston RPM formula. The distance the piston moves is called the stroke. We know the stroke cannot change since the cylinder is a fixed size. The piston speed is calculated as 2*stroke (side note: 2 because it goes up and down). So, to finish the calculation:

$$V_p = 2 \times S \times (RPS)$$

Piston speed = 2*stroke*RPS. RPS is just rotations per second and so we can convert our RPM by simply dividing by 60.

Therefore, mathematically we have proven that a car at constant speed, with a constant stroke, means constant RPM.

Yet have you ever heard the engineers at GM say RPM is constant no matter what or that the stroke is a different length depending on your perspective?

No! So why was this a thought experiment that Einstein used the speed of light as constant or special relativity as certain?... Perhaps he needed a V8! In conclusion, the use of the mechanical example of a piston has a two fold purpose.

First, the combustion does contain a spark which is light.

Second, it follows mathematically precisely the same way as the light in the Light Clock experiment.

The importance of using a piston rather than say a falling candle is that a cylinder contains the piston and therefore sets the distance as well defined. In connecting a non-mechanical event (The Light Clock) to mechanical event (The Piston) encouraged the new idea of simply watching the Light Clock from behind the train where the observer saw the same defined distance as the one on the train.

Finally, the question of light's consistency needs answering. To address this, take gravity's affect on light travel. A curvature can occur (but light's velocity previously must remain constant) and a clock at a certain altitude will act differently from another at a different altitude due to of gravity. This is however a purely mechanical idea.

Hence, a clock in a free falling plane (accelerating at 9.8 m/s^2) will have a significantly different movement than a clock in a by standing plane accelerating at the same speed but simply in an altered vector to the Earth's Surface; and the C being constant allowed the mechanical methods with their agreeing equations to help me realize the original Light Clock never acknowledged the possibility of an observer simply standing behind the train.

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John Lyttle III, began work as a Quantitative Analyst and then assumed the role of Chief Operating Officer at Ogee Group LLC, New York, a quantitative hedge fund as well as Financial Analyst at Vornado Realty Trust (VNO), John currently is Senior Analyst to the CFO at Health Monitor Network.

John was acknowledged in a Wiley Finance Book Publication titled "Advanced Equity Derivatives: Volatility and Correlation. He has lectured at Johns Hopkins University on Black Scholes and its use in pricing options.

John holds a MS in Finance from Johns Hopkins University and a BS in Mathematics with a minor in Economics from Fordham University.

4-H STEM LAB

HughesNet®and National 4-H Council launch STEM Lab to inspire the next generation of scientists. STEM Lab is an online hub offering fun, hands-on STEM activities developed by top public universities and 4-H groups to spark kids' interest in science, technology, engineering and mathematics (STEM).

"Hughes and 4-H share a passion for increasing students' access to STEM activities no matter where they live," said Peter Gulla, senior vice president of marketing, Hughes Network Systems. "Through the activities we support with 4-H, like STEM at Summer Camp and National Youth Science Day, we've seen the powerful impact of the curriculum and programs created by 4-H and their university partners. With STEM Lab, we're excited to bring those world-class resources together in a learning hub that's accessible to kids everywhere."

STEM Lab features easy, hands-on STEM activities organized by age group for youth ages 4 to 16. Projects include easy-to-follow instructions and how long the project will take, an explanation of the foundational concepts at work, discussion questions and a list of necessary supplies – which most often consist of basic household items.

There's even a project Messy Meter, ranging from "clean" to "mega mess," which helps activity leaders plan for their budding scientists' activity. At launch, the website features some of the most engaging activities from 4-H's land grant universities and other educational partners across the country. An exercise in mechanical engineering by the University of California and the University of Nebraska encourages kids to create a simple robot that draws on paper.

Younger students can play chemist

by creating "Fizzy Foam" in a project presented by Ohio State University, or build a basic wind turbine with little more than paper cups, construction paper, paper clips and rubber bands. With HughesNet's support, 4-H will continue growing STEM Lab with exciting new activities and projects.

who tap into their curiosity and enthusiasm for STEM now will grow into the leaders of tomorrow – ensuring our country stays competitive in the global economy and powering our connected future."

