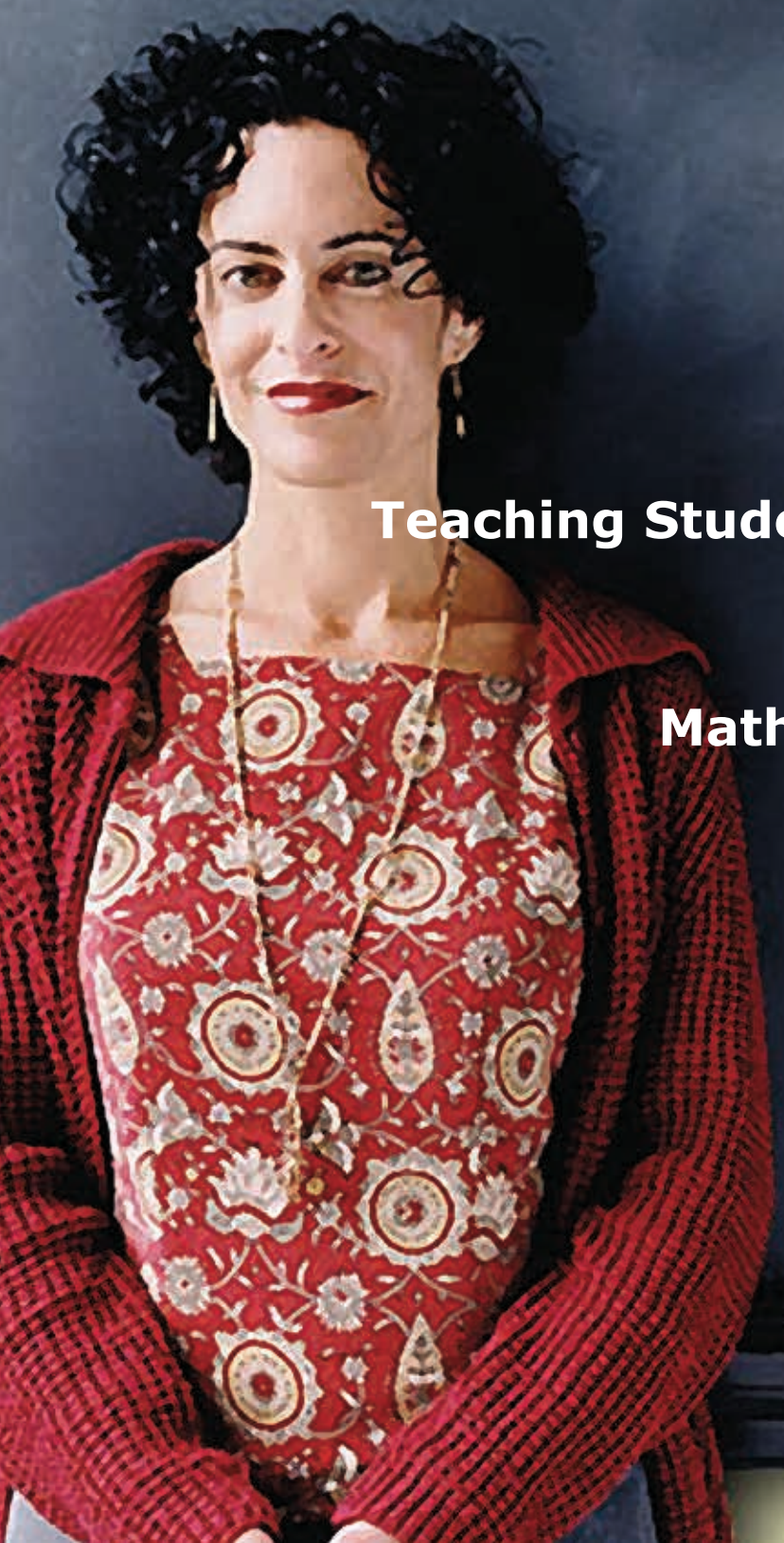
S.T.E.M.

MAGAZINE



"Please Don't Leave"
Publisher

Distance Learning

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STEM Innovations

A Math and Science Partnership Initiative in Northwest Indiana

Dear Educators,

The 2015 MSP STEM Innovations Summer Institute August 3-7 at Merrillville High School brought together more than 50 7th, 8th and 9th grade teachers, education professionals and STEM partners to develop learning sequences across the math and science disciplines.

During the week long workshop teachers collaborated to complete a challenge to develop an efficient way to extract DNA for medicinal drug research. Lessons which supported the DNA outcomes included a study of evidence of enzymes in living cells, the balloon animal cell model which made an abstract concept tangible, and using algebraic expressions to understand how surface area and volume relate to DNA extraction. Teachers studied the *Framework of Quality K-12 Engineering Education*, the *Framework for High Quality STEM Integration* and used STEM Integrated Curriculum Assessment to analyze the challenge and to determine the extent to which the activities were reflected in both frameworks.

Teachers will continue throughout the 2015-2016 school year to perfect and implement the lessons developed at the institute. To meet the required outcomes of the grant, lessons will be shared on Learning Connection and insights and experiences will be shared at upcoming state conferences.

A huge thank you to Merrillville High School for the hospitality during the week and to READY NWI and Center of Workforce Innovations for sponsoring lunch on the institute's last day. We appreciate the support of our important STEM work.

CALL FOR PRESENTERS! Your work through the MSP grant is truly innovative and should be shared across the state. The classroom successes associated with the STEM Innovations program are new and relevant to several statewide education associations that have conferences taking place during the 2015-2016 school year. Please contact Dr. Marion Hoyda at mirj1950@yahoo.com to discuss presenting at one of the following state conferences (or to suggest other relevant presentation opportunities):

- Indiana Council of Teachers of Mathematics (ICTM) - October 4, 2015 in Indianapolis
- Indiana Association of Public School Superintendents (IAPSS) Meetings- October 2015
- Hoosier Association of Science Teachers, Inc. (HASTI): Feb 2016 (exact dates TBA)

We hope you are having a great start to the school year.

Your STEM Innovations Team

MERRILLVILLE COMMUNITY SCHOOL CORPORATION

Global Stem States and S.T.E.M. Magazine are proud and excited to present STEMFEST 2015. 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 both 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

S.T.E.M.
Magazine

For your monthly electronic issue of S.T.E.M. Magazine, simply send your E-mail request to the E-mail address below.

You have unlimited distribution to teachers, students, parents and friends. STEM Magazine is also PDF printable.

wayne@stemmagazine.com

GLOBAL STEM STATES

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GLOBAL STEM STATES

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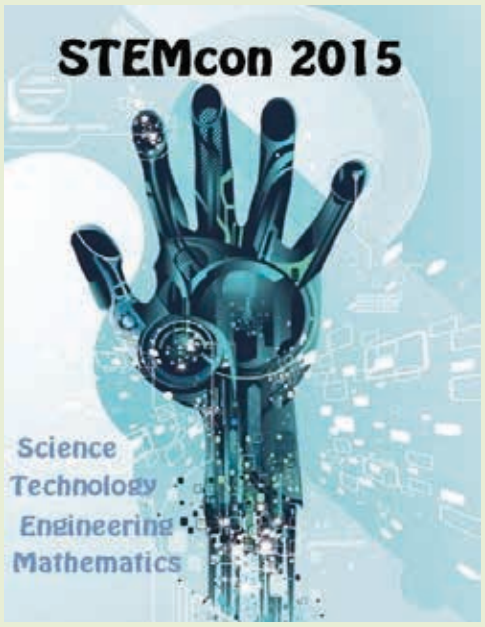
Datuk Hj LenTalif Salleh
Minister for Advanced Education SWK, Malaysia

Mr David Goncalves
Global STEM States, Australia

Dr James Kaufman
Laboratory Safety Institute, USA

Dr Cindy Moss
Discovery Education, USA

Dr Som Naidu
Open and Distance Learning Association of Australia



Ms Kate Edwards
International Game Developers Association, USA

Ms Rosa Walker
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Mr Kim Allen
Engineers Canada

SASKATOON

Dear Teacher,

It's going to be another challenging year, no doubt. I'm sure you've thought about last year and considered what you'll do differently to be more effective.....***or survive.***

As you know, the drop out rate for educators, per capita, is higher than that of students. We both know why. It's a variety of reasons, but they are good enough to quit.....quit the career you thought would be so rewarding and influential in the lives of American youth.

