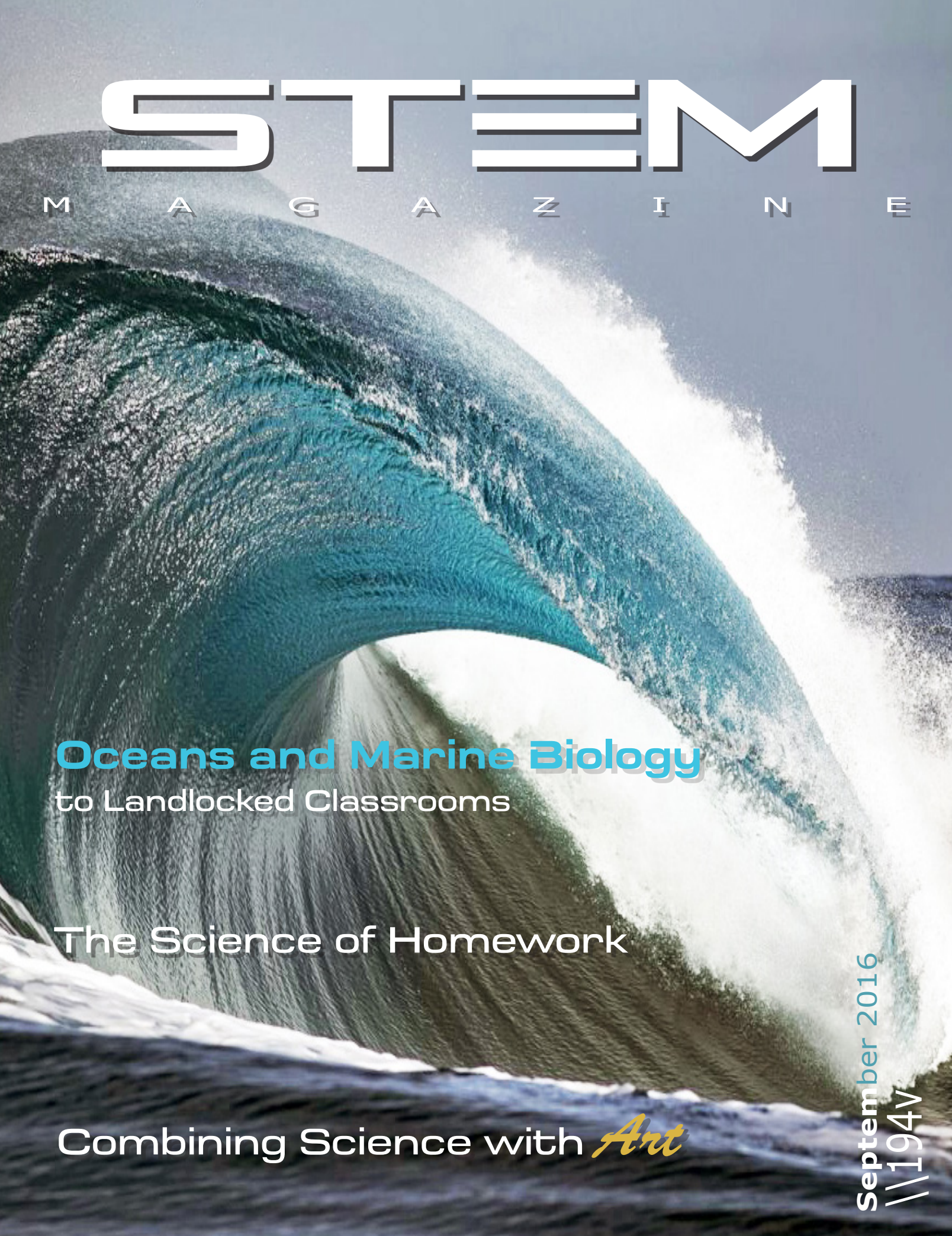
STEM

MAGAZINE



Oceans and Marine Biology
to Landlocked Classrooms

The Science of Homework

Combining Science with *Art*

September 2016
\\194v

i3 Technology Group LLC

INSTALLATION, INNOVATION, INTEGRITY

i3 Technology Group specializes in the installation of STEM software & STEM computers for K-12 education. We also offer consultation services to guide your IT team through the installation process and ensure they have a successful deployment. Please visit our website at www.i3technologygroup.com and contact our team with any questions.

Our founding members have multiple years of experience working in the K-12 Information Technology industry and installing client software for one of the nation's leading STEM software curriculum providers. We ensure the software is operational when the teachers and students are ready to embark on the wonderful learning journey of STEM.

Not sure your computers meet the specifications for STEM software?

Call (888) 261-9873 and we will check your computer specifications for FREE!

25% discount on software installation or consultation with this ad!

A **warm welcome** to our newest readers in Zimbabwe at the Department of Journalism and Media Studies National University of Science and Technology, Bulawayo Zimbabwe.

