S.T.E.M.

MAGAZINE

November 2015
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STEM Innovations

A Math and Science Partnership Initiative in Northwest Indiana

Dear Educators,

Good news! We have received notification from the Indiana Department of Education that Year 3 of the MSP Grant STEM Innovations program has been fully funded. Congratulations and thank you all for your hard work and dedication in getting to this critical point in the grant process.

This notification means we can move forward with our important STEM work, including the lesson study experience, being led by Dr. Marion Hoyda, who will soon be contacting those of you who have expressed interest in participating in this portion of the grant.

As we enter the final year of the STEM Innovations program keep in mind the goals of the grant:

- To increase teacher knowledge and implementation of science and mathematics practices and process principals in STEM instructional units
- To help math and science teachers create STEM-focused instructional units that cross disciplines and take advantage of the application of algebra and probability and statistics in scientific study

We see these goals turning into tangible outcomes as we enter the final stages of the program and teachers continue implementing the lessons that were developed from the challenges at the previous summer institutes: Solar Bottle Bulbs, Waterwheel, Recycling-Let's Sort It Out, Concrete Planters and DNA Extraction. Keep the momentum going by introducing arguments in your STEM classes and writing assignments-another important element in growing your STEM students!

Your STEM Innovations Design Team is planning for another exciting year and will be in touch soon with information on what to expect in the final year of the program.

Your STEM Innovations Team

MERRILLVILLE COMMUNITY SCHOOL CORPORATION
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School City of Hammond · GCSC · MSD of Boone Township · School Town of Munster · College Acceleration Network · Purdue University North Central

STEM Magazine is a non-profit monthly education publication for teachers, students, their parents and administrators. CEO Wayne Carley is the publisher and senior editor for all content in S.T.E.M. Magazine.

We believe that the key to success in seeing higher graduation rates, improved testing results, student inspiration, creativity, excitement and career satisfaction rest 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, inspiration and creativity, the foundation of every career passion.

Wayne Carley
Publisher
STEM Magazine

School, district, county and state subscriptions are available.

To find out more, simply send your E-mail request to the E-mail address below.

You would have unlimited distribution to your teachers, students, parents and friends. STEM Magazine is also PDF printable and mobile device friendly.

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The five Stages of Innovation

1. People deny that the innovation is required.
2. People deny that the innovation is effective.
3. People deny that the innovation is important.
4. People deny that the innovation will justify the effort required to adopt it.

5. People accept and adopt the innovation, enjoy its benefits, attribute it to people other than the innovator, and deny the existence of stages 1 to 4.

 Inspired by Alexander von Humboldt's 'Three Stages Of Scientific Discovery', as referenced by Bill Bryson in his book, 'A Short History Of Nearly Everything'.

More STEM Activities, or *actual communication*?

Publisher

The typical American educator generally has very little time to add anything to their busy daily curriculum demands as testing looms on the horizon, so let's make this simple and fast.

As publisher of STEM Magazine, my primary concern remains the well-being and longevity of the educator. My question to myself is, "What does the reader need this month from us at STEM Magazine?".

Do you need more "STEM activities?", *which by the way are a dime a dozen using Google* or do we need to intellectually reach out and ask about the interests young students already have or do not have?

Many of our articles refer to the adolescent brain and how it learns, retains and recalls information for future recall. Maybe that is a huge part of the "STEM Interest" equation....the brain.

What if STEM activities are not the best tool to accomplish STEM interest for the majority of our students?

Could it be that students already have interest's and curiosity in career paths but not the opportunity to ask questions about them in the typical classroom environment?

If per chance the average parent was not up to speed on STEM and a large portion of American educators have a limited or incomplete understanding of what STEM really is, who will the students turn to in exploration of their curiosity and dreams of a future job they will love? I wouldn't expect an elementary student to have the level of will and determination to do this on their own, and as students enter adolescence, so many other hormonal influences begin to interfere with mental processes and focus as the daily grind of school continues without pause.

So many of the curriculum skills necessary to prepare for advanced STEM careers must be pursued and accomplished prior to high school and the teenage years can become full of everything BUT curriculum preparation.

As STEM Magazine continues to chase the hundreds of thousands of educators who don't think they need to be concerned or aware of STEM because they don't teach at a STEM school or don't teach math or science, I can only repeat once again,

"Every career is a STEM career and every teacher is a STEM teacher".

Pick any career field and you will find it full of daily STEM applications to some degree or another..... including being an educator, which by the way is a STEM career.

Here is my "STEM activity" for you and your class this month:

1. Have your students take 3 minutes of class time to write down what they are most interested in (at this moment anyway) as a possible career.

You can spare that time and this applies to every grade level. Have them turn those in to you with their name on it. *If the page is blank, that student needs a mentor right away* to help them find a path of interest. It's there, but may simply be unrealized or assumed to be frivolous.

2. As an easy and "important" week-

end assignment, have them briefly define (and probably Google) how that job uses:

Science (best definition: the systematic accumulation of knowledge)

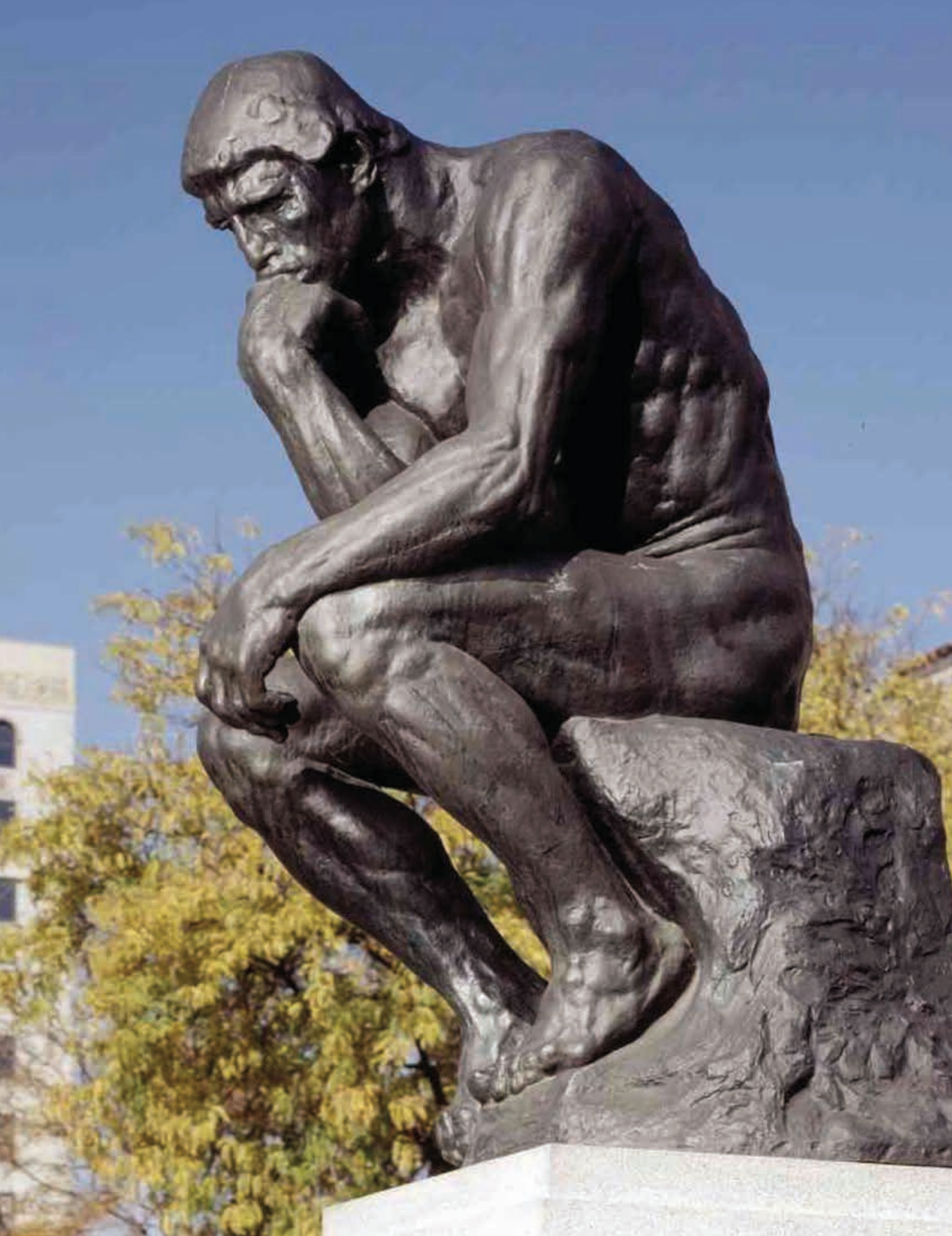
Technology - easy one.