Is it the lack of respect and classroom disruptions? No discipline plan or lack of enforcement?

Is it the lack of support from administration?

Is it the lack of resources?

Is it the lack of time due to preparations for standardized testing?

Is it the lack of pay?

STEM Magazine is of course concerned in preparing students for careers, all of which we believe use STEM daily. We're also focused in helping educators fully understand the broadness of STEM far beyond math and science.

I started this magazine for you..... to keep you in class. I've taught the unteachable and the uncontrollable students. I felt the "flight" response and wanted to just get in the car and not come back.

I remain convinced that the key to resolving some of these issues for leaving is personal; your personal love of teaching and the skills, both emotional and technical that bring the satisfaction necessary to carry on daily despite the obstacles.

As we enter this school year, I plan to dig even deeper to provide tools and options to overcome the internal pressures to quit. I will continue to seek out the worlds foremost professionals to gain their insight and expertise.

STEM Magazine isn't as much about STEM as it is encouraging and supporting the educator now that STEM

has been dumped in your lap.

Recently I had a teacher ask me to stop sending her monthly issues because she just didn't have time to read them. That tells me at least two things: she clearly is overwhelmed and she is not sharing STEM Magazine with her students or peers.

Resources are a dime a dozen, but you have my personal assurance that I spend everyday researching, contacting experts and thinking about how to keep "your" interest and the interest of your student in all grades.

Please read and share your issue.

Please make the monthly issue link available to your students and their parents.

Please continue to hold on to that which motivates you to teach and continue your personal educational growth journey.

Please don't leave. You and I both know that a handful of students setting before you will have their lives changed forever by your influence and example.

Open, Flexible and Distance Learning Association of Australia (ODLAA) – A Professional Organization of Your Choice

by Som Naidu

The Open & Distance Learning Association of Australia is a professional association for teachers and educational designers, researchers, consultants and administrators from across Australia and overseas, that is dedicated to the advancement of research, scholarship, practice and the support of education across time and space.

Learners themselves are choosing to mix and match modes of learning, to meet their educational and training needs and at the same time, suit their personal and professional lifestyles.

The diversity of learning environments knows no bounds. As we move through the changing landscape of online, flexible and blended learning, open educational practices, innovative pedagogy, delivery and support, as educators we are continually challenged.

Professional organizations such as ODLAA are vital conduits for networking, sharing, disseminating, supporting and (dare we say) engaging with a diverse and dispersed community of educators for whom busy lives and workloads can sometimes be very isolating.

Why are you hearing about us?

Well, we're a partner organization joining STEMFest 2016 in Perth, Western Australia!

ODLAA (yes, we pronounce it as it looks!) has been part of the distance and open learning landscape in Australasia for more than 40 years – and interest is widening, with members also now in Africa, Europe, America, Asia and Oceania. Our strength has been in flexibility to accommodate the evolving modes of addressing professional support for learning needs across space and time.

Membership covers all sectors of educational practice including private and corporate providers from K-12, college, technical, university and workplace sectors. They are involved in management, design, development and evaluation, and teaching in modes that extend beyond the confines of conventional education systems and traditional classrooms.

ODLAA is a non-profit organization managed by an elected Executive Committee of members who donate their time to conduct association business.

What we bring to our members ODLAA aims to:

- Advance research, practice and support of education across time and space;
- Engage, support and develop a learning community in education across time and space;

- Be the learning community's association of choice for those involved in education across time and space;

- Advocate on behalf of the learning community on all matters related to open, flexible, online, distance and elearning.

ODLAA is a premier organization that responds to government initiatives and policy directions in the field, and lobbies for particular needs of global interest and nationally in Australia.

Distance Education is the peer-reviewed international journal of ODLAA and published by Taylor & Francis. The journal is managed by a sub-committee of the ODLAA Executive and ODLAA members receive it as a part of their membership.

Distance Education publishes research and scholarly material on open, flexible, online, distance and elearning. One of the first journals published to focus exclusively on this area of educational practice, it remains a primary source of original and scholarly work in the field.

The ODLAA Bulletin (available online) keeps members updated with a regular roundup of relevant issues and events in the field.

Professional networking:

A broad spectrum of members with a growing international component provides a dynamic community of practice (see Member spotlight articles on the website – ODLAA.org). The ODLAA Forum brings together practitioners from around the world to address key issues in the field. The 2016 ODLAA Forum will be held in Perth, Western Australia in association with STEMFest 2016.

Professional development ODLAA arranges and supports a variety of professional development activities, some of which are restricted to ODLAA members. Recent webinar topics have included analytics in e-learning, an international panel discussion on aspects of digital assessment, social inclusion, and current thinking around MOOCs. (Some recordings are available from the ODLAA website.)

Contact details and membership
For further information visit **www.odlaa.org** or contact us via email at executive@odlaa.org.

Drop round to our display at STEMFest 2015 in Saskatoon.

STEM Success is NOT just about *"activities"*.

STEM success is about-

"Connecting the intellectual dots between curiosity and investigation in preparation for a career path."

That is why **EVERY** teacher in every subject is a STEM teacher.

Please tell me this is available to your students.....and their parents.....

More STEM Student 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.

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

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 Code-Now, a nonprofit program that helps introduce less advantaged students

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 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 is a STEM career.

How to Teach Students About ***Their*** Brain

Dr. Judy Willis

If we want to ***empower students***, we must show them how they can control their own cognitive and emotional health and their own learning. Teaching students how the brain operates is a huge step. Even young students can learn strategies for priming their brains to learn more efficiently; I know, because I've taught both 5th graders and 7th graders about how their brains learn. I was a practicing neurologist before I became a teacher.

Once I entered the classroom and observed how my students learned, the connections between my two professions became clear. I began to write about brain-based teaching strategies. It took a few years, though, before I realized that my students could also understand how their brains learn.

When I began incorporating basic instruction about the brain into my classes and teaching simple activities to improve brain processing, students not only became more engaged and confident, but they also began changing their study practices in ways that paid off in higher achievement. Consider these typical comments from my 7th graders.

I imagine neurons making connections in my brain when I study. I feel like I'm changing my brain when I learn something, understand it, and review it. If I use my prefrontal cortex to mentally manipulate what I learn, my dendrites and synapses grow, and I will own that learning for a long, long time. I won't have to learn fractions all over again each year.

Explaining how the brain works is especially important for students who believe that they are "not smart" and that nothing they do can change that. Many children, and even some parents and teachers, think that intelligence is determined at birth and that even intense effort will not budge their academic abilities. The realization that they can literally change their brains by improving how they approach learning and how they study is liberating.

I guide students in activities that help them focus and achieve positive moods to prime themselves for learning. We practice techniques to increase mindfulness. For example, students learn to do visualizations, deliberately recalling in detail a place where they felt happy, calm and safe. The more learners practice visualizing their particular calming place, the stronger the neural network

Explaining how the brain works is especially important for students who believe that they are "not smart"

Students realize that their physical health, their emotions, and how well they focus their attention affects whether new information even reaches their thinking brains or gets filtered out because of negative emotions.

I guide students in activities that help them focus and achieve positive moods to prime themselves for learning. We practice techniques to increase mindfulness. For example, students learn to do visualizations, deliberately recalling in detail a place where they felt happy, calm

holding that memory becomes; eventually, the students can easily return to that memory whenever they feel stressed. Returning to that safe place enables learners to let new information that someone is presenting flow into their thinking brain rather than being filtered out.