STEM Magazine is a non-profit monthly education publication for teachers, students, their parents. The example and inspiration of individual educators carries tremendous weight on a daily basis, greatly impacting the quality and effectiveness of the classroom environment.

Wayne Carley is the publisher and senior editor for all content in STEM Magazine.

Wayne Carley
Publisher
STEM Magazine
478.319.7177
www.stemmagazine.com

wayne@stemmagazine.com

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 foundations of every career passion.

Wayne Carley
Publisher
STEM Magazine
STEM for Women Magazine
STEAM Magazine
STEM Mars Lander Experience

School, district, county and state "customized versions" are available.

To find out more, simply send your E-mail request to:

wayne@stemmagazine.com

You would have unlimited distribution to your teachers, students, parents and friends.

STEM Magazine is also PDF printable and mobile device friendly.

Online Learning Brings

Oceans and Marine Biology

to Landlocked Classrooms

By Catherine E. Christopher
Curriculum developer and outreach director, Ocean First Education

There's no debate about it—the ocean is a place of wonder and mystery.

In 2016, as the world comes to grips with climate change, it's more important than ever that students study ocean science and marine biology to understand the role of the ocean in the planet's health.

But how do you make that experience vivid and visceral if your school is surrounded by cornfields? Or mountains? Or if the closest ocean is 1,000 miles away?

When introducing marine science concepts, start big by introducing the concept of the ocean and all the ways it can be experienced. For instance, students are often introduced to terrestrial ecosystems; the flora and fauna, predator and prey relationships, and the abiotic components that make them unique.

Do the same, only through the lens of the ocean. Explain how it supports life on earth. Then consider tackling the topics that may be of greatest interest to students. Certainly, sharks is one of the first species that comes to mind.

High-definition (and 360 degree) video coupled with next-generation online curriculum can bring sharks splashing around in your classroom. Take that curiosity of sharks to the next level, introduce the marine ecosystem. The ocean is a vast space, filled with many dynamic ecosystems from rocky beaches to deep sea hydrothermal vents.

If your students are interested in sharks, specifically, imagine replacing wolves, the go to terrestrial apex predator, with these ancient marine predators to explain the importance of predators in maintaining a healthy, balanced ecosystem. This can then lead to conversations about education and conservation of an entire group of fish.

For instance, check out this 360 degree video.
Click on arrows, upper left, to change your view and explore the ocean.

After students interact with the video for a few minutes, ask them a series of questions, such as:

- ***Did you see the reptile (sea snake)?***
- ***Describe the shape and color of the fish you observed.***
- ***What were the predominate colors you observed?***

Then have students return to the video to find the answers to those questions. This level of engagement gives students the opportunity to experience a new world on their terms - they are no longer limited by the perspective of the videographer.

This immersive opportunity is engaging, motivating students to want to know more as they go back and watch again and again. Additionally, because students can change their view, the video doesn't get old and can be used throughout the lesson to hone their observation skills and give them the opportunity to apply what they have learned. With this ***one minute long*** video students can identify biotic and abiotic components of a coral reef ecosystem, identify various taxonomic groups and species, as well as observe the properties of light in the ocean.

Joe LaMagna, a biology teacher at New Covenant School in Lynchburg, Virginia didn't let distance from the ocean hinder his desire to expose students to marine science. LaMagna led his class through studies about the impact of sunscreen use in the ocean, the ocean's role in photosynthesis, and coral bleaching caused by warming ocean waters.

All of the studies were enhanced by using online curriculum and high-definition video streamed from the web.

"What we are trying to do is understand the importance of the ocean, even though we live 180 miles away. We needed to learn that everything we are doing with soil and even simple things like how we change our car's motor oil, and deal with the waste, have a direct impact on the ocean's health," said LaMagna.

Teachers can seek online marine science courses that offer access to interviews with leading-edge scientists and up-to-date research. Some courses offer supplemental videos, webinars and imagery that help students better grasp new concepts and keep them engaged throughout the learning process, such as the 360 degree video example above. Online courses that follow Next Generation Science Standards (NGSS) will require students to actively participate through scientific inquiry using critical thinking skills, data analysis and explanation construction based on their observations.

For example, students can investigate the temperature and salinity of the world's ocean using real-time data collected by over 3,900 autonomous buoys. The Argo Buoy Project, out of the University of California, San Diego, is part of the Global Climate Observing System/Global Ocean Observing System and the data collected is free for anyone to use. The buoys float along the surface of the ocean, then every 10 days drop to 2,000 meters. As they ascend back to the surface, the buoys collect and transmit data regarding temperature, salinity and some of the newer ones provide pH levels. Students can compare and contrast the temperature and salinity of the ocean at depth as well as across the globe using real-time data.

Cyndi Long, an instructional coach in Mapleton School District near Denver, says science teachers who are considering the use of online coursework should start by finding out what students know.