Engineering- (The Engineering Method: a decision making process)

and **Math** (what kind of math?)

3. You need to read these the following week for your benefit and theirs. If the assignment is complete, you've accomplished more than you know in regard to presenting STEM as a necessity for every student and brought invaluable awareness to the student and you about the "true meaning" of STEM in everyday life....both yours and theirs.

The most important STEM activity students can participate in is **"thought"**....thought about what keeps their interest, causes curiosity, questions the requirements to pursue it and evaluates their will and determination to follow that path.



Mike Rowe - A Real-Life Tradesman in action

by Wayne Carley

For years now, T.V. celebrity Mike Rowe has participated weekly in every dirty job you can imagine, many of which are what we at STEM Magazine consider to be non-traditional STEM (science, technology, engineering and Math) careers, but STEM careers none the less on a daily basis.

As the labor crisis continues and skilled tradesmen and women are desperately needed in a vast variety of jobs, from welding, electricians, heating, and environmental careers to name a few, Mike Rowe continues to support, encourage and highlight these non-traditional STEM opportunities that are in serious demand.

The good news is that these shortages often require as little as an apprenticeship, trade school, tech. program or 2 year degree which can be very affordable and lucrative in addition to filling this tradesman need.

Mike always has opportunity to participate with many of these hard working American men and women

in their chosen career fields to once again get a real feel for what hard work is and show his support in getting your hands (and most other body parts) dirty to make a great living and provide a real service to their communities.

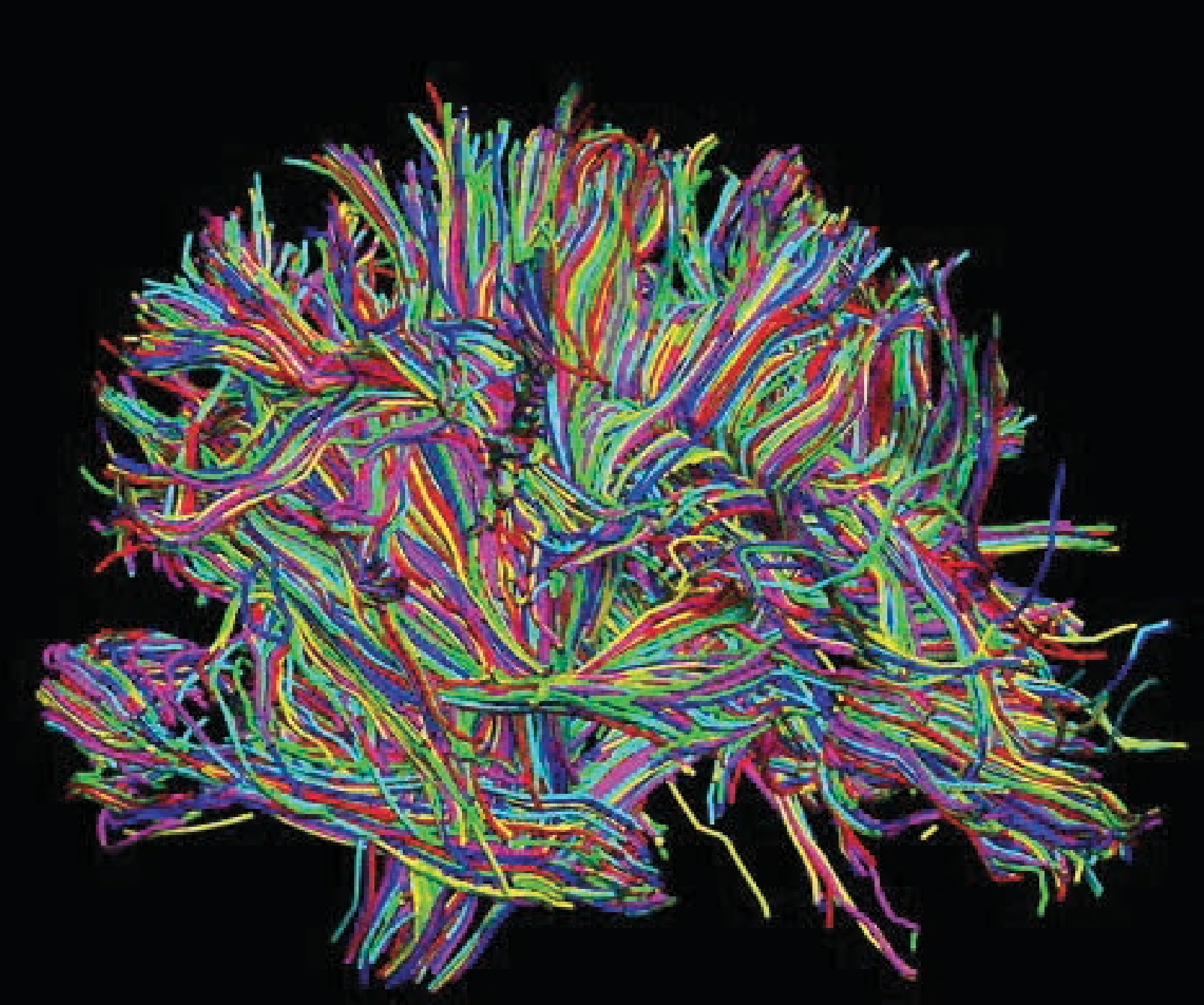
MikeroweWORKS is dedicated to helping close the "Skills gaps" and continues to receive generous support to fight this cause. The need for skilled labor in heating and air, plumbing and building electricians is soaring well beyond thousands of immediate openings in small and large companies nation-wide.

These are considered non-traditional STEM(S) jobs but can easily provide a chance at a six-figure salary. Mike would like to see an "S" added to STEM to represent "skills" which would certainly be deserving.

Being your own boss can be a dream come true or a long-term career that can easily evolve. "The fact that so few people are currently trained to do the available work is something close to a crime, and the fact that more people aren't lining up to get the necessary training is preposterous", said Mike." I'm pleased to help spread the word about these and other opportunities available within these career fields.

I admire Mikes exploits with the real working class in the trenches is they are not actors, but authentic tradesmen who hope to reinvigorate the trades, inspire more young people to master a long list of useful and needed skills to fill "The Skills Gap" before I have to do it myself.

You won't get lip service from Mike, but rather knuckle banging, sweating, even disgusting reminders that America runs on back-breaking labor that pays great, provides real personal satisfaction and makes my own life much more comfortable. My sincere thanks to the tough guys and gals in the pits and the overwhelming support both in word and action of Mike Rowe.



Dr. Judy Willis

Neurologist

How to Rewire Your Burned-Out Brain:

Tips from a Neurologist

The holiday breaks are just around the corner and with those comes a likely drop in the stressors that build up and promote teacher (and administrator) burnout. It therefore may seem timely to suggest interventions to prevent or reduce burnout. However, it is often not until we are away from a high-stress situations for a while that the brain can move out of reactive survival mode and into a relaxed state where it can ponder the big picture.

The burnout interventions I am about to suggest are likely to be ones that you already know. The problem is, when it comes to adding another activity to your schedule, past experiences may have left you with the expectation that there is ***not enough time*** -- or you've tried things like this before and didn't notice any change. So you stopped.