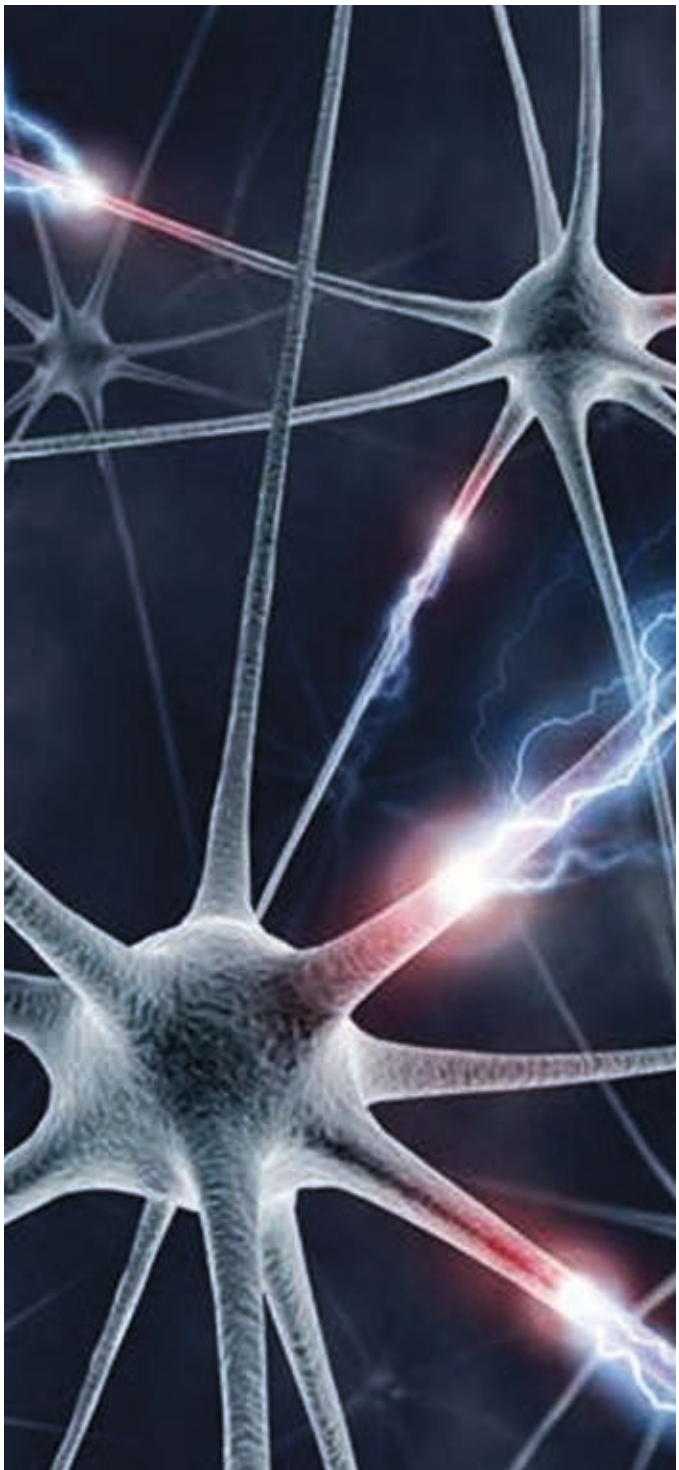
> "Positive moods prime students for learning."

I have students do relaxation breathing before we begin a test or challenging lesson. Students report that they feel calmer, more alert, and more focused, and they do understand and remember more.

To help students realize that brains and intelligence can change, I discuss neuroplasticity, the fact that the brain can grow new connections between neurons as we learn something by having new experiences. We can then strengthen these connections by remembering, practicing, visualizing, or using the new information. More dendrites grow when a person learns something new and then gets adequate sleep.

"Now I know about growing dendrites when I study and get a good night's sleep. Now when I'm deciding whether to watch TV or review my notes, I tell myself that I have the power to grow brain cells if I review. I'd still rather watch TV, but I do the review because I want my brain to grow smarter. It's already working and feels really good."

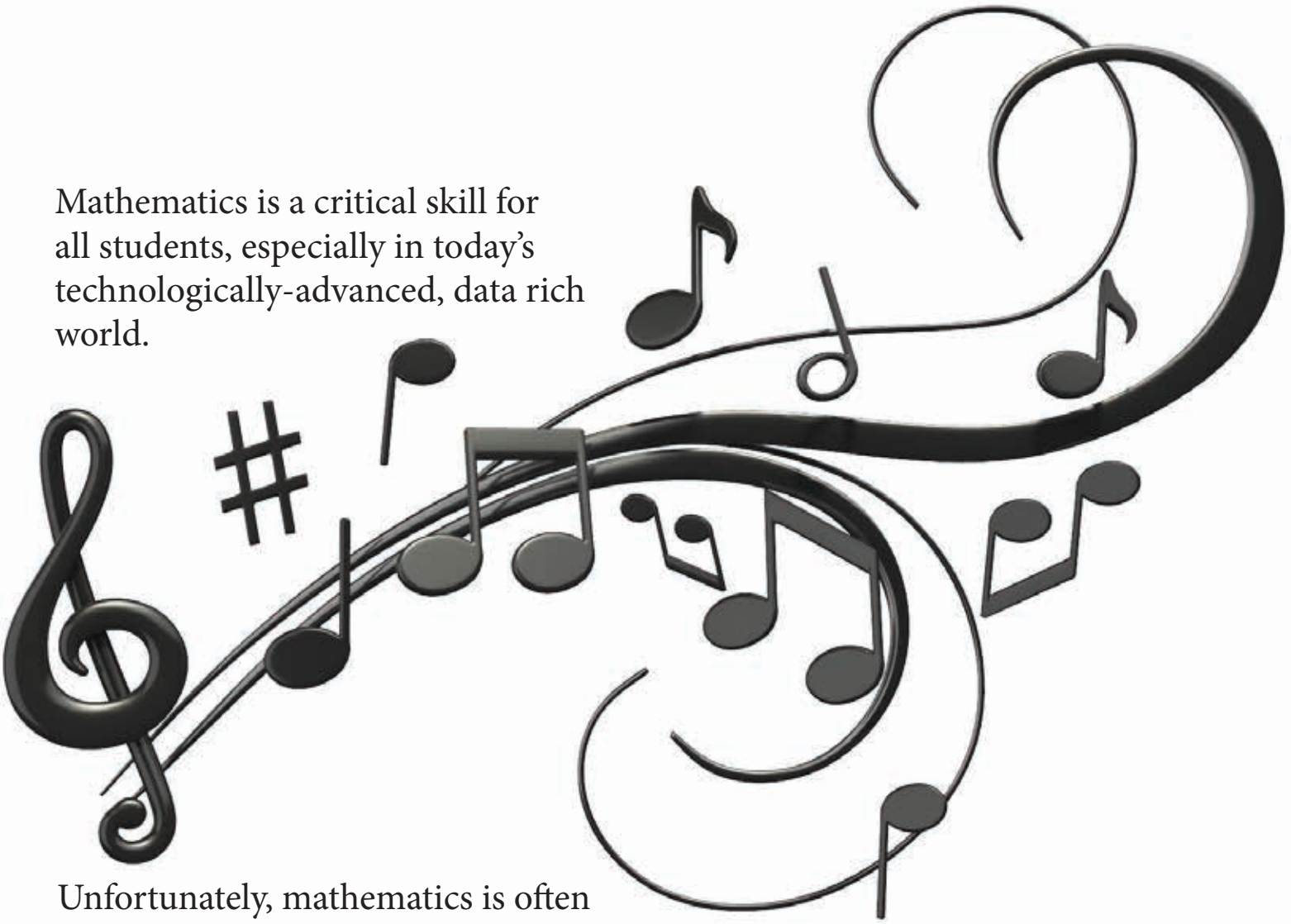
Teaching students the mechanism behind how the brain operates and teaching them approaches they can use to work that mechanism more effectively helps students believe they can create a more intelligent, creative and powerful brain. It also shows them that striving for emotional awareness and physical health is part of keeping an optimally functioning brain. Thus, instruction in brain function will lead to healthier learners as well as wiser ones.



{MATH}^{2}, *Music* and Movement

Engaging All Students Inside the Mathematics Classroom

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



Mathematics is a critical skill for all students, especially in today's technologically-advanced, data rich world.

Unfortunately, mathematics is often a gatekeeper for many students. Sadly, students who consistently struggle inside the math classroom tend to become frustrated, disengaged or even drop out of math all together.

Traditional methods of instruction which tend to dominate most classrooms, are simply ineffective and insufficient for the vast majority of North American students. Given the urgency to have all students become mathematically literate in today's high-tech world, educators must employ new methodologies and pedagogical practices inside the math classroom so that all students can realize a high level of mathematical success.

$$= \sum_k h(n,k) = \sum_k \binom{n}{k}$$

$$= \sum_k \binom{n}{k}$$

Furthermore, it is no longer acceptable to adhere to the dominant discourse which suggests only some students have "math brains". We now understand that all students can, and should, learn mathematics at high levels. This article asserts that teaching math through engagement in movement while incorporating music offers an innovative solution to the age-old problem of mathematics acting as a gatekeeper for the vast majority of North American students.