Leaders

"Our aim is to ensure that all children, no matter where they live, have access to hands-on, experiential STEM learning," said Gulla. "It is a part of our company's larger commitment to bridging the technology divide. Kids

Data from the U.S. Bureau of Labor Statistics (BLS) shows that occupations related to STEM are projected to grow 13 percent between 2012 and 2022, faster than the 11 percent projected for all occupations over the same period.

"As the nation's largest youth development organization, 4-H prepares youth for the future, which includes opening doors to exciting potential careers in STEM fields," said Jennifer Sirangelo, president and CEO, National 4-H Council. "We know that 4-H youth, compared to their peers, are two times more likely to pursue STEM careers which is why we are excited to have HughesNet's support launching the new 4-H STEM Lab, where parents can share the excitement of STEM learning with their families."

HughesNet has worked with the National 4-H Council since 2014 to broaden access to STEM education in an increasingly technology-dependent world. In addition to the launch of STEM Lab, Hughes supports 4-H National Youth Science Day and the 4-H Youth in Action STEM pillar award. To learn more about STEM Lab and to dive into STEM activities, visit 4-H.org/STEMLab.

About Hughes Network Systems

Hughes Network Systems, LLC (HUGHES) is the global leader in broadband satellite technology and services for home and office. Its flagship high-speed satellite Internet service is HughesNet®, the world's largest satellite network with over 1.2 million residential and business customers across the Americas.

For large enterprises and governments, the company's HughesON® managed network services provide complete connectivity solutions employing an optimized mix of satellite and terrestrial technologies.

The JUPITER™ System is the world's most widely deployed High-Throughput Satellite (HTS) platform, operating on more than 20 satellites by leading service providers, delivering a wide range of broadband enterprise, mobility and cellular back haul applications. To date, Hughes has shipped more than 7 million terminals to customers in over 100 countries, representing approximately 50 percent market share, and its technology is powering broadband services to aircraft around the world.

Headquartered outside Washington, D.C., in Germantown, Maryland, USA, Hughes operates sales and support offices worldwide, and is a wholly owned subsidiary of EchoStar Corporation (NASDAQ: SATS), a premier global provider of satellite operations. For additional information about Hughes, please visit www.hughes.com and follow @HughesConnects on Twitter.

About 4-H

4-H is the nation's largest youth development organization, growing confident young people who are empowered for life today and prepared for career tomorrow. 4-H programs empower nearly six million young people across the U.S. through experiences that develop critical life skills.

4-H is the youth development program of our nation's Cooperative Extension System and USDA, and serves every county and parish in the U.S. through a network of 110 public universities and more than 3,000 local Extension offices. Globally, 4-H collaborates with independent programs to empower one million youth in 50 countries.

The research-backed 4-H experience grows young people who are four times more likely to contribute to their communities; two times more likely to make healthier choices; two times more likely to be civically active; and two times more likely to participate in STEM programs.

Learn more about 4-H at www.4-H. org, find us on Facebook at www. facebook.com/4-H and on Twitter at https://twitter.com/4H.

* US Bureau of Labor & Statistics, STEM 101: Intro to Tomorrow's Jobs

How To **Nurture** STEM Opportunities for the Next Generation of *Women* Leaders

By *Lori* GATMAITAN

Today, women make up nearly half of the U.S. workforce (U.S. Department of Commerce). But when it comes to science, technology, engineering and mathematics (STEM) career fields, the number of women drops to less than 25 percent. Additionally, while women fill 47 percent of all jobs in the U.S., only 24 percent of those are STEM related jobs.

This hits close to home for me. While I was growing up, my parents didn't have the wherewithal to encourage me to pursue a STEM career. Thankfully, I was already interested in STEM, and I had an older sister who went into engineering as a role model. Once I chose to pursue a STEM degree, I noticed how boys outnumbered girls, 17 to 1.

Unfortunately, this statistic is still very similar years later. Women in STEM fields face significant implicit bias on the basis of their gender and because of that there are still fewer women pursuing STEM-related jobs than men. Reasons for the underrepresentation of women in the field can vary from gender stereotypes molded by societal expectations, family income, exposure to the field while growing up and even institutional factors that limit a woman's ability to enter a STEM job.