My belief is that when you understand what happened in your brain to build up the hopelessness and frustration of burnout, you'll connect with the logic of the interventions. Then, with the addition of the video game model to the boost the neurochemical benefits of the activity of your choice, you'll literally deconstruct the resistance network your brain constructed, and reset your circuits of confidence and motivation.

Know It's Not Your Fault

Teachers often blame themselves for problematic student behavior, failure to "cover" every standard, and not differentiating instruction to suit the needs of each student. Know that you are not alone, but part of a growing majority of educators questioning their abilities to continue teaching. You are teaching at a time when it takes profound commitment and creativity to meet expectations. There is pressure to teach excessive quantities of information and differentiate instruction to meet the needs of all students -- yet the supporting resources needed are dwindling.

Burnout feelings are not a reflection of your teaching skills. Teachers who question their ability to do their jobs properly are often among those who hold themselves to the highest standards. They also put in the greatest effort. When they must deal with external forces -- beyond their control -- that limit their ability to attain their goals, self-doubt builds, confidence drops and burnout sets in.

If You're Burned Out, Your Brain Has Rewired to -

Survival Mode

What I offer from the nexus of my dual careers as a neurologist and classroom teacher are interpretations and correlations from the neuroscience research to teaching and learning. Neuroimaging studies reveal the metabolic changes in regions of the brain where activity increases or decreases in response to emotional or sensory input.

There are specific and reproducible patterns of changing neural activity and brain structures associated with stress. In the high-stress state, subject's scans reveal less activity in the higher, reflective brain and more activity in the lower, reactive brain that directs involuntary behaviors and emotional responses.

Prolonged stress correlates with structural increases in the density and speed of the neuron-to-neuron connections in the emotion-driven re active networks of the lower brain, and corresponding decreased connections in prefrontal cortex conscious control centers.

The explanation of these changes is generally attributed to the brain's neuroplasticity of "neurons that fire together, wire together." The brain literally rewires to be more efficient in conducting information through the circuits that are most frequently activated.

As you internalize your thwarted efforts to achieve your goals and interpret them as personal failure, your self-doubt and stress activate and strengthen your brain's involuntary, reactive neural networks. As these circuits become the automatic go-to networks, the brain is less successful in problem-solving and emotional control.

When problems arise that previously would have been evaluated by the higher brain's reasoning, the dominant networks in the lower brain usurp control.

Reset Your Brain's Default Neural Network from Retreat to IGNITE!

The good news is that you can apply what you now understand about your brain's survival mode to take back voluntary control of your choices. You can activate the same neuroplasticity that gave dominance to the lower brain networks in the burnout state to construct a new, stronger default response. With more successful experiences achieving goals, you can reset the circuits that will direct your brain to access its highest cognitive resources for creative problem-solving. You can build up new, improved circuitry, switching your responses from retreat to IGNITE!

Since a repeated pattern of effort-failure set up the brain's survival response to withhold effort, you'll need to strengthen the pattern of effort toward goals can result in success. Your weapon of mass reconstruction can come from your brain's very powerful drive for its own neurochemistry --
dopamine and the pleasure it brings.

The plan to guide you comes from the video game model that works

because of three components: buy-in, achievable challenges, and frequent awareness of incremental progress en route to the final goal.

See these resources for a full description of the video game model:

- A Neurologist Makes the Case for the Video Game Model as a Learning Tool

- How to Plan Instruction Using the Video Game Model

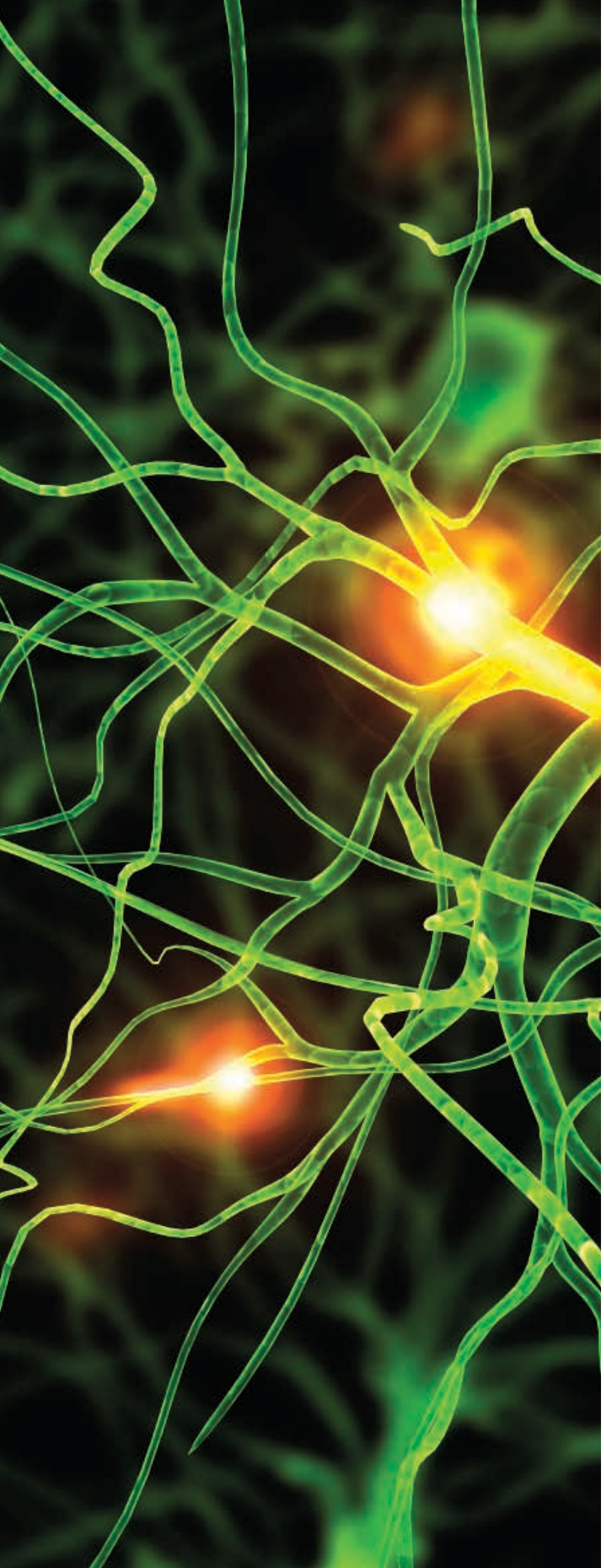
The fuel that motivates the brain to persevere through increasing challenge, even through failed attempts, is dopamine. This neurochemical produces the pleasure of intrinsic satisfaction, and increases motivation, curiosity, perseverance and memory. Dopamine is released when the brain makes a prediction or achieves a
challenge and gets the feedback that it was correct. This can be in situations from the "Ah, I get it!" of figuring out a joke to the satisfaction of completing a marathon.

Just as the video game model can be applied to building a growth mindset in students, the same model can help rewire your mindset regarding your ability to achieve teaching goals at school. As in the video game model, to get the dopamine-pleasure response from challenges achieved, you'll need to plan for your brain to experience frequent recognition feedback of incremental progress. You should set your "rewiring" goals by their desirability and by the goals' suitability to be broken down into clear segments.

This way, you can chart your goal progress as you achieve each stepwise challenge. The pleasure burst of intrinsic motivation that will accompany your recognition of each progressive increment achieved in the goal pathway will keep your brain motivated to persevere.

Goal Buy-In for Your Brain's Neural *REWIRING*

Buy-in and relevance are important in choosing your rewiring goal. Since your goal is to rewire your brain's expectations that your efforts will yield progress, even through increasing challenge, you need to really want the goal. This is not the time to challenge yourself with something you feel you should do but won't really look forward to doing, such as dieting, climbing stadium stairs, or flossing after every meal. Select a goal that you would enjoy en route



and at the finish.

Usually goals are tangible. Some are visible, such as planting a garden or making pottery on a wheel. Others are auditory, such as playing an instrument, or physical, such as learning tai chi. But your goal can also be the increased amount of time you sustain an activity such as journaling, practicing yoga or sketching.