Since the launching of Sputnik, the STEM (Science, Technology, Engineering and Mathematics) fields have been flagged as increasingly important (Schoenfeld, 2001). This trend continues today (National Science Foundation [NSF], 2010). In fact, "STEM" is the most frequently occurring word in our current Information Age (Lefkowitz, 2014).

The reason for this is simple; North American students continue to underperform in mathematics (National Assessment of Educational Programs [NAEP], 2005; National Center for Educational Statistics [NCES], 2009; PISA, 2007 & 2013). This leaves large gaps in our schools, universities, and in our current and future workforce (Gateway, 2006; NSF, 2010; Manpower, 2010; Statistics Canada, 2013).

The repercussions this intellectual shortfall are huge as a Nation's economy depends on their ability to produce a workforce that enables them to be innovative and nationally competitive (Association for Career and Technical Education [ACTE], 2001; Networking, Architecture, & Storage [NAS], 2007; NSF, 2010; Orpwood, Schmidt, & Hu, 2012). Having a skilled and knowledgeable workforce that can solve real-world problems

is critical for the health, wealth, and cultural vitality of a nation (Fullen, 2010). Given that over eight million jobs (in the US alone) will require STEM skills by the year 2018 (Lefkowitz, 2014), and the fact that we are projected to be grossly unable to meet these demands (NSF, 2010; Orpwood, Schmidt, & Hu, 2012), the urgency to produce a citizenry that is literate in the STEM fields has never been greater (Manpower, 2010; Parntership for 21st Century Skills, 2010).

To be successful in the STEM fields, students need to be mathematically literate as mathematical knowledge is the foundational building block for learning science and acquiring skills in engineering and technology.

Additionally, mathematics is important because according to six large, longitudinal studies that included students from Canada, the US, and England, early mathematical skills are a greater predictor of future reading, math, and academic success more so than socio-emotional skills, attention issues, socio-economic status and even early reading skills

(Duncan, Dowsett, Claessens, Magnuson, Huston, Klebanov, Pagani, Feinstein, Engel, Brooks-Gunn, Sexton, Duckworth, & Japel, 2006). The evidence is clear; math is a critical and necessary skill for all students in today's technologically-advanced, data-rich world.

In addition to being a gateway into the STEM fields and to future academic success, being mathematically literate in the 21st Century is important for other reasons as well. First, mathematical literacy is an equity issue as disparities in mathematics cut across racial, gender, and socioeconomic lines and therefore, contributes to continued social and economic stratification (Ladson-Billings, 1995; Guiterrez, 2009; NCTM, 2000; PISA, 2013). For example, that a student's ability to do math was found to be highly correlated with their future educational and vocational opportunities, (Moses & Cobb, 2001; Guiterrez, 2009; Wai, Benbow, & Steigler, 2010), and to their future earning power (Moses and Cobb, 2001).

Given that minorities, second language learners (SLLs), females and underrepresented youth tend to be filtered out of math at significantly higher rates than hegemonic males, these populations are less likely to reap the benefits of those with a higher mathematical proficiency thus continually perpetuating social, economic and racial divisiveness. It is simple; students who are not mathematically literate will have less opportunities than those who have a higher degree of mathematical literacy.

Second, mathematical ability has also been linked to social and emotional wellbeing and to attaining full and active participation as a critical citizen in today's rapidly changing world (Guiterrez, 2009).

For example, it is linked to higher rates of community volunteerism (PISA, 2013) and to overall job satisfaction (PISA, 2013). Having a citizenry that is mathematically literate is linked to a country's health and vitality in addition to the wealth and global competitiveness of that nation. Thus, the questions on everyone's mind is how to do get more students to be proficient in mathematics not just for the good of STEM but for the good of a just and condign society for the 21st Century.

Full STEAM Ahead

Finding innovative ways to teach math conceptually to students will ensure more students can engage in mathematical learning successfully. One way to do this is to add Arts to the equation.

Adding Art to STEM (STEAM) will remove barriers while adding multiple entry points for many students to engage in mathematical learning. In addition, it will make math (and science) more meaningful, more connected, and more engaging. Furthermore, it provides students with real-world experiences where they come to see and understand how math applies to the world around them which fosters a deep, conceptual understanding of mathematical concepts as opposed to a memorized, disconnected, and shallow understanding.

This is important as the in order for students to be aptly prepared for their future, they need the full range of skills which include problem solving, mathematical reasoning and communication skills, as well as

mathematical fluency and flexibility (National Council of Teachers of Mathematics, 2000). In order develop a robust understanding of math, teachers need to engage students in non-traditional ways inside the mathematics classroom. Using music to teach math has been found to be a highly effective way to ensure students develop a deeper understanding of math (San Francisco State University (2012, March 22).

Music and The Brain

Music has been found to impact aspects of brain development (Pantev & Trainor, 2006; Shahin, Roberts, & Trainor, 2004), in addition to brain structure (Hutchinson, Lee, Gaab &Schlaug, 2003) and to brain function (Seppanen, Penson, & Tervaniemi, 2012).

Music training has been strongly connected to enhanced neural functioning (Tierney, Krizman, Skoe & Kraus, 2013). For example, it has been strongly linked to enhanced executive functions (Zuk, Benjamin, Kenyon & Gaab, 2014), auditory working memory and attention (Strait, Parbery-Cl;ark, Hitter & Kraus, 2012) and to enhanced language abilities (Tierney, Krizman, Skoe, Jophnston & Kraus, 2013).

Musical training is also connected to positive changes in students' working memory and their cognitive flexibility (Zuk, Benjamin, Kenyon & Gaab, 2014).

In a seminal study conducted to test how listening to music impacts the brain, researchers subjected students to either relaxation tapes, or to Mozart's sonata in D major. Results of this study revealed that students who listened to Mozart reported an 8 to 9 point increase on their IQ tests directly after listening to the music (Rauscher, Shaw & Ky, 1993). It is important to note that this "Mozart Effect" was found to last for only ten to fifteen minutes.

Early Music Training and the Brain
A prodigious amount that looks at how early childhood music training affects music development and other areas of child development such as language, creativity, affective development, motor skills, visual spatial abilities, and social development (Jordan-Decarbo & Nelson, 2002).

Music training before the age of seven has been found to have a significant impact on brain development (Penhune & Zatorre, 2013). Haley (2001) found that people who had learned to play a musical instrument prior

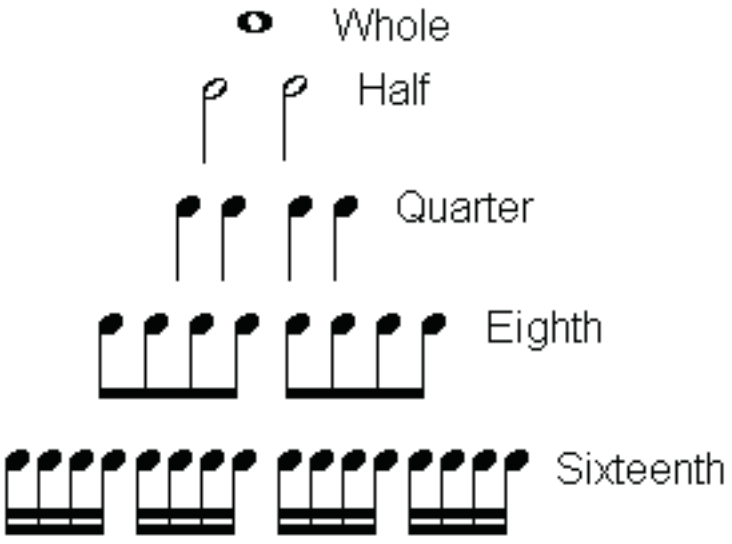
“Music training before the age of seven has been found to have a significant impact on brain development”

to grade four had higher scores in mathematics than those who did not.

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.

Part 2 of this *White Paper* will be continued next month in **the October issue.**

Benefits of Investing in *Early STEM Education*

A look at the effects of pre-kindergarten education in STEM and return on investment

by **Brooke Fox / University of Colorado, Boulder**
Chris Cochella / Founder of Brackitz

Science, technology, engineering, and math (STEM) education is a growing topic of discussion in the U.S. According to the STEM Education Coalition, STEM jobs comprise 20% of all U.S. jobs, and job openings in STEM occupations outnumber unemployed persons 1.9 to one. STEM industries are under-staffed, yet they represent massive economic opportunity.