Although girls may dream of growing up to become engineers and scientists, a recent study showed that while the classroom will always be the frontline of exposure for girls (and boys), 32 percent of middle school girls and 35

percent of high school girls don't feel supported by their teachers and classmates in STEM classes. As a result, not enough students seriously consider a career in STEM or can translate their skillset in order to make real connections in the workplace. STEM is an integral part of our everyday lives, and while the field itself is swiftly growing, there is a shortage of high-skilled workers – particularly females – to meet this need.

Why is this happening? This crisis can be traced back very early on in childhood when girls enter school. Through college and into their career fields, STEM interests is not heavily influenced among feminine pursuits.

Fortunately, I work with an organization called the SAE Foundation which provides effective avenues for girls (and boys) to engage in and become excited about STEM. Their unique, proven model, which combines project-based learning with real-world experience, builds bridges between education and business. Engaging industry professionals in the classroom is heralded among teachers and volunteers. SAE's STEM programs have reached over 5 million students and have brought over 30,000 industry professionals into classrooms across the globe.

When families, educators and business leaders work together, we can help close the gender gap and increase the number of girls who become involved in STEM. Here are three simple strategies to empower young girls to spark their curiosity in STEM:

● Have a curriculum with a strong foundation in math and science. This is important for all students – not just for those who know they like it or have parents who are encouraging them to pursue a STEM field.

All citizens should be competent in STEM skills – they can not only help propel our careers but can positively impact all areas of our lives. STEM education is not just about being good at math or science. The intrinsic skills developed by being immersed in the thought process – problem solving, critical thinking, teamwork and collaboration, and communication – are critical skills needed to be successful in life.

● Expose girls to STEM early in their childhood. Reaching all kids by a young age can help them feel as though they belong in STEM. Research shows that the earlier students engage in STEM experiences, the higher their chance of achieving STEM fluency, building a foundation for future engagement.

As the only U.S. based engineering organization to offer a full continuum of PreK-16 STEM education opportunities, SAE International fosters a passion for STEM by providing access to fun activities that facilitate integrated learning for all students—girls and boys—right in their schools. If exposed to a wide variety of STEM careers early on, these students may have a bright future in technological fields.

● Engage girls with female role models and hands-on activities. Seeing someone who looks like them in a STEM role, can significantly influence a young girl's perception of STEM careers.

With the help of female engineers and technical experts, SAE advances technology and effectively provides solutions for student engagement, participation and achievement in STEM.

Through SAE's programs such as A World in Motion® (AWIM), students acquire and retain a strong knowledge of engineering – particularly when an industry volunteer is in the classroom.

SAE's programs include a full curriculum and student literature focusing on topics such as engineering design, force and motion, and cybersecurity, bringing these concepts to life. Research has shown that students in this program showed more positive attitudes toward engineering over time, particularly when they had fun and perceived they learned from the AWIM experience.

To reach all students, girls as equally as boys, minorities and majorities, in suburban as well as rural areas, we must meet the students where they are and capitalize on differences to create a strong team with superior results. Focusing on all students helps locate those who didn't know STEM subjects were fun, and introducing volunteers in the classroom opens their eyes to what could be possible moving forward.

Now is the time to focus our efforts on filling the gap with women. Our future depends on it.

Lori Gatmaitan is the Director of the SAE Foundation where she provides development leadership and a strategic philanthropy focus for all fundraising efforts. Lori joined SAE in 2012 after working for 10 years in development and nonprofit management. Her career has included directing strategic programs for large and small nonprofits in healthcare, human services and higher education. Lori focuses on the linkages between mission, organizational strategy, development programs and donor passion.

Lori serves on the Board of Directors for the Engineering Society of Detroit. She is a member of the Association of Fundraising Professionals and Inforum, a professional women's alliance. Lori graduated from Kettering University with a Bachelor of Science in Industrial Engineering and received her Master of Science in Organizational Leadership, with a concentration in Non-Profit Management, from Robert Morris University.