Sample "Rewiring" Goals

You'll find your own goal for buy-in, but here are some examples to give you a sense for how to structure your new goals.

Physical Goals

Notice I didn't say exercise. That's not as motivating as "training" for a physical goal you want to achieve, even though they often overlap. If you want to run a 10K, and if you enjoy running, the goal for achievable challenge could be first building up to the distance starting with the baseline distance you comfortably run now. Then plot out the increments that you'll consider progressive successes, such as adding .5K a day or a week. The increments will depend on what you consider both challenging and achievable. Once you reach 10K, speed can become

the next goal, again plotted out in segments of incremental progress before you start.

Archery

Possibly after seeing The Hunger Games, archery has new appeal. Again, plan your stepwise achievable challenge increments. As you get better in accuracy, move farther back. Record your results, noting the distance of each improvement you set as an achievable challenge.

Learn a Language

Try this one only if the buy-in is strong enough, such as definite plans to go to a country where the language is spoken.

Videography / Photography

If it appeals to you to make high quality videos or PowerPoints using advanced computer software, go for an early success, such as the videos you can make on www.animoto.com

Your Rewired Brain's Default Changes from Defeat to Ignite

As you meet your incremental goals and have repeated experiences of dopamine-reward, you will literally change your brain's circuitry.

Repeated effort-reward experiences promote neuroplasticity, and this makes a neural network that expects positive outcomes into your new default network. This is because your "rewiring" goals helped your brain build stronger and more connections into a memory pattern where effort brings pleasure. As with other networks not used, the previous lower brain stress-activated go-to response network you developed, the one that caused you to react to problems, will be pruned away from disuse.

You'll be rewired with optimism and renew your positive expectations. With your higher, reflective brain back in control, you'll be able to access your perseverance, innovation and creative problem-solving when you return to the classroom. Just be sure you take time to recognize each small success and creative problem-solving opportunity.

Keep up the habit of breaking down big challenges into opportunities for recognizing incremental progress and receiving your well-deserved dopamine reward. The brain needs that battery recharge to sustain the positive expectations that motivate continued effort -- so that you can stay engaged and move to the next step toward your teaching goals.

Remember that you have unlimited distribution to teachers, students and their families within your school.

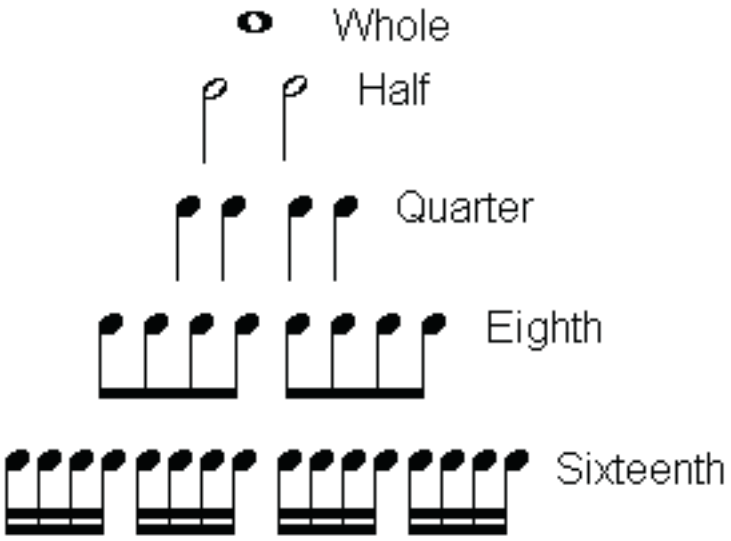
It's a great connection and cool conversation piece....especially over the holidays.

Mathematics, Music and Movement

Part 2

Engaging All Students Inside the Mathematics Classroom

A white paper by **Dr. Gina Cherkowski**



Music and Math

Historically, it has been assumed that there is a strong connection that exists between music and mathematics (Vaughn, 2000) however, many people fail to see the connection.

Recently, there has been a significant and increasing amount of literature bringing awareness to the strong connections between music and math (Hoch & Tillman, 2012).

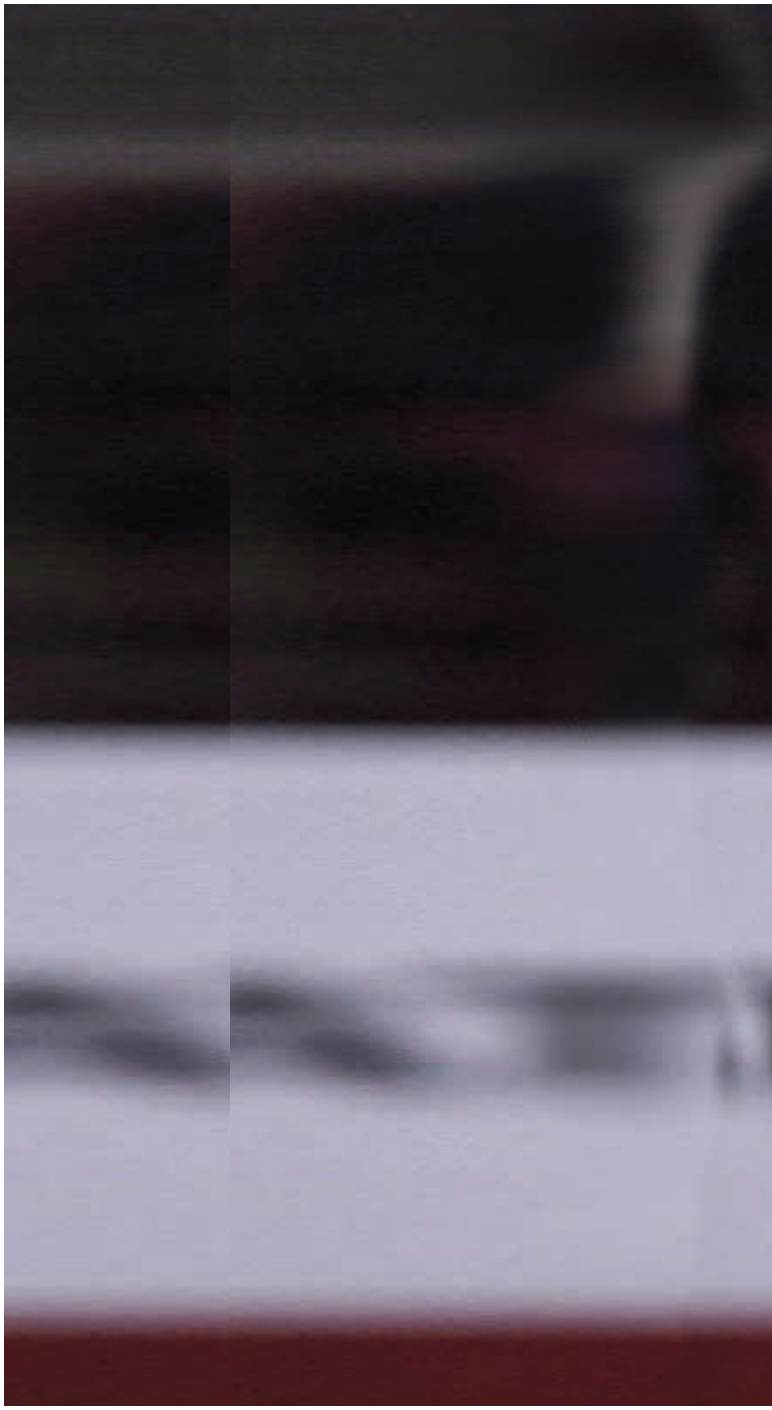
This explosion of research is promising as it supports previous assertions that music has a positive effect on one's ability to learn and do math (Gardiner, Fox, Knowles & Jeffery, 1996)

Music, *Movement* and Other Important Math Skills

In addition to facilitating spatial skill development, increasing sequential skills, and enhancing fractional reasoning, learning math through music combined with movement (dance) has been found to be particularly beneficial for students as they learn math (Schaffer, Stern & Kim, 2001). For example, according to McCutchen (2006), when students participated in a dance based math class, students' attitude towards math students improved and they scored much higher than the students who were in the more traditional, non-dance based math class.