For example, with the mean wage for engineers exceeds the all-occupation mean wage by $33,210, and have they higher job security at 3.8% unemployment.

Given the sizable opportunity in STEM positions, many organizations have taken action to increase STEM education in the U.S. Idaho, for example, recently established a new state office under the governor called the "STEM Action Center," following the lead of states like Utah, which enacted a STEM Action Center in 2013 with a starting budget of $10 million. In 2010, President Obama emphasized the importance of STEM education, stating "Leadership tomorrow depends on how we educate our students today—especially in science, technology, engineering and math."

2.6 hours per week on science? You're kidding....

Currently, of 34 developed nations, U.S. 15 year olds rank 21st in science test scores. Many attribute this to the lack of time spent on science in the classroom, with the average elementary school student only spending ***2.6 hours per week*** on science.

Pre-K Education

Recently, several studies have been released that detail the importance of educational engagement with children before they begin Kindergarten. A study conducted by Voices for Utah Children, found that 238 preschoolers test scores indicated that they would need special education starting in Kindergarten. Yet only 7 were referred to special education after completing preschool.

Additionally, the widely cited High-Scope Perry Preschool Study put participants that were considered at risk of failing high school into a high-quality preschool program. Over the course of the participants' lifetime, the study found that they were 20% more likely to have incomes above $20,000 than their non-preschool peers.

Additionally, they were more likely to graduate high school, and less likely to be arrested. Countless other studies have confirmed the results of these two, making a strong case for the effects of pre-elementary education on long-term success.

STEM and Early Education

One state is truly on the cutting edge of early-education STEM integration. In an effort to combine the lasting effects of preschool and the national need for STEM workers, Minnesota has commissioned statewide programs aimed at enhancing STEM learning among student pre-k-12: the "Preschool Stem" program was created in 2012 for three to five-year-olds to get a head start in STEM education.

The Boston Children's museum also put out a guide for teaching STEM concepts to preschoolers, which focuses on creating the right environment, indicating a growing emphasis on the need for STEM education prior to the kindergarten years.

STEM and Block Play

One study, published in Child Development, indicated that higher spatial assembly skills in three-year-olds correlated with higher mathematical skills. As spatial skills are improved

with block play, the study advances that: "Block building, in particular, offers a potential route to study and improve these skills in children prior to formal mathematics instruction" (Verdine et al, 2013). There is also

evidence that higher levels of representative block construction correlates with higher reading abilities. It appears that the relationship between block play and early development of spatial skills implies that integration of block play into preschool curriculum is a necessary step in laying the foundation for STEM education.

Return on Investment

In the aforementioned Voices for Utah Children study, it was estimated that the cost savings in special education alone, over three years for the three cohorts of preschoolers, was $963,938. Additionally, the HighScope Perry study estimated $195,621 in public savings (welfare, etc.), and a $12.90 return per dollar invested.

Additionally, impressive results were produced by a cost-benefit analysis of three states that provide state funded prekindergarten programs. In Massachusetts, the estimated return on investment was 1.18, and totaled $105.28 million in 2005. In Wisconsin, the return on investment was 1.16 and total benefit was $131.68 million. Lastly, Ohio's prekindergarten program yielded a net benefit of $299.19 million, and a return on investment of 1.62.

The research overwhelmingly suggests that investing in a child's prekindergarten education benefits not only the future success of the child, but also society overall. Additionally, the importance of STEM education

has become a national discussion about efforts to get children better educated in science, technology, engineering and math. Engaging preschool students in activities that increase spatial assembly abilities has been proven to increase math skills and potentially reduce the gap in students' engagement with STEM subjects and future careers.

STEM and Preschool Funding

According to the President's FY 2014 Budget Request for the U.S. Department of Education, a proposed program titled "Preschool for All" would invest $750 billion over the next 10 years in states for the funding of high-quality preschool education programs. Funding for this program has been maintained in the FY 2015 budget proposal. Additionally, funding for Preschool Development Grants, Early Intervention Programs for Infants and Toddlers with Disabilities, and Preschool Grants for Children with disabilities totals $1.2 billion.

According to the National Institute for Early Education Research, 1.3 million children attended state-funded preschool, representing 4% of three year olds and 28% of four year olds after a decrease of over 9,000 students in 2013. When private institutions are included, this number increases to a total of 54.9% of three and four year olds enrolled part-time or full-time in 2013 (Census). Efforts such as Preschool For All are aimed at increasing the percentage of students enrolled in preschool education, especially low-income participation, as students who begin Kindergarten without any preschool education are often already disadvantaged academically when compared with their peers.

The President's budget request outlines the budget proposal for investments in STEM education: six initiatives totaling $450 million in investment have been proposed to consolidate current programs and target four areas including K-12 instruction, undergraduate education, graduate fellowships and extra-curricular education activities. There is no mention in either document, however, of federal funding of STEM education for preschoolers.

In 2013, the average state spending per pre-kindergarten student was $4,026. Given a return of 8.2 in cost savings according to the Voices for Utah Children report, a more conservative estimate than the High-Scope Perry Preschool study, were

Pre-K

just $10 spent on the 4.4 million enrolled preschoolers, equal to approximately 10% of the proposed federal spending on STEM initiatives, a $366.6 million in cost savings for society would result. Additionally, given Ohio's 1.62 return on investment, the same amount spend per student would result in $72 million return on investment.

While it appears that upfront costs of implementing STEM activities for such young children may not seem well-suited, it is in fact probably the most effective use of education investment.

Conclusion

Undoubtedly, the U.S. is in desperate need of quality Science, Technology, Engineering and Math education, so that it may fill the need for professionals in these fields. A viable solution to this gap seems to lie in preschool block play, as it develops early spatial skills that are necessary for STEM occupations. Investment in preschoolers, specifically, appears to have the greatest return on investment both societally and individually.

Therefore, not only does society benefit from engaging young, pre-kindergarten children in STEM based activities as a means of equipping with the necessary skills to be successful future engineers, scientists and mathematicians, but the potential return on investment for parents and institutions seems to hold obvious opportunity.

References

"Children Ages 3 To 4 Not Attending Preschool." Kids Count Data Center. N.p., Feb. 2015. Web.

"Does It Pay to Invest in Preschool for All? Analyzing Return-on-Investment in Three States | Nieer.org." Does It Pay to Invest in Preschool for All? Analyzing Return-on-Investment in Three States | Nieer.org. N.p., n.d. Web.

"Fiscal Year 2015 Budget of the U.S. Government." (2015): n. pag. Web.

"HighScope Perry Preschool Study." HighScope Perry Preschool Study. N.p., n.d. Web.

"Home." STEM Education Coalition. N.p., n.d. Web.

"Idaho Lawmakers Vote to Set up New 'STEM Action Center' - The Spokesman-Review." Spokesman.com. N.p., n.d. Web.

"Resources." Nurturing STEM Skills in Young Learners, PreK–3. N.p., n.d. Web.

"Science, Technology, Engineering and Math: Education for Global Leadership." Science, Technology, Engineering and Math: Education for Global Leadership. N.p., n.d. Web.
"Speech." FRB: --Bernanke, Early Childhood Education--July 24, 2012. N.p., n.d. Web.

Dubno, Janis. A Sustainable Financing Model High Quality Preschool for At-Risk Children Results from the Granite School District in Utah. Voices for Utah Children, n.d. Web.

Hanline, Mary Frances, Sande Milton, and Pamela C. Phelps. "The Relationship Between Preschool Block Play And Reading And Maths Abilities In Early Elementary School: A Longitudinal Study Of Children With And Without Disabilities." Early Child Development & Care 180.8 (2010): 1005-1017. Academic Search Premier. Web.

INVESTING IN EARLY LEARNING. Rep. U.S. Department of Education, 2014. Web.
OECD (2013), Education at a Glance 2013: OECD Indicators, OECD Publishing.

Scientists., Tural, and • Preschool Is The Perfect Time To D. Welcome! Are You Ready for Some Fun? (n.d.): n. pag. Boston Children's Museum. Web.