Lori finds that what makes her most happy is (decaffeinated) coffee, reading, running, yoga, volunteering and more than anything, spending time with her family. Lori lives in Michigan with her husband and two children.

STEM Interest Needed

BY MARK ELGART

According to the National Center for College and Career Transitions (NC3T), about 20 percent of careers — and many of the fastest growing areas — directly relate to science, technology, engineering and math.

But by one count, an insufficient number of students today will pursue STEM careers. So how do we convince students that STEM is important even if they don't think they will pursue a career in a related field?

"To varying degrees, every workplace is being transformed by enabling technologies," writes NC3T President Hans Meeder.

Understanding technology is becoming an expectation in all roles within the workforce and as the workplace continues to evolve, everyone needs the critical-thinking and problem-solving skills that STEM education fosters.

Put simply, to be an informed citizen requires careful, methodological thinking to navigate the world successfully —financial decisions, health issues, parenting as well as making sense of politics and polls. No wonder, then, that Meeder argues "life skills are really STEM skills."

Former Deputy Secretary for the U.S. Department Education Jim Shelton makes his own case as to why STEM education is important even for students who aren't considering careers in science, technology, engineering and math.

"Everything we know about the way the world is evolving is saying that STEM is becoming a more important part of not only the technology sector, but every sector of the economy—and, frankly, solving most of the world's most important problems," Shelton says. "So STEM education is important for every student, no matter what they want to do in life."

What does it mean to be STEM literate? It means understanding the fundamental concepts and approaches used in science, engineering, technology and math—concepts such as the scientific method and how to frame and then solve abstract problems.

It also means grasping the extent to which these STEM skills are needed in a broad spectrum of careers, including the growing number of middle-wage jobs that require some college or credentials, but not necessarily a traditional four-year college degree. In adolescence, "you start developing ideas of what you're good at," says Yvonne de la Peña, Ed.D., director of learning and engagement for CodeNow, a nonprofit program that helps introduce less advantaged students to technology.

"If you never have the opportunity to try something like programming, you may never realize you're really good at it."

The question, then, is how do we expose all students to STEM—if a four-year degree, much less a career in technology, isn't on their radar screens? This question is especially critical in middle school and high schools, when students begin making their own decisions about what classes they take and what subjects they study.

More importantly, students may not understand the connection between STEM subjects and the future careers they are interested in. As part of AdvancED STEM Certification, we have reviewed and certified schools that have the qualities and components vital to creating and sustaining superior, student-centered K-12 STEM teaching and learning programs.

We have found that schools that weave technology into other subject areas in authentic ways and set clear expectations for student outcomes are helping their students make the connection between STEM and 21st century skills.

At Logan High School in Ohio, for example, students in advanced biomedicine classes investigate real-world medical problems by using data acquisition software to monitor body functions, including respiration and blood pressure, in a variety of settings. Along with getting hands-on biology experience, these students quickly learn the value of technology in what can literally be life-or-death situations.

Quality STEM programs like the one at Logan High School provide important benefits. They expose students to real-world science while encouraging students to think and work with the mindset of a STEM professional,

solving interdisciplinary problems that require problem identification, investigation and analysis.

As was the case with CodeNow alumni Wilfried Hounyo, these programs also help students understand just how pervasive skills like computer programming are, and the connections these skills have to everything around them.

"You can use coding for so much more than I realized," Hounyo says. Those of us in the technology sector are all too aware of the growing challenges of finding, training and retaining skilled workers. Ensuring that all students, not just the future computer science majors, are exposed to skills like programming could be the best way to broaden and improve skills within our workforce.