In addition to improving attitudes towards math, dance has been found to be an innovative way to teach students the fundamentals of mathematics in a ways that helps students see and understand these ideas. Dance provides students with basic intuition about the abstract and sometimes hard to grasp concepts found in math. For many students, dancing enables them to apply an abstract mathematical idea to a more familiar real-world context which they can see, feel, and experience.

When students experience math through dance, this makes math more accessible and engaging for many students (Wasilewska, 2012). According to Kokona, (2009), "Culture and Arts can help practi-



tioners train and develop a further understanding of Dance Mathematics principals,"

Many people find it strange to combine dance with mathematics as they see math as a realm of rationality that limits expression and creativity while dance is seen as a form of free expression that is highly creative.

However, upon closer inspection we can see a lot of connections and commonalities between math and dance.

For example, there are a lot of mathematical ideas that can be found in dance such as time and space, rotation, number, geometry, patterns, sequence, number, and even graphing (McCutchen, 2006). Research suggests that dance has been found to be highly beneficial for understanding mathematical concepts like combinatorics, symmetry, geometry, and patterning (Schaffer, Stern & Kim, 2001).

Additionally, abstract mathematics and various methods of analysis can be applied to help dancers of all skill levels understand dance at a much deeper level. Many choreographers often create their dance pieces based on intuition and feeling however, it has been suggested that being explicitly aware of the mathematical principles they are applying might help them with the creative process (Wasilewska, 2012).

Conclusion:

STEM + Arts = Opportunities for all

Math is a critical and necessary skill for all students in today's technologically-advanced, data-rich world. Students who are not mathematically literate will be greatly disadvantaged in this future world.

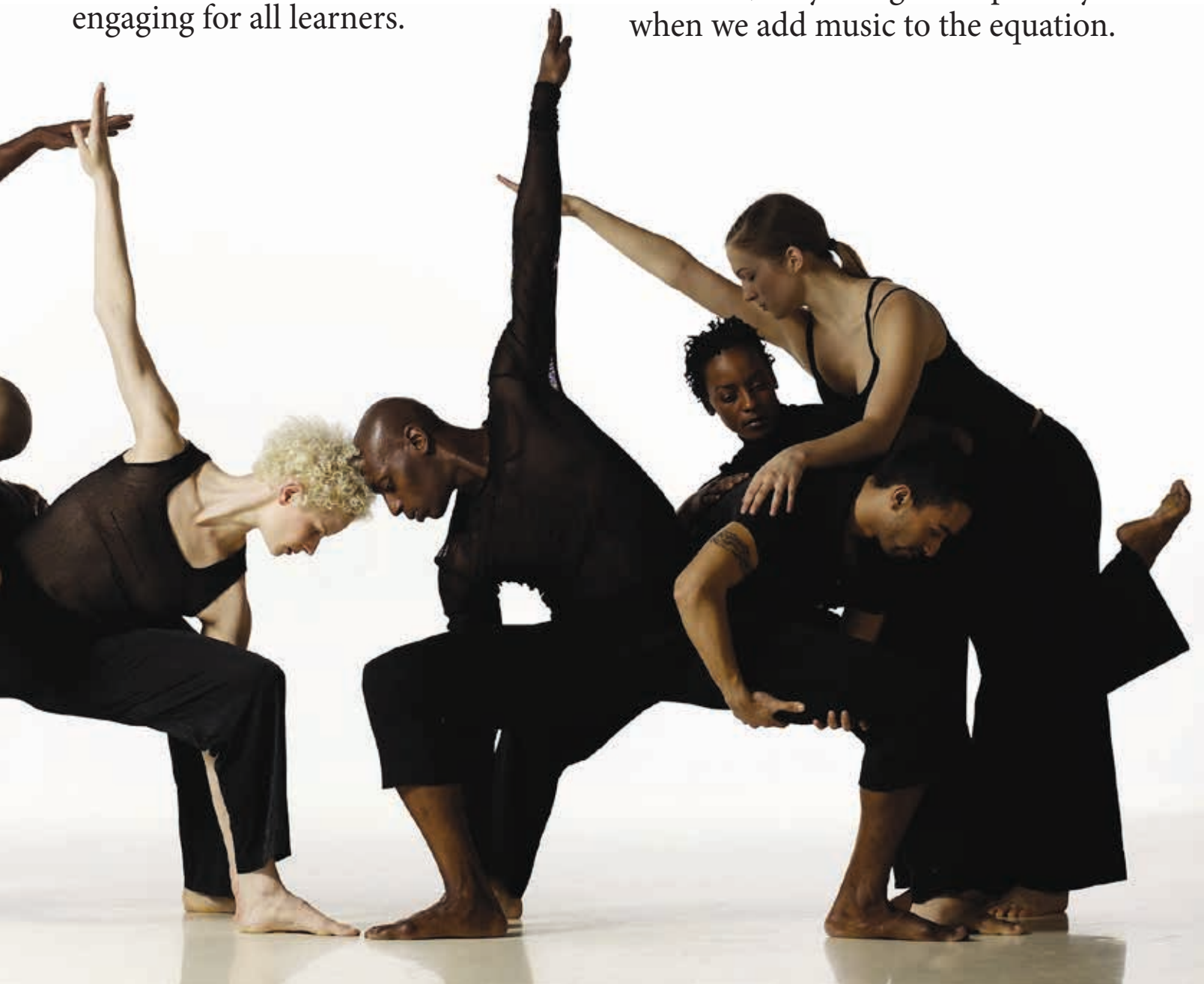
Consequently, it is unjust not to give every student the opportunity to be mathematically literate so they can be optimally positioned to be a full and active participant in their future. Since neuroscience tells us all students can do math at high levels, (Boaler, 2012), we know this goal is not only a nice dream, it is in fact attainable. Therefore, society must ensure all students can access the

mathematics easily, effectively and in ways that allow them to understand it in their own way.

This white-paper argues that combining music and movement with math is one way to help achieve this critically important and timely goal. Adding music and movement to mathematical learning removes barrier of entry for many students, provides meaning and context, and makes learning math fun and engaging for all learners.

Additionally, learning math through movement and music helps allows math concepts to no longer remain abstract and disconnected from students' real world experiences.

Through the integration of the ARTS (music, visual arts, and/or performing arts) with math students get to feel, experience, understand and embody math. As research has shown us, if students feel it, see it, and do it, they will get it especially when we add music to the equation.

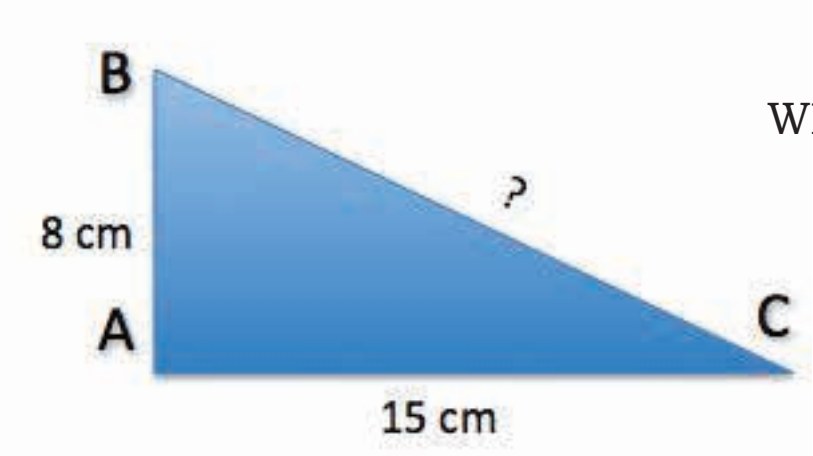


Math Challenge by Grade

4th Grade Question

Which number will be served next?