Verdine, B. N., Golinkoff, R. M., Hirsh-Pasek, K., Newcombe, N. S., Filipowicz, A. T. and Chang, A. (2014), Deconstructing Building Blocks: Preschoolers' Spatial Assembly Performance Relates to Early Mathematical Skills. Child Development, 85: 1062–1076. doi: 10.1111/cdev.12165

Wascalus, Jacob. "From Preschool To High School, Programs Aim To Close Minnesota's STEM Achievement Gap. (Cover Story)." Fedgazette (2015): 1-5. Business Source Complete. Web.

STEALTH TECHNOLOGY

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Dr. Omid Gohardani
Springs of Dreams Corporation, Orange County, California

Have you ever tried to imagine seeing something that is invisible? Whether you have played peek-a-boo as a child or dreamed about coming up with the potion that would make you invisible to others, invisibility is limited to objects and light outside our visual spectrum or blocked by something physical. Invisible events constantly happen around us in our everyday lives, but are all these events really invisible? Or do we call them invisible only because we do not pay much attention to them, or simply do not know how to make them visible to us?

Heat from the sun, events in your body and radio waves are a few examples of real things we cannot usually see without specialized technology. Technology allows us to see additional light waves or the influence of radio waves. Medical monitors and scanning instruments allow doctors to see inside your body to monitor blood flow, heart efficiency, disease, broken boned (X-rays) and more.

These are not invisible events, just not visible to our natural vision. By peeking into the unseen or invisible, it is sometimes possible to detect the visible and aerospace design and aerospace operations features many such examples.

In the early days of stealth technology, many popular science books and magazines presented stealth aircraft as invisible aircraft. In some ways, this description might be true if you look at a RADAR screen, but if you ever go to an air show and see a stealth aircraft fly, you would still be surprised that you are actually able to see the stealth aircraft with the naked eye. What is the advantage of invisible aircraft if you actually can see them?

In order for us to understand the secrets behind stealth aircraft, the first thing we can conclude is that so far there has been no invention of invisible material for airframe structures.

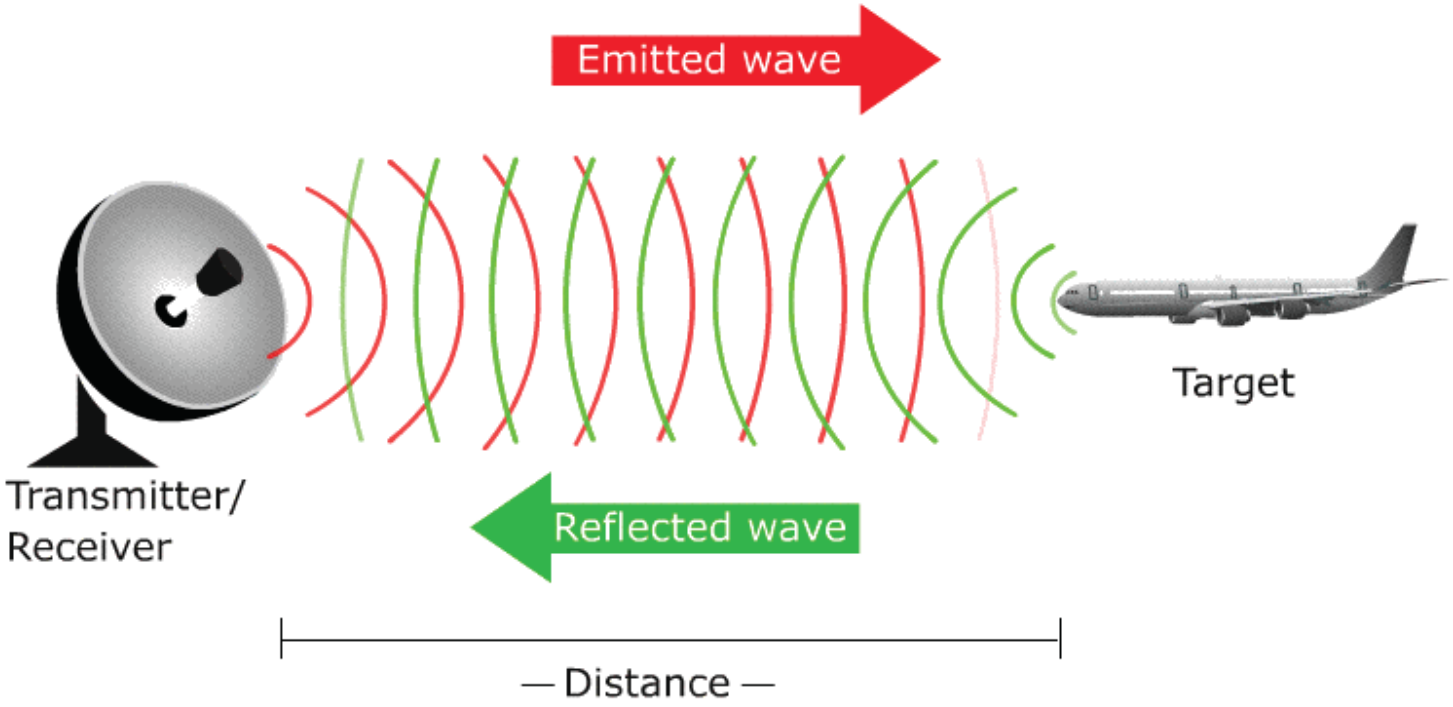
In other words, don't think along those lines that once a pilot sits in the cockpit of a stealth aircraft, he or she can push a button and make the aircraft vanish to the naked eye. Stealth aircraft are typically invisible to RADAR and the interest for stealth aircraft is primarily to monitor certain aerospace activities without being detected. This type of aerospace technology is ideal for national defense purposes.

But, how does stealth really work?

You might have wondered why RADAR is spelled in capital letters. RADAR is spelled that way since it is an acronym. RADAR stands for RAdio Detecting And Ranging and is based on the use of radio waves. The first practical radar system was produced in 1935 by the British physicist Sir Robert Watson-Watt, and by 1939 England had established a chain of radar stations along its south and east coasts to detect aggressors in the air or on the sea.

Whether it's mounted on a plane, a ship, or anything else, a radar set needs the same basic set of components: something to generate radio waves, something to send them out into space, something to receive them, and some means of displaying information so the radar operator can quickly understand it.

The radio waves used by radar are produced by a piece of equipment called a magnetron. Radio waves are similar to light waves: they travel at the same speed—but their waves are much longer and have much lower frequencies. Light waves have wavelengths of about 500 nanometers (500 billionths of a meter, which is about 100–200 times thinner than a human hair), whereas the radio waves used by radar typically range from about a few centimeters to a meter—the length of a finger to the length of your arm—or roughly a million times longer than light waves.



Both light and radio waves are part of the electromagnetic spectrum, which means they're made up of fluctuating patterns of electrical and magnetic energy zapping through the air. The waves a magnetron produces are actually microwaves, similar to the ones generated by a microwave oven. The difference is that the magnetron in a radar has to send the waves many miles, instead of just a few inches, so it is much larger and more powerful.

Air traffic control uses RADAR technology on daily basis to track aircraft in the air and on the ground. Riding on one of the three key purposes of RADAR, which are: to detect the presence of an object at distance or to detect the speed of an objective or to enable mapping capabilities, the need for RADAR applications is indeed essential. A typical RADAR antenna sends out electromagnetic waves. Once these signals hit and are reflected by an object, or in this case an aircraft, the radar antenna will measure the time it took for the reflection to arrive back to the antenna and subsequently reveal how far away the aircraft is from the antenna.

If we analyze a conventional shape or airframe of an airliner, we can easily deduce that the rounded shape of such an aircraft suits as a perfect RADAR reflector and nearly always reflects some signals back to the RADAR antenna regardless of where it bounces off the aircraft.

In order to enable a stealth aircraft, we must trick the RADAR antenna to not see any reflections of the radio signals and one way of doing so is either to absorb the radio signals by the aircraft skin or to reflect them away from the RADAR equipment. When aeronautical engineers design stealth aircraft, they make sure that the airframe has very sharp edges and is made up of completely flat surfaces.

If the radio signals from the RADAR antenna are not reflected back to the RADAR equipment, RADAR will have no clue where the aircraft is, giving the impression of being invisible, or invisible to RADAR.

Learning points:

RADAR = RAdio Detecting And Ranging

Principles of Stealth Technology in Aeronautics

For more information and additional resources for learning please visit Learning Corner at the Springs of Dreams Corporation Website: www.springsofdreams.org/education.html

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Every career is a STEM career

STEM skills are needed in every career on a daily basis

As important as STEM careers are, the notable dropout rate in STEM focused college programs and the growing segregation of students into STEM versus non-stem categories shows our broad misunderstanding of what STEM really is at its core.