One of the most exciting approaches to bring more students into STEM fields is happening not in K-12 schools, but in the nation's community colleges that are establishing career and academic pathways to bring students into fast-growing career fields. By offering the growing numbers of students who attend two-year colleges a more cohesive and focused course of study in which they can gain academic and career skills in tandem, students can grasp why they need specific STEM classes—say, computer science to
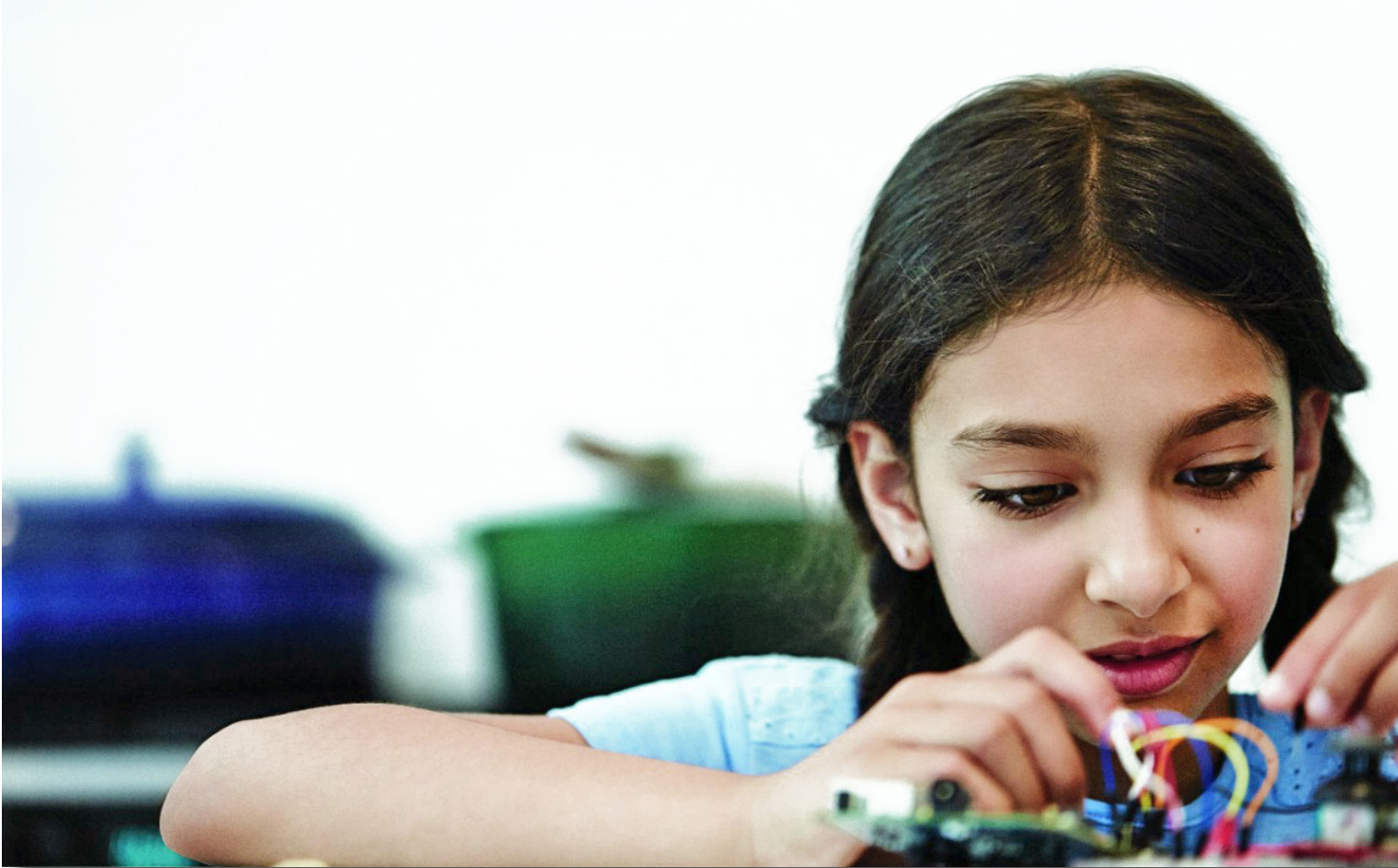
science to pursue a career in business operations, or algebra to become a civil engineer—to reach their career goals. Finding ways to do something similar in middle school or the early years of high school could help more students connect STEM skills to their own personal goals, resulting in a smarter, more STEM-literate workforce.

"I think every kid has their own special interest," Hounyo says. "If you can find a way to tie programming into it, it's a good way for them to learn it."

Our challenge, our opportunity is to help every student discover how STEM skills can be the foundation for success throughout their life no matter the pathway.

Every career needs STEM skills.

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