- 7100
- 7910
- 899
- 800



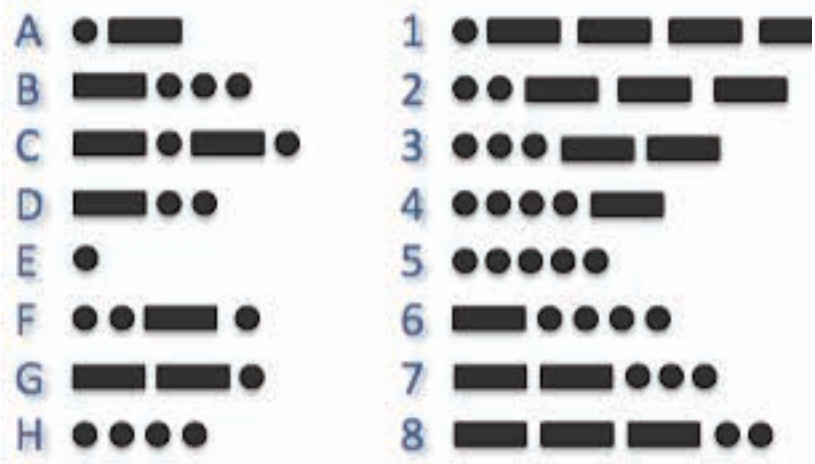
8th Grade Question

What is the length of BC?

10th Grade Question

In Morse code, each symbol is either a dot or a dash.
How many different sequences of 8 symbols are possible?

- 800
- 88
- 256
- 64



How STEM Is *Advancing* A Jobs-Driven Economy

Talmesha A. Richards, Ph.D.

Science, technology, engineering and math are at the heart of the 21st century's jobs-driven economy.

The gap

According to the U.S. Department of Commerce's Economics and Statistics Administration, growth in STEM jobs was three times greater than that of non-STEM jobs over the past decade. 71 percent of all jobs in the United States will require STEM skills by 2018 and, today, there is one unemployed STEM worker for every two STEM job openings.

In spite of the billions of dollars being spent on STEM education and programs across the nation, scores of students are not prepared for the STEM workforce.

Shifting education

Gallup and Lumina Foundation published a study in 2014, entitled ***"What America Needs to Know About Higher Education Redesign."*** The report noted that only 11 percent of business leaders strongly agree that higher education is graduating students with the skills needed

for success in the workplace.

This reality is challenging education institutions and companies to train an increasingly technical workforce. Utilizing an employer's perspective, we must focus on bridging this skills gap while placing a particular emphasis on increasing diversity and encouraging young women and girls to pursue and persist in STEM careers.

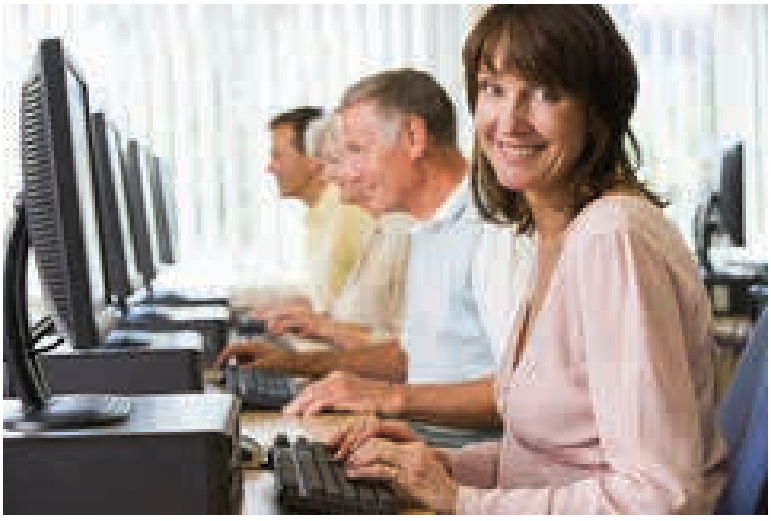
This process of bridging the gap will require the collaboration of multiple stakeholders in STEM education: academic institutions, companies, non-profits, policy organizations and government entities. Aligning corporate, education, and community partners requires that we reevaluate and redesign the system that supports STEM education and workforce preparedness.

Early exposure

Our focus must be on the entire pipeline from kindergarten through careers, with an emphasis on retention as well as recruitment. A few key elements of effective STEM partnerships include K-12 outreach, internships, apprenticeships, mentoring, peer support and course redesign.

Exposing students to hands-on STEM experiences and opportunities where they pioneer solutions will assist in equipping them with the skills and competencies that companies demand. Providing those already in the pipeline with the necessary support—mentoring, sponsorship and work-life balance—can increase retention in STEM careers.

Together as a community, we can lead a STEM workforce revolution and meet the training and educational needs of the global STEM workforce. The sustainability of our schools, the innovative engines of our businesses, the prosperity of communities and the global competitiveness of our economies are at stake. We must act if we do not intend to be left behind.



"How will Senior Adults Define my Career Choice?"

By **Dale Keshishian**
Founder and CEO of HealthWorks Academies

As many people do, I was lucky enough to have a very close relationship with my grandmother. When I was a little girl, I would stay at her house every Saturday night. It was a tradition for us to stay up late and watch movies on television, something I wasn't allowed to do at home. When I was coming over, she would go out and buy my favorite caramel popcorn for us to eat while watching our favorite programs. She was a creative, funny and truly inspiring woman, and I loved her very much.

For as long as I can remember, my grandmother suffered from asthma. I remember feeling so helpless when she got sick and it became unbearable to watch her struggle just to breathe.

The day after I got my driver's license, she called in the middle of the night and asked me to take her to the hospital because her inability to breath had gotten so severe.

Thinking back on this part of my life, I often wonder if she is the reason I have spent my career in healthcare. By 2020, this country will have 74 million seniors. Ten thousand people turn 65 each day, and that rate is expected to continue through the year 2030! In today's age, people are living longer than at any time in history, so the percentage of the population over the age of 65 will continue to expand.

The needs of seniors and the demand this places on the healthcare system are dramatic. It means we will need many more healthcare professionals in traditional roles, particularly as the healthcare workforce ages. We will see emerging careers as well, as the industry transforms to satisfy the demand of the seniors and improve health outcomes.

Clinical pharmacists, professionals who expand the capabilities of physicians to help patients manage multiple medications for many different medical conditions, will be in great demand. More nurse practitioners and physician assistants will

be needed as well as specialists in geriatric medicine. Nutritionists, physical therapists and diabetic nurse educators will also be in demand as the population ages and chronic disease like diabetes continue to rise.

When we consider the needs of seniors, and the sheer numbers we'll be facing as a nation, we must also consider that we will have to do some things differently. Housing, transportation and assistance with daily living will undergo dramatic change. Home care professionals will be certified with a career ladder and will be active participants in the healthcare team. Maintaining individuals in their homes and as independent as possible will be critically important. The cost of institutional care is roughly double compared to providing services and keeping seniors at home, where they want to be.

We can anticipate an explosion of technology to assist seniors to remain independent, manage medication and stay safe at home. Professionals will need to monitor and maintain technology. We'll also need people to analyze and report data to constantly improve services.

If there is ever a time to be excited about a STEM profession, this is it! There are so many opportunities to match interest with market demands. Careers that serve to meet the needs of seniors and help them live healthy, independent, active lives will provide a long, successful and satisfying career.

Nursing is a GREAT STEM Career

Safe Science at Home

James A. Kaufman, Ph.D.
President/CEO / Laboratory Safety Institute

How safe are the science experiments that children do at home? For three families in Bethesda, Maryland the answer to that question, tragically, was "not safe enough." On New Year's Eve, four boys were killed in the garage of a Brazilian diplomat's home experimenting with explosives. Two of the teenagers died instantly in the explosion. The other two died in the hospital from injuries sustained in the 3am incident.

This unfortunate tragedy raises questions about the safety of home science experiments. It makes us want to ask "what can parents, children, and teachers do to make home science be safe science?"

Examples of problems are far too prevalent. In Rhode Island, two boys were burned when a science fair project overturned while being transported on the school bus. The caustic solution injured both the student carrying it and the boy sitting next to him.