Every career is a STEM career. The only difference is the amount of education required for a specific field and the financial compensation received. From bug exterminator to aerospace engineer, STEM skills are required on a daily basis. This can only call into question our approach to filling career field shortages and how STEM is understood and incorporated into every curriculum skill set become very clear.

A corrected understanding of STEM in our daily lives can only provide less resistance to STEM discussions and career considerations from an early age as well as clarify the hardwired STEM characteristics inherent in our brains from birth.

When teachers and students are aware of their use of science, technology, the engineering method and mathematics in their personal, non-professional lives, the application to careers and their required skill set become very clear.

By definition, we all use the engineering method (a decision making process) several times per day without realizing it. The same can be said when defining science, which is the "intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experimentation". When we truly understand our daily use of "systematic study" and "decision making" we quickly see that we are engineers and scientists in practice well before a career choice is made.

"Every young man and woman....all are born hard wired for STEM and destined to use STEM daily"

Regarding math and technology use, those two are fairly easy to see, from cooking recipes and simple measurements (math) to smart phone and computer use (tech). The creation of STEM schools, degrees and specialized pathways could make one question our STEM understanding and solution planning in light of a one third college STEM degree dropout rate, not to say they don't have an important role to play.

Every career field uses STEM skills ***every day***.

Wayne Carley
STEM Magazine

The incorporation of STEM understanding in grades K-12 is easily accomplished without increasing the budget or creating a new curriculum, both of which the typical school is unwilling to embrace to say nothing of the teachers already overwhelming time constraints.

An early start to a clear and comprehensive knowledge of STEM use in our daily lives can only increase our curiosity and interest in career possibilities that would have otherwise been ignored or deemed unattainable by many if not most students and their families. That simple curiosity is the foundation of all student exploration into fields of interest. When clearly understood, no career choice is unreachable, and its STEM applications no longer scary and unattainable.

"I use STEM every day, no matter my future career choice," are the words we should be hearing from students in all grades.

For those who drop out of college level STEM paths, they will soon discover that they still need and will use STEM skills anyway, everyday.

We need to redefine our misconception of STEM by definition, career category, and curriculum development. A 60 second STEM activity a few times per week in every subject is the foundation of a corrected understanding of how we think, what we can accomplish, a new encouragement to be curious and a welcome embrace of all things STEM without fear or discouragement.

Every young man or woman…. all are born ***hard wired for STEM*** and destined to use STEM daily as a plumber, teacher, auto mechanic, politician, aerospace engineer or geochemist.


SMART ASS WORKS HERE

VET TECH

Volunteer designers develop solutions for Veteran at Tech event

By David Hodge and Steve Goetsch

The McGuire Veterans Administration (VA) Medical Center hosted a grand finale Make-A-Thon event, July 28-29, inviting the area's brightest engineering minds to work hand-in-hand with facility clinicians to solve issues experienced by a panel of disabled Veterans.

More than 100 participants of all ages attended the VA Innovation Creation Series, Prosthetics and Assistive Technology Challenge, a capstone event in which design teams sought to improve care and quality of life for disabled Veterans through the development of personalized prostheses and equipment.

Veteran Eric Young kicked off the Veteran's panel. It was his chance to take the stage and personally challenge the engineers to provide him a personal solution. He asked the room to close their eyes while he painted a serene picture of the sun rising in the West, and for each person to imagine themselves moving through that beautiful landscape.

He loves to ride motorcycles, but it is still a dream for him because his amputation prohibits him from riding. He wants an arm brace that he can feel confident enough to take a bike out West to visit his daughter in California.

One of the younger designers at the event, 13-year old Kayleigh Childress, and her career and technology education teacher, Ed Levis, worked diligently to try and turn that dream into a reality. They 3-D printed a prosthetic device capable of attaching a prosthetic arm to a motorcycle handlebar.

While riding a motorcycle, a rider relies on the push and pull of the handlebar to turn and balance, said Levis. The design can be attached with relative ease, but not lock into place. This, they explained, was essential in the event of an accident or emergency, the hand would break away at a predetermined stress point.

This wasn't the first time Childress built a prosthetic device. When she was in the 7th grade she helped a boy in her class born without fingers on his left hand. She found an existing 3-D hand design online and modified it to suit her design needs. All the pieces were printed and assembled using fishing line and elastic bands.

"He had wrist movement and when he moved his wrist down, the elastic would pull, and the fingers would close and he could grasp objects," Childress said.

Childress added that she has grown to like 3-D printing and its applications and intends to pursue a career in aerospace technologies. The Veterans' stories and issues with tasks that most in the crowd complete daily inspired the designers.

The Veterans themselves were in awe at the innovation and compassion shown to them from such a large and diverse group of brilliant philanthropists.

Nash said the Make-A-Thon just reinforced what she already thought about the McGuire VA. She originally was receiving care in Alabama, but relocated her family near her surgeon, McGuire physician, Douglas Boardman, who performed a shoulder-fusion take-down to reverse shoulder replacement (the first-ever in the country.)

Her outcome improved her life so drastically; she knew she had to return. Now she receives all of her care at McGuire.

Engineers He and Hu thought the trip to McGuire from the West Coast was well worth it. "It was really great to get to speak directly with the doctors and patients and get their perspectives," said He. "That's what makes the Innovation Creation so good."

Fear

Student Fears. A daily reality.

There are 2 basic types of fear; ***rational and irrational.***
Everything about school can be scary. Our students face both daily, at school and home.

Irrational fears may take the form of a phobia; an intense and persistent fear of certain situations, activities, testing, peer pressure, teacher approval, things, animals, people and for some students their personal successes.

The primary symptom of this disorder is the excessive and unreasonable desire to avoid what's causing the fear.

When the fear is beyond our control, and if the fear is interfering with daily life, then a diagnosis under one of the anxiety disorders may apply. This fear may range from mild discomfort, to an intense anxiety that inhibits social contact and attendance.

The natural fight or flight response is tattooed on our DNA. The greatest fear for the average American of any age is the fear of speaking in public, something we make our students do often and that they are totally ill-equipped to handle emotionally.

Is this rational or irrational? The fear is irrational, but the physical effects on the body can be very real and dramatic causing a sudden rise in blood pressure, racing heart,

sweating, dizziness, chest pain, weakness and overall panic. The emotional effects can be just plain terrifying. Are we actually in physical danger and at risk of death or injury? **Of course not**, but the effects on our mind and body are real.

Stories of professional athletes, entertainers and speakers becoming physical ill just prior to a performance, even after decades of experience, are very real. Phobias such as the fear of speaking in public, testing or failure are not usually diagnosed if they are not particularly distressing to the individual and are not frequently
encountered.

An experience of being laughed at in class during a speaking presentation can have a dramatic and life-long affect on a student. A new phobia is born and the flight response kicks in causing avoidance behaviors, physical and emotional stress and confidence issues that will be passed along to every class and many situations. It may only take once. Is the student in real danger? No, but at the point of this new experience the student has to make some choices emotionally and mentally although mostly emotionally.

Bullying is a rational fear…. it's real, it's an object / person and students are dying. It's encouraging that national awareness and lack of toleration are growing, but it's still happening, even by teachers….I've seen it.

This rational fear at school directly interferes with scholastic performance, information retention, increased peer pressure, physical illness, loss of confidence and who knows what else.

There is an overall basic distinction between fear and anxiety. Anxiety is a vague unpleasant emotional state with qualities of apprehension, dread, distress, and uneasiness. All of our students experience this and so do we on occasion. In addition it is objectless.

Fear is similar to anxiety except that fear has a specific object. Can a person be both anxious and fearful about the same thing? Yes they can, and both will have to be dealt with. Class should be a safe place with no real fears.

Control: we all want it, but in class the student has very little control thus complicating the ability of handle fear and anxiety. They can't run or escape as a coping mechanism….the flight mode. Quiet suffering ensues right before our blind eyes daily.

Loss of control in a situation when there are unpredictable or uncontrollable events or expectations leads to anxiety and/or depression may result in feelings of helplessness. *How can we function in school effectively in the midst of constant helplessness?*

The inability or perceived inability to make an adaptive response to a threatening event or perception that no such response is available will lead to feelings of anxiety.