"Show a video or photo that captures the mysteries of the ocean or the physical movement and power of the sea," says Long, who is planning to bring online marine biology curriculum to her landlocked school district soon. The district has already used some courses for credit recovery at the high school level.

"Then ask students questions such as, 'What do you notice? Where do you think this is? What is living and non-living?' Based on the concepts students are learning in your class, guide the discussion to find out what knowledge and experiences they already have and what misconceptions are present."

By pulling in a variety of next generation learning tools, from 360 degree videos, webinars, Twitter chats with marine scientists, and online course materials, teachers can bring the ocean to life in the classroom in engaging and memorable ways.

As curriculum developer and outreach director for Ocean First Education, Catherine Christopher is responsible for developing engaging course content and designing online interactives for middle school through adult learners.

Volunteer Designers Develop Solutions

By David Hodge and Steve Goetsch

The McGuire 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.

for Veterans at Tech Event

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.

Michel Nash, who has trouble tracking the multiple medications she must take, first debuted her problem on a video that was shot at McGuire months earlier. It is on that video where California engineers David He and Jie Hu first saw Nash. "We decided to build a custom pill box after we saw the video," Hu said. "We saw the video at Palo Alto, and began designing a [pill] case for Michel," he added. "It took about two months to build."

Nash was overwhelmed at the level of support not only from her new California friends, but the Innovation Creation process. "I didn't know they were going to make my video into one of the challenges," Nash said. "What that tells me is that they [VA] were listening."

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."

The doctors and patients in attendance weren't by happenstance. Two dozen engineers, physicians and providers were there as official mentors from a variety of disciplines representing organizations like McGuire, Walter Reed, Google and Virginia Commonwealth University. That diversity fueled collaboration and a successful event.

"Bringing together individuals from various backgrounds and expertise allows for this synergy of creativity," Melissa Oliver, assistive technologies program manager, said. "The Veteran is at the center of this process and as a result, innovative solutions evolve and the Veteran benefits."

Some of those evolutionary processes happened rapidly, like in the case of Army Sergeant Lisamarie Wiley, who lost her left leg below the knee in a bomb blast in Pain Kalay, Afghanistan. Wiley took to the stage, showcasing several of the dozen prostheses she has been fitted for since she was injured.

She explained to the participants that she runs into problems transporting all of those prostheses while traveling. Her request was a single, interchangeable coupler for all of them.

That led to her vehemently exclaiming, "If you can figure out how to see a smiley face on Mars, surely it's not impossible to develop a coupler for a prostheses."

Team Spline members Matthew Kelly, Mihir Shelke, Jason Suh, Ausvin Khanna, Matt Baker and Rod Goode took on her challenge.

The judging panel that included design engineers and executives from Toyota, 3-D Systems, Google and Dr. Lucille Beck, Chief Consultant of the Rehabilitation and Prosthetic Service for Veterans Affairs selected their coupler device as the overall Google.org winner and the $20,000 prize.

All of the designs produced will be placed on the National Institutes of Health 3-D Exchange. An online, open source biomedical repository for 3-D designs.

Results:

1) $20,000 – Team Spline – Spline Coupler - Google.org winner (Make-A-Thon and GrabCad online Challenges)

2) $2,000 – Glucose Tester – 1st Place

3) $1,000 – Camo Cup – 2nd Place

4) $1,000 – Makeup Glove – Girls Lounge Personalized Prosthetic + Assistive Technology for Women Challenge

5) $1,000 – Drug Pushers (Water Bottle) – Pillbox Challenge

6) $1,000 – Dr. McCarran – Grip Strength and Speed Upper Extremity Prosthetic Challenge

7) Duck and Cover – Spotlight Award for 18 and under team

The 'Holistic Approach' to Integrating STEM, Common Core

By *Alan Neuhauser*

Integrating Common Core education standards involves integrating once-disparate school subjects with one another, experts said Tuesday at the 2015 U.S. News STEM Solutions Conference in San Diego.

"Thinking about the standards as being integrated really can push you," said Thomas Smith, dean and professor of the Graduate School of Education at the University of California—Riverside. "What can an English teacher do to help reinforce the math and science standards in their classroom when it comes to writing? What sort of writing activities would you expect to have in a mathematics class?"

It's those expectations, he and other panelists said, that can help students develop not only science, technology, engineering and math proficiency, but true STEM "fluency."

"STEM educators need to realize the world works in bodies and systems. Fluency is intrinsic to you. If I'm fluent in two languages, I think in two languages," said Cynthia Pulkowski, executive director of ASSET STEM Education, a Pittsburgh-based STEM education improvement nonprofit. "Can we have students deconstruct those worlds and systems and reconstruct them for another area to innovate, to problem solve, to create?

istic

This is really what our workforce is asking of our students, what they're asking of their future employees."

"Creating opportunities where kids learn to think for themselves more, reason better – that's a harder teacher to train and support later on in teacher development than just standing in front of a board and talking and telling, which is the traditional mode of math teaching," said Kirk Walters, a former math teacher and principal researcher in the Education Program at the American Institutes for Research. "We think that professional development … is important. But some of the studies that I have my name on, the results are disappointing."