In a separate incident, several school children were injured when a model volcano exploded while being demonstrated at a school bus stop. The project had been successfully demonstrated at school during the day.

However, on the way home, the bus stop demonstration did not have the same happy ending.

There are three common ways that science experiments end up being conducted at home.

(1) The school suggests or requires a project.

(2) The child is given a toy or kit that involves science experiments.

(3), the child decides to try something on her or his own.

In each case, there are a few simple and inexpensive precautions that should be observed. These precautions will help to ensure that home science experiments continue to be enjoyable and positive learning experiences.

We can learn two important lessons from our country's major chemical companies. First, in their research laboratories scientists are not allowed to work alone. As with other potentially risky activities, such as swimming or skiing, working alone is a bad practice.

Second, these research scientists do only those experiments that are

approved.

This means that the health and safety consequences of new experiments are thoroughly reviewed and discussed before the experiment is conducted. If it can't be done safely, they are not supposed to do the experiment.

Parents need to supervise their children's home science activities. For experiments arising out of purchased toys and kits, only the published experiments should be performed. And, for experiments originating from their child's school, clearly written procedures should be provided so that parents can be

Why are children doing unsupervised and unauthorized experiments?

In fact, they shouldn't be. Children need to be taught by their teachers and their parents that they should not work on science experiments without adult supervision. And, they also need to be taught the importance of conducting only approved experiments.

Both parents and teachers have a role to play in encouraging safe science in the home. Parents have several important responsibilities. Clearly, it is important that they teach their children these two golden rules of science safety:

1. Don't experiment without adult supervision.

2. Only do approved experiments.

confident that what the child intends to do is appropriate.

When parents have doubts or questions concerning the safety of a particular experiment, they should contact a science teacher at their local school.

Teachers also should play a key role in making sure that home science is safe science. First, they need to store chemicals and equipment securely. Children do continue to take these and it's the schools' responsibility to see that they are not easily accessible.

In Connecticut, an honors student was taking chemicals from an unlocked chemical stockroom and storing them in his locker before taking them home to his lab. One morning, his locker exploded and eight

students were injured.

Two boys were injured in an explosion in a New York school. The explosion took place while the boys mixed chemicals in the stockroom after being sent there as a disciplinary action by the science teacher. One boy may lose the sight in one eye.

Two Massachusetts college students were stealing chemicals from the college's stockroom and making rocket fuel in the basement of their dormitory. After several successful launches on the front lawn of the dorm, something went very wrong. One morning, during the loading phase, the fuel mixture exploded and both boys were seriously injured.

The chemical stockroom must be kept locked at all times and students should not be allowed to enter without direct teacher supervision. Teachers and their schools are, in fact, liable for the health and safety of their students when science projects are assigned as part of the curriculum.

If students are expected to do a science fair project, the school is responsible for the project even if the work is done at home. Therefore, teachers need to carefully review each of their student's experiments to help ensure the issues of health and safety are carefully considered.

The Laboratory Safety Institute recommends that science teachers use a rules agreement as part of all school science projects that will be conducted at home (and at the school).. This agreement lists the safety precautions that should be observed.

Student and parents are required to sign a statement that they have read, understood, and agree to follow these precautions before the school allows the project to start.

A sample rules agreement is available from the Laboratory Safety Institute on request. Email your request to jim@labsafetyinstitute.org


iPad
9:41 AM
Messages
FaceTime
Photos
Camera
Maps
Clock
Photo Booth
Tuesday
23
Calendar
Contacts
Notes
Reminders
Newsstand
iTunes
App Store
Game Center
Settings
Safari
Mail
Videos
Music

Mobile Devices for Schools Generating 'Huge Momentum'

by Benjamin Herold

By the next academic year, mobile devices will be available for 1-to-1 computing for half of the U.S. K-12 student and teacher population, according to Futuresource Consulting Ltd, a U.K.-based research and forecasting company. In fact, by the calendar year 2016, 54 percent of students and teachers will have access to a school-issued personal computing device.

"We see huge momentum in development" of mobile devices for U.S. schools, said Michael J. Fisher, associate director of Futuresource's education division. "It's a massive opportunity for all platform and publishing providers, on the back of device sales."

The projection is part of Fisher's "Personal Computing in K-12 Q4 2014 Market Track Report," to be released Wednesday. Next year, the company predicts a 10 percent growth in mobile devices in the United States alone, and a 12 percent growth globally.

Predictions come despite some K-12 officials approaching expensive new technology projects with caution in the wake of a number of high-profile mishaps in districts. Just last week, Los Angeles Unified School District Superintendent Ramon Cortines announced that his district cannot afford to provide computers to every one of its 641,000 students, as well as staff and administrators.

Globally, the market for mobile computing devices in K-12 has been heating up, increasing by 18.3 percent in 2014, compared to 2013. In the U.S., the numbers are even more dramatic, with a 40.5 percent annual growth rate over that period, driven

by the technology requirements associated with the common-core standards and tests and the overall move to online assessments, according to Futuresource.

Chromebooks—which commanded 39 percent market share in the U.S. in 2014—overtook Apple's iPads, at 26 percent, as the bestselling device on the market last year, the report found. More than 3 million Chromebooks shipped in 2014, according to Futuresource statistics.

"Chrome has absolutely flown," said Fisher in a phone interview. "It has an attractive price point" for districts that need to prepare quickly for online assessments, he added.

While Chromebooks have a strong presence in the United States, they are less in demand globally, where tablets are preferred in developed markets, especially Western Europe, he said.

Fisher said it will be important to keep an eye on the potential growth of so-called "2-in-1s," convertible computing devices that can act either as tablets or laptops, depending upon whether the keyboard is attached or not. Trends are being tracked in as many as 46 countries around the world, looking at how governments are increasingly wanting to influence the skills of their workforce through major investments in school technology.

Publisher comments:

In my experience having taught in hundreds of schools over the past decade, mobile devices "can" often become more of a distraction in the classroom rather than a valuable resource. You don't "have" to allow them.

Cell phones can be the worst offenders due to texting abuse during class, but controlling internet access on other devices is certainly a must for everyones protection and positive experience.

School policies allowing cell phone use in class as a "resource" may be hazardous to the classroom environment. You decide.

S.T.E.M.

S.T.E.M. you've already used today.

Science:
Many adults and students would have had to take a medication this morning in direct response to the physiology of their body that requires it; Advil, antacid, vitamins, caffeine, blood pressure meds, and the list goes on. Breakfast....no breakfast, what do you need to get the morning going. That's science.

Technology:
Our digital alarm wakes us up. We've checked the morning E-mails, watched the news on T.V., used our car or bus to get to school, perked our digital coffee, made a call or text message on our cell phone or maybe even tweeted already.

Engineering:
Since this is a "decision making" process, we've evaluated what needs to be done this morning before lunch, before the end of the day, and before bed. It's been prioritized, evaluated, compensated for, changed and then re-evaluated.

That's engineering.

Math:
It started last night. You had to make mathematical calculations about what time to set your alarm based on the time needed for a shower, hair prep and make up (NOT IN THE CAR), pick out clothes or estimate dryer time, time to eat breakfast or stop for something on the way.....so based on all of that, you calculated the estimated time requirement and set your alarm accordingly.

Life is S.T.E.M.

Te

A **STEM** career we ***really*** need.

acher

One question I always ask during STEM presentations to students at schools is "How many of you are considering becoming a teacher?" The average response in a group of 60 students is one….or worse. When asked why, student replies vary from "I could never put up with teenager behavior", which is interestingly honest, to "The work is too hard and he pay is terrible"; another accurate evaluation.

You ask, *"Why is the dropout rate of teachers higher than student dropout rates per capita?"*

Like many careers, we are ill prepared in college for the realities of the career that has captured our hearts. Been there….done that. I'm not suggesting a solution but hope to enlighten you regarding the reality that no matter what subject you teacher, you are a STEM teacher already.