Our students are totally ill-equipped to handle anxiety. It just eats away at their body, mind and soul.

I have to take the test...there's no way out.

I have to stand up a give my presentation or I'll fail.

I have to take my report card home and I'll be in so much trouble.

I have to go to that class that makes me want to hurl.

I don't understand this, but I can't raise my hand.

Pressure to perform.

What class did we take in elementary school to teach us coping mechanisms for pressure, anxiety, stress and fears? Kids are rarely able to rationally distinguish between what fears are real or imagined, they just react emotionally and pay the price.

Let's help them cope.

"The mind can only think of one thing at a time."

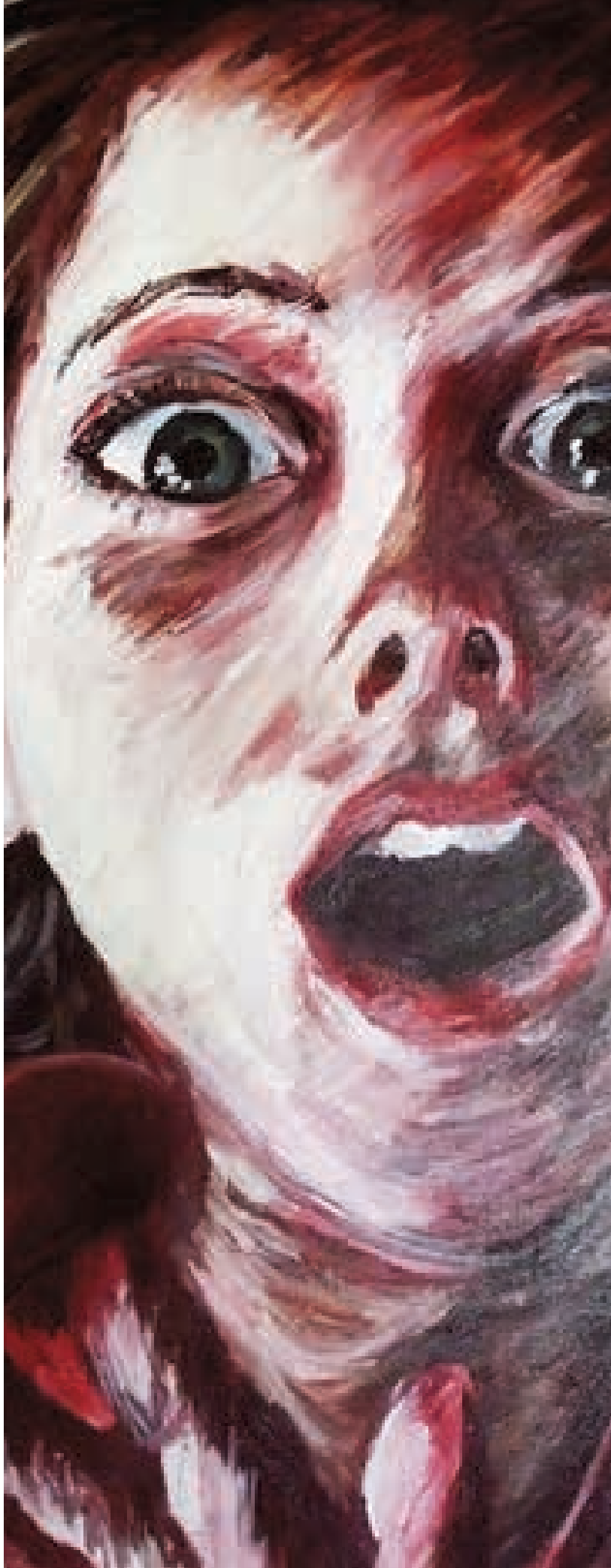
Think happy thoughts. Naive?
Maybe, but it works when we go to our "happy place".
As a teacher, I go there OFTEN.

Since anxiety is very ambiguous, it is the key which prevents the elaboration of clear action patterns to handle the situation. Any idea or subject you're thinking about at that moment directly affects your state of mind and then your physical well being.

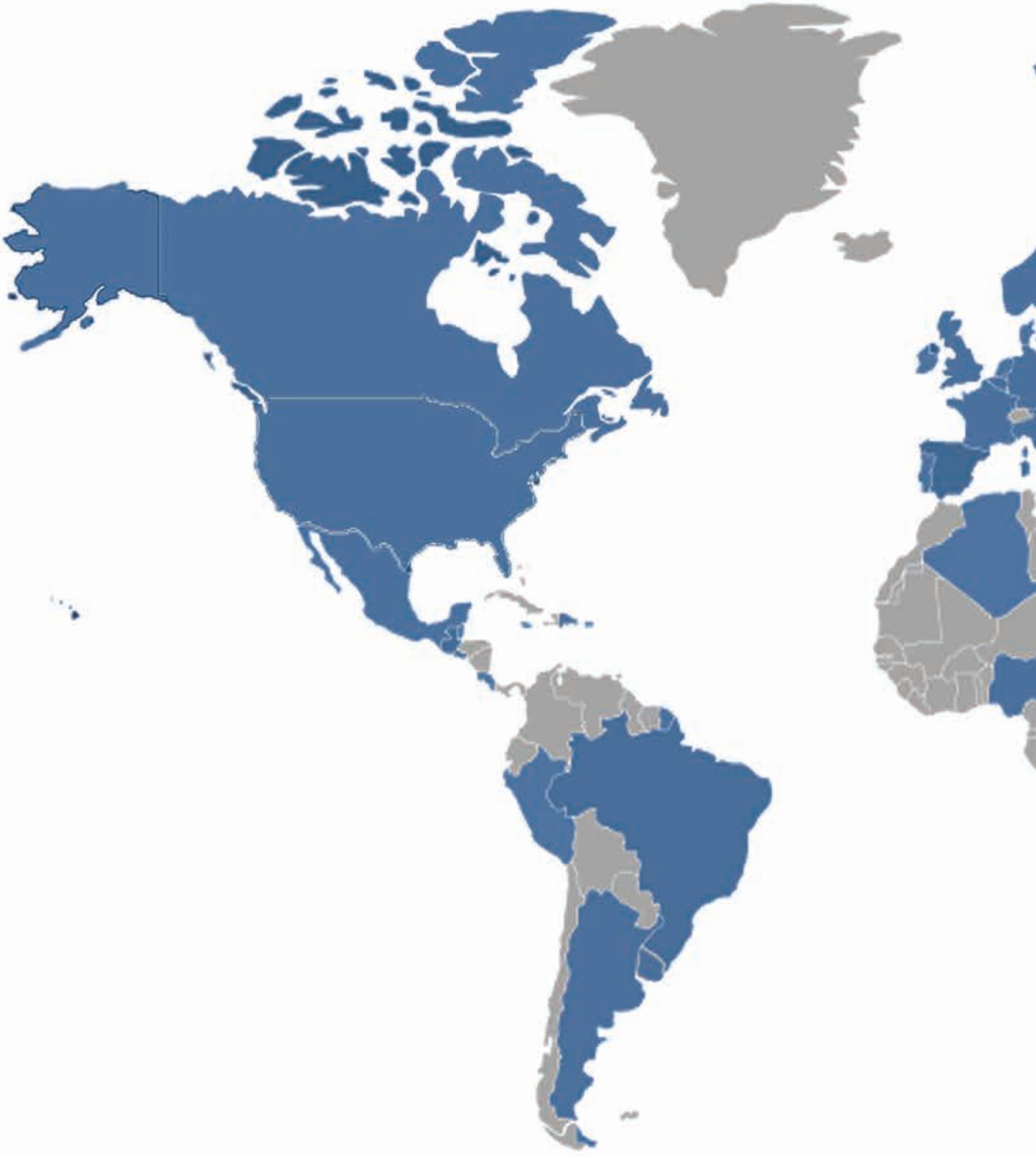
If you are thinking happy thoughts about a recent good grade, celebration or event then your mind translates those happy thoughts into happy feelings releasing feel good chemicals in the brain...thus a healthy body response and peace of mind.

So if you're constantly thinking about how scared you are, or how bad you might do, it totally occupies your thoughts, creating unhealthy feelings, anxiety, depression, increased fear, lack of focus, memory block, insomnia...and the list goes on.

As you think...so you feel.



STEM Magazine and Global STEM States



are truly.....***Global***