The kind of collaborative learning he and others advocate for, however, may also offer a path forward for teachers and administrators, who can cooperate across subject areas, districts, seniority levels – even with independent researchers.

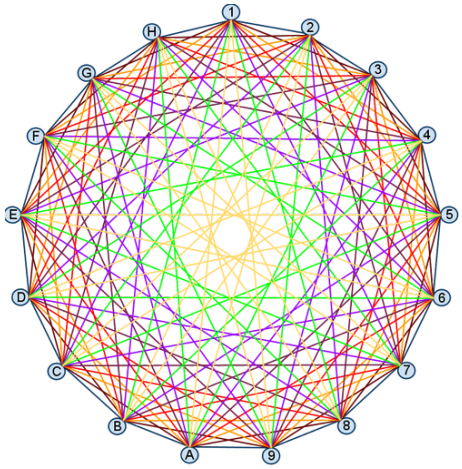
"Creating opportunities where kids learn to think for themselves."

"We started looking at project-based learning, and when teachers are involved in that, how are they bringing that back to the classroom," she said. Fifteen school districts in Pennsylvania, for example, have formed a coalition that's helped foster "shared decision-making, shared data, shared learning."

"Combine high school teachers, community college instructors and some university faculty to come together and share how they approach different topics in a broadly similar curriculum," Walters said. "More of a hand-off … rather than a full-stop on the brakes when someone goes from High School

"We're not doing a very good job blending the research with the practice," he said. Researchers will conduct poor studies then force those on schools, he added, and schools will fail to share what they're already doing and experiencing in their classrooms. But broad collaboration, he continued, can bring about big change – and ultimately make for a far smoother transition to college, too.

to college and everything goes back to the way they learned math and science back when they were in middle school."



No matter what you teach, from Art to Social Studies, this magazine is for ***you***. Let us show you how.

Use it in class. PDF printable and mobile device friendly.
Forward this to your students and their parents.
Make this a ***new connection*** for curiosity and interaction.

Submit an article: wayne@stemmagazine.com

The SCIENCE of Homework:
Tips to engage students' brains

Dr. Judy Willis

If you know a bit about the brain then you can plan homework to suit the needs of students as they develop. During early school years, for example, the brain is focused on getting to grips with the world around us. Memories and understanding grow when new information can be linked to things we already know. Homework that helps with this recognition can build literacy and numeracy skills.

When students reach adolescence, they become more independent and self-directed. There is shift away from rote memorization and single, correct responses. Learning goals are more likely to focus on reading for content and comprehension, revising, report writing, solving problems, investigating and independent or group work.

Well designed homework provides multiple ways for students to engage with what they are learning. They will then be able to use the facts they acquire to be creative and solve problems in class.

When to use online learning games for homework

Most teachers work hard to differentiate homework based on skill level, but with each new topic there may not be time to prepare individual tasks. Online games, in which pupils learn and test their factual knowledge, can be helpful when homework goals are about building a foundation of knowledge. This tends to be in the early years of school. Computer-assisted learning cannot replace good teaching: it is only from teachers that students can experience rich interactive learning and build conceptual understanding.

But using online learning games for homework tasks lets students gain the necessary level of factual knowledge and learn procedures that need to be memorized. This allows them to then progress in class to the richer subject content. Relieving teachers of essentially being drill directors means students get more class time to understand concepts and apply what they have learned.

Online games also help students to build skills to an automatic level at an appropriate pace for them. Games could be helpful in learning multiplication tables, spelling, remembering dates, names of rivers, foreign language learning, or getting to grips with grammar rules.

Well designed online skill games evaluate each student's ability as the basis for the questions or problems given. A good website for information about hundreds of available programs is ***graphite***. You can browse by subject, grade level and skills, and see rankings of popularity with learners and teacher evaluations.

The importance of homework that students value

In later school years homework is more likely to focus on reading for understanding, revising and launching investigations. When students know that the effort they put into homework will enhance their participation and enjoyment of classroom learning, they become more motivated. Pupils also put more effort into schoolwork or homework when they are engaged in something that is relevant to their studies.

For instance, if the class is studying how to calculate area, good math homework may be to get students to measure parts of their room they want to change (e.g. walls to paint, windows for curtains, doors to cover with cork board for posting photos etc). Those who complete the homework will be able to make sketches to scale of their rooms on graph paper and determine area. Those who don't do the homework will not be prepared for this activity and will have to solve less interesting worksheet problems.

If the assignment is to read a chapter in a social studies or history book for discussion the next day, teachers can inform them that there will be a short quiz of the main points. Students who score high enough to demonstrate that they did their reading will have the rewards, or do independent projects of their choice and move on to new challenges.

How much time should homework take?

The amount of time spent on homework will always vary depending on the age of students and what task you have set.

After about 15 minutes of learning and practicing something - such as the Pythagorean theorem in math - the regions of the brain activated in spatial-numerical learning get fatigued and need to rebuild the neurotransmitters, such as dopamine, that ***get depleted.***

This is why teachers need to plan brain breaks in class time and for homework. It doesn't mean the child needs to run around or play a game. It just means another part of the brain (or body) should be doing the activating while the other area rests.

The restoration only takes a few minutes if the break is timely, but if they are pushed to stay with that same process for too long, stress builds, neurotransmitters drop way down and it will take twice as long to restore full efficiency to that area of the brain.

The good thing about getting students to do something that will enhance their classroom experience is that they are more likely to engage in it, so they don't mind spending time on it.

Online games for learning basic knowledge usually have set timings. You can assign a specific amount of time to be spent on the skill building program for homework and confirm students' compliance by checking the teachers' pages.

The First Public Space Telescope

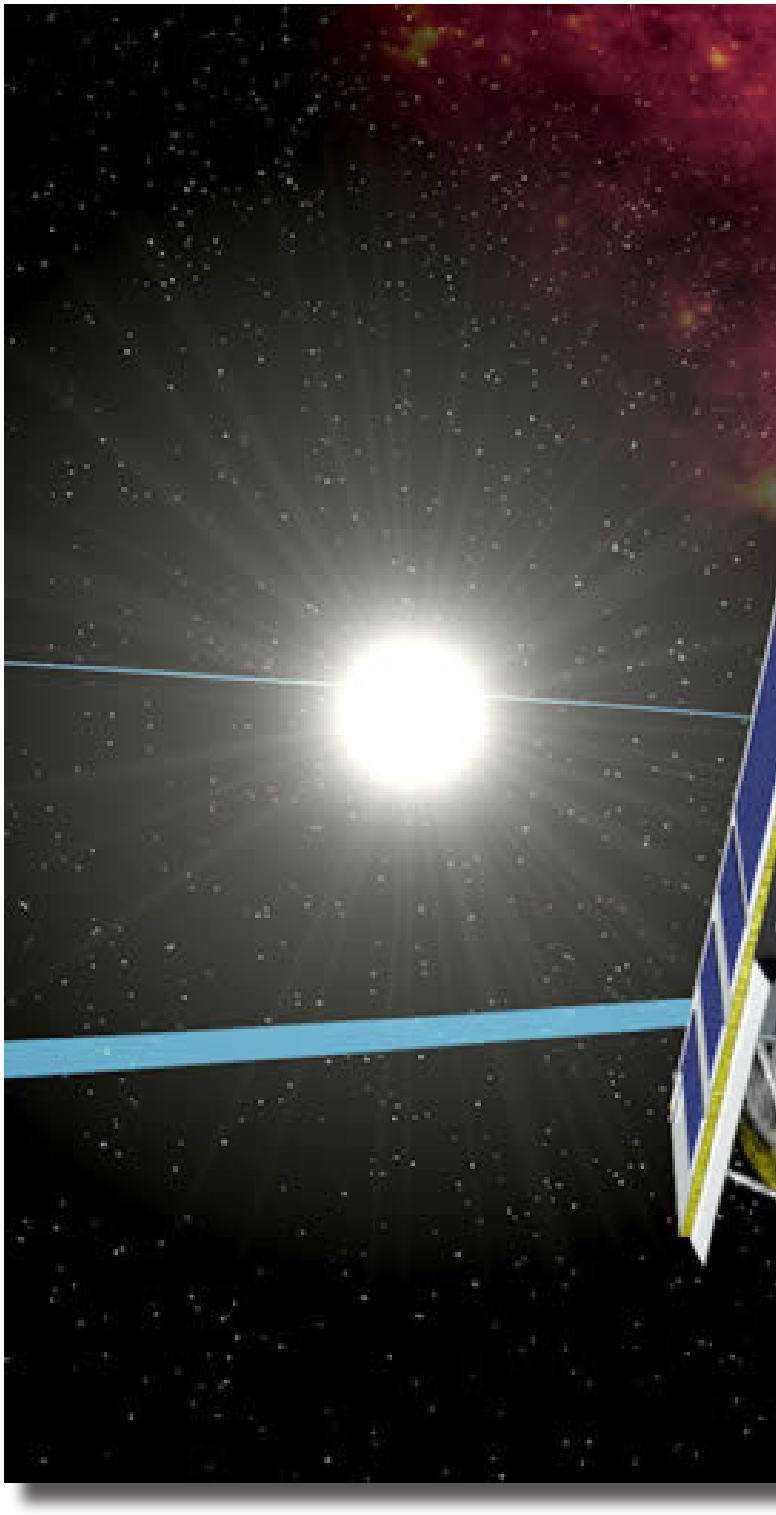
Christian Wiederer
Institute for Astronomy and Space Technology, Munich, Germany

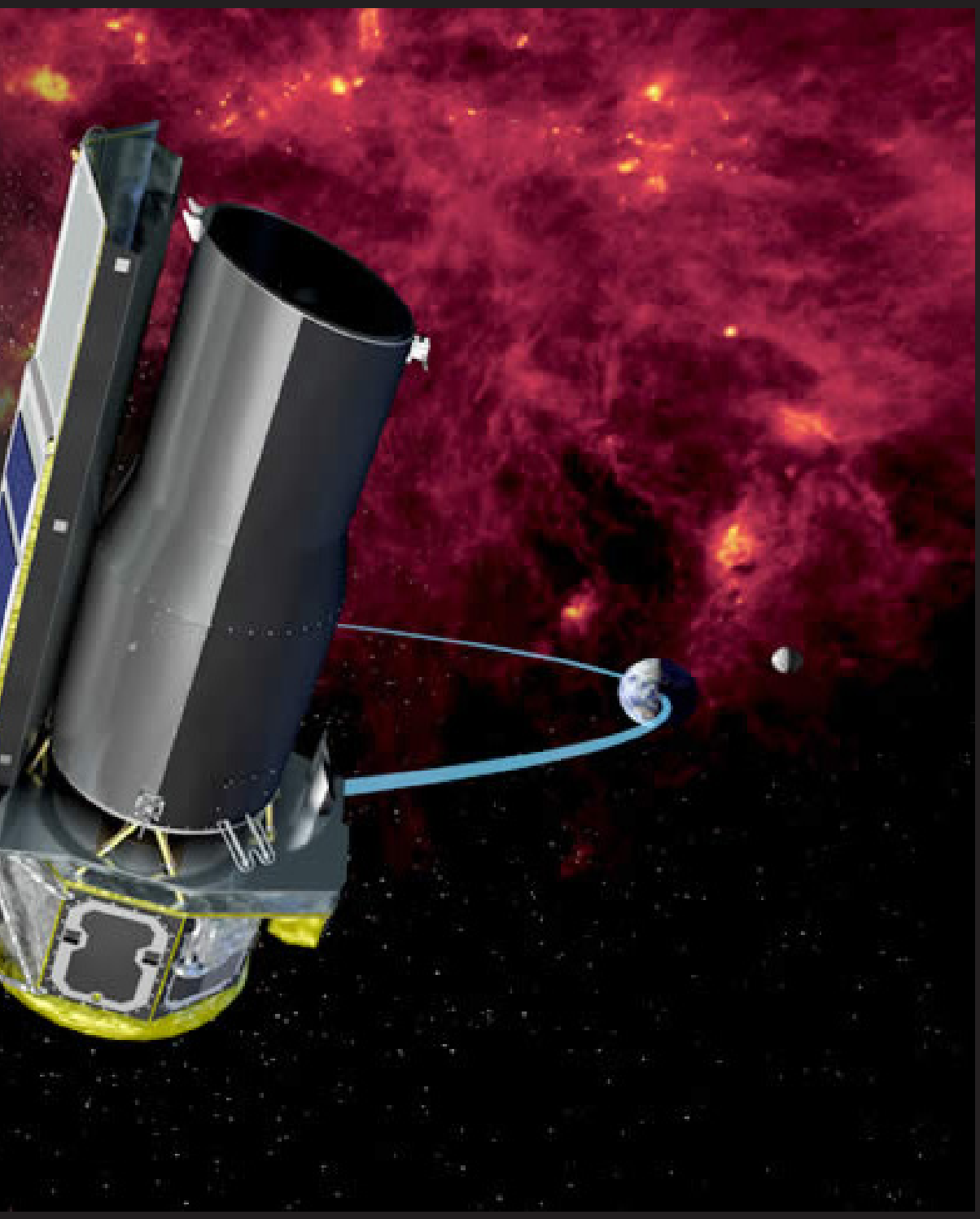
As we mentioned 2 years ago, this project is coming along nicely.

The main objective of this project is to make astronomical observations available to a wider international audience, not just the select few.

Everyone can access "**Public Telescope**" from amateur astronomers, educational institutions and scientists to members of the public all from the comfort of their classroom or home over the web.

The space telescope is currently being designed in Germany and is planned to be operational in 4 years. Once the telescope has reached earth orbit, it will be available worldwide for everyone to access.





Advantages of a Space Telescope

The Public Telescope offers many advantages over conventional terrestrial telescopes:

• Due to the lack of atmosphere in space there is no air turbulence.

• The increasingly widespread air and light pollution on earth have no influence on the observation.

• The space telescope is independent to the location of the user and of local meteorological conditions on earth, such as cloudiness or change of day and night. This results in a daily usage time of 24 hours for the entire starry sky of both the northern and southern hemisphere.

• Without the filtering effect of the earth's atmosphere, the space telescope can also reflect ultraviolet light in addition to human visible light something not possible from the surface of the earth.

• Public Telescope will allow observation of incidents such as star bursts and supernovae or the exploration of massive black holes without doubt leading to new insights into our solar system.

Ease of use and operation

Home users will be able to take photographs of specified objects such as planets, stars or galaxies through a simple and easy to use website. The process of accessing these objects is greatly simplified meaning the only prerequisite is a working internet connection. Indeed the telescope will also be accessible on mobile devices or tablets through an easily available app. The heavens will be yours to explore.

Opportunities for amateur astronomers

This is an unprecedented opportunity, at no time in the history of astronomy has such a high-powered tool been so easily available, not just for professionals but for amateurs and enthusiasts.

The high resolution capability of the telescope offers new possibilities for the observation of small or distant objects. This will make it, for example, possible to study the evolution of the planets and their moons in our solar system much more accurately.

Another possibility is to analyze in far greater detail the distribution of meteorite impacts on Jupiter and Saturn,

which can lead to conclusions on the spread of interstellar matter in the outer solar system. In addition to these classical observations unresolved questions can also be addressed, for example if within the orbit of the planet Mercury asteroids are orbiting the sun.

The space telescope offers amateur astronomers an extensive and fully customizable suite of functions and configurations; co-ordinates can be directly input, different cameras select, exposure time, color filters and much, much more.

In addition, students will be able to watch, in real-time, how other users (amateur astronomers or scientists) use the telescope.

Following this experience, interested students can also use the telescope independently. The Public Telescope team places great emphasis on the application of the telescope for educational purposes, therefore, educational institutions, schools and universities are encouraged to submit their own ideas, use case, project goals before the Telescope is put in space and wherever possible the Public Telescope team will look to implement these features.

The heavens will be yours to explore.

Space Telescope for Education

With the Public Telescope, students have the opportunity to access state of the art space technology for their own projects. Planets, galactic nebulae, galaxies, detailed sections of the earth or the moon, all of this can be observed and discussed in real-time during the lessons. Lessons become much more tangible when discussions on the forming of stars or the remnants of supernova explosions can be analyzed and explored in practical lessons.

More value to science and research

With tools for monitoring the ultraviolet light, the Public Telescope provides an excellent complement to existing monitoring capacities for scientists. Using the Public Telescope scientists greatly enhance their capabilities to observe variable objects of different astronomical classes:

- Novae, dwarf novae or supernovae
- Stars in their mass loss episodes, hot and cool stars

• Active galactic nuclei, even analyzing their molecular chemistry

• The gas and dust production from comets

These objects can be photographed over periods of hours to months and regular spectroscopic analysis can be done.

Technology

The space telescope will be equipped with an optically effective mirror with a diameter of 80 cm. Due to special technology, the angular resolution will be in the optical spectrum of the theoretical limit of 0.15 arc-seconds. Instruments for different spectral ranges, such as infrared (IR) and ultraviolet (UV) will also be included allowing the recording of images, spectroscopy and photometry. Additional cameras will allow the transmission of images of the earth's surface.

"Every major invention for astronomy has rapidly spread among the many people interested in astronomy around the world", underlines Heiko Wilkens, founder and managing director of the project. "The realization of a space telescope for everyone is therefore only a question of 'when' and not 'whether' or 'why'. By using Public Telescope - the first public space telescope - the view of the Universe is possible for all people. That's our vision. That's what we work for."

Astrofactum GmbH, Institute for Astronomy and Space Technology

The planning and execution of the project Public Telescope is coordinated by an experienced team under the direction of the initiator Heiko Wilkens (48) and Christian Wiederer (42).

The project is also supported by renowned experts from science and technology, amongst others by ESA astronaut Gerhard Thiele, astrophysicists and university professors Dr. Hanns Ruder and Dr. Klaus Werner and the optics and telescope developer Harrie Rutten.


Zom

Zombies

Infiltrate Classrooms to Bring STEM Back to *Life*

Educators are tapping the undead to bring life to subjects in need: science, technology, engineering and mathematics (STEM). With a decline in student interest, especially among girls, teachers are incorporating popular trends in movies and TV shows into lesson plans.

The National Academy of Science and Texas Instruments TXN +1.29%, the company behind the large graphing calculators, teamed up to create STEM Behind Hollywood, a program that creates STEM lessons based on zombies, superheroes, space and forensics. The goal is to engage middle and high school students with things they are excited to talk about.

One theme in the four-part activity is focused on zombies and is centered on the idea that a hypothetical virus is infecting humans. Imagine that distinctive shuffle that is commonly used in zombie shows or movies —

excluding the terrifying brain-eaters from the "28 Days Later" series. Students can observe a zombie's behavior and deduce that something is wrong with the cerebellum, the part of the brain involved with walking. From there they can work backwards to reverse engineer a zombie brain and learn how a healthy brain operates. From the math angle, students can track how the contagion spreads to write an equation showing the curve of infection rates.

"The activity teaches the concepts and then gives them the ability and opportunity to apply that to real-world situations," said Melendy Lovett, the president of Texas Instruments' Education Technology. "This is the kind of experiential learning that gives students a deep understanding of the concept."

STEM Behind Hollywood hopes the lessons will ignite curiosity about STEM careers, an area that is expected to see a 17% jump in employment opportunities by 2018, according to the U.S. Department of Labor. But interest in the subjects is diminishing among teens. Almost half ranked STEM and medical-related jobs as their first choice, a 15% decline from last year's figures, according to the Junior Achievement USA and ING.

"The major interest is to improve student achievement in STEM and build a pipeline of STEM capable students," Lovett said. "The STEM area is the fastest growing area for jobs and having this pipeline of STEM talents will be important."

Math and science educators teamed up with specialists in the featured themes, like Dr. Steve Schlozman, an assistant professor of psychiatry at Harvard Medical School and expert on zombie neurobiology. Gurus in forensics, space and superheroes were also tapped to help create STEM Behind Hollywood.

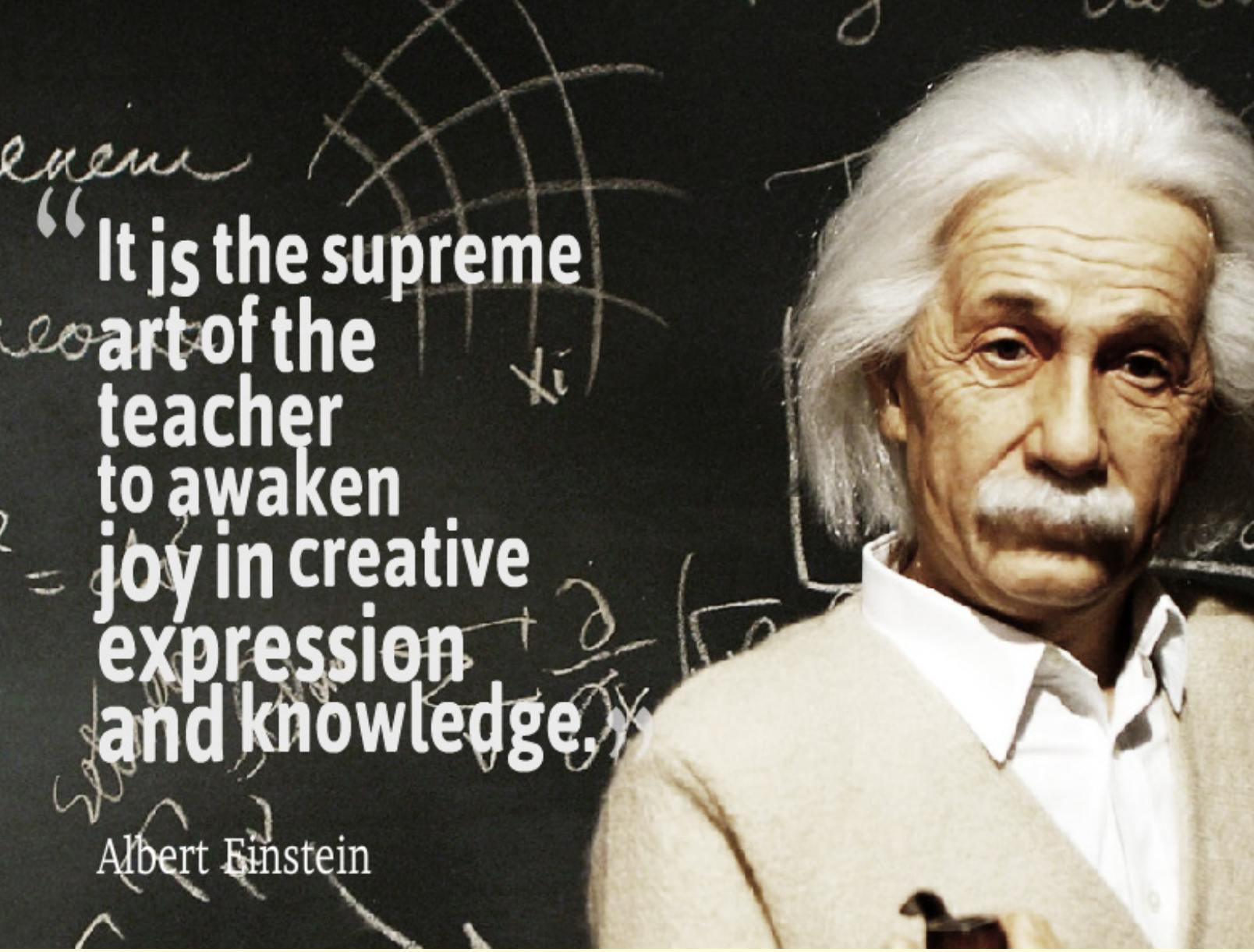
Zombies have been staggering their way towards students' brains for some time. Dorothy Pomerantz wrote about the new open online course on 'The Walking Dead' and classes on the undead already offered at Columbia College in