Science: Every teacher is a scientist by definition. Two definitions that every teacher uses:

1. Systematized knowledge in general.

2. Knowledge, as of facts or principles; knowledge gained by systematic study.

Name a class subject, sport or career that does not use systematic learning.

Teachers are required to plan their curriculum to follow specific state and national standards. They rarely get to teach what they want or what's really needed. They follow a path of knowledge progression that continues based on past subject knowledge presented and required.

This could apply to history class following the course of the French Revolution, American History of the industrial age and its progression….. you name it.

Math is easy to include in our discussion because it's the basic language of science and grows from basic addition to algebra and on to trigonometry, physics and more.

Language Arts or English class are also a system of progressive knowledge following specific guidelines of proper grammar, the roots of words, proper use and combination of nouns, adjectives, verbs, poetic format, story format, specific writing styles and so on; all science based systematized knowledge. You ARE a scientist, not by career but in practice.

Technology: Every teacher is a technologist to some degree, from computers, iPads, cell phone, projectors, calculators, web searching, Twitter, Facebook, excel, Word, and on and on. (software counts too) This is an easy one.

Aside from the fact that every teacher uses computers or devices daily to research, plan and present subject curriculum and then store that information on a hard drive,

*This is critical for educators

thumb drive, the cloud or school server, every student in every class is expecting to use technology to successfully meet subject requirement, homework assignments, communications and test preparation. If they don't understand the technology application needed, that teacher, regardless of the subject they teach, is expected to explain its use.

to remember. We MUST stay current on technology innovation and applications. Our students are, and will continue to utilize them, even if we do not expect to use them in our own class. As with all teaching, we have to stay at least one step ahead of our students. You ARE a technologist, not by career but by practice.

Engineering: Every teacher is an engineer by definition.

By far my favorite subject of the STEM acronym and a topic STEM Magazine continues to beat into the ground, the Engineering Method is used daily by both teacher and student, usually without their knowledge….until now.

1. to plan, construct, or manage. She engineered several big class projects.

2. to design or create using the techniques or methods of engineering:
The assignment was thoroughly planned considering all of the requirement and outcomes.

3. to arrange, manage, or carry through by skillful or artful contrivance:
He certainly engineered the class project beautifully.

For every teacher in every subject, the decision making process known as the Engineering Method is useful, critical and natural. From writing a term
paper, finding a ride to basketball practice, picking a date for the prom, to choosing our next job, what college to go to or what to wear to that special event, decision making happens.

1. *What is the problem?*
2. *Consider / list possible solutions to the problem*
3. *Test / consider / think through each possible solution*
4. *Evaluate the effectiveness of those possible solutions*
5. *Choose the best solution to implement*

This process is used in personal relationships, at work, at school and in our personal lives. To some degree, we are all engineers by behavior even if we are not building space ships, bridges or a new artificial heart. You ARE an engineer, not by career but in practice.

Mathematics:

Every teacher uses math daily….like it or not.

For most teachers regardless of subject, daily math applications include basic calculations, measurement, estimation,

logic, statistics, analysis, graphs, probabilities and I'm sure a few we've never heard of. If you use any of these often and well you would be considered a mathematician by definition, not by career, but in practice.

As teachers, we should be students continually. What better example to our students than to be excellent students ourselves. How many of us have uttered the words, ***"I learn more by teaching than any other method."*** What have you learned lately…..hopefully today?

My request or challenge to everyone reading this article is to share it or print it out and give it you a colleague or student who's convinced STEM isn't relevant to them or their subject. We are STEM creatures by nature and understanding that opens every door imaginable to any career we wish.

Within your subject area,you are an expert and a professional. Not only that, but you are a S.T.E.M. teacher in general and in a S.T.E.M. career.

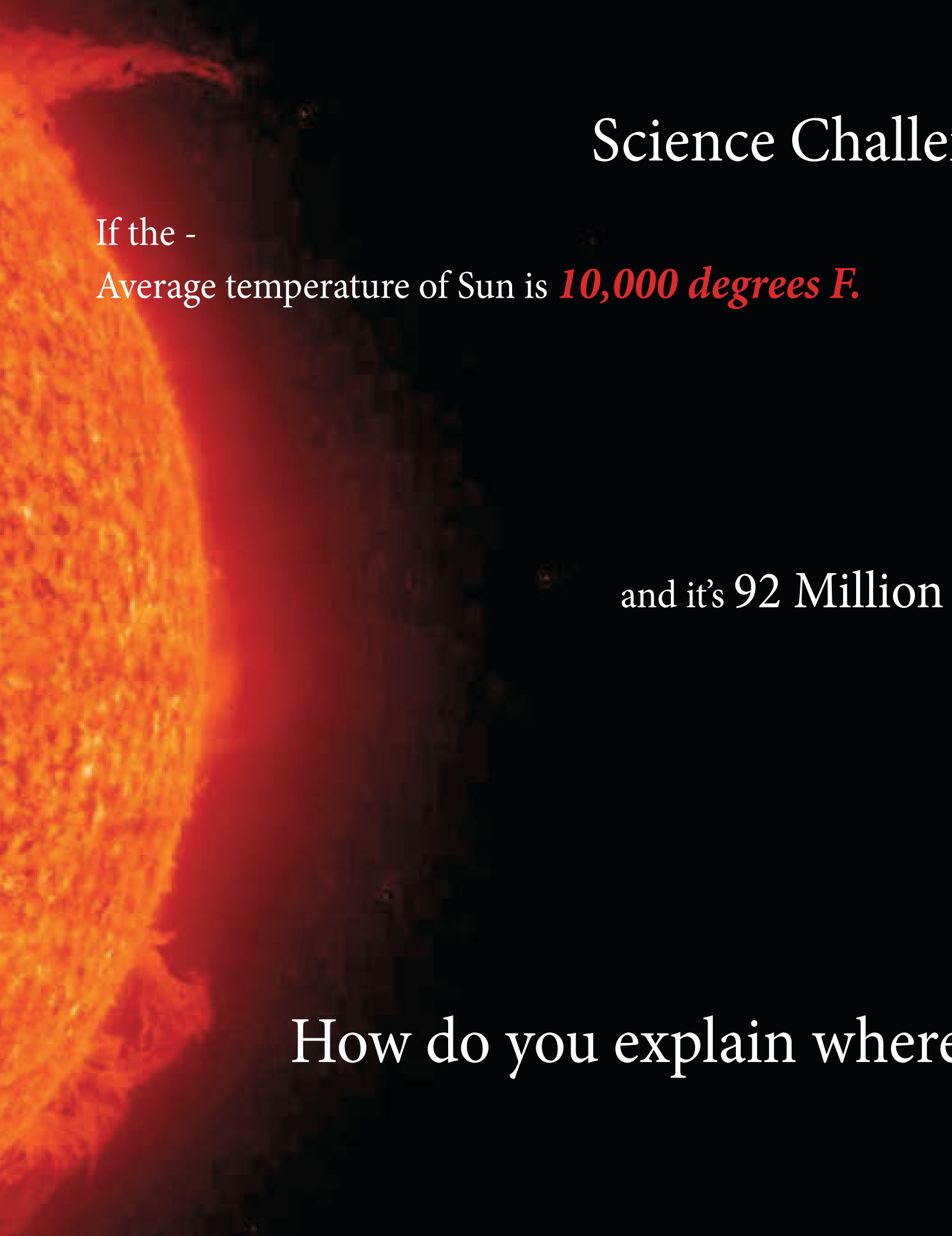
Ex·pert [n., v. ek-spurt; adj. ek-spurt, ik-spurt] noun

1. a person who has special skill or knowledge in some particular field; specialist; authority:

2. possessing special skill or knowledge; trained by practice; skillful or skilled

3. pertaining to, coming from, or characteristic of an expert: expert work; expert advice.

Teacher:
A S.T.E.M. Career


Science Challe
If the -
Average temperature of Sun is *10,000 degrees F.*
and it's 92 Million
How do you explain where

nge Question

And the -

Average temperature of space is ***-450 degrees F.***

Miles from the Sun to the Earth

e Earth's heat comes from?

STEM Magazine is.....***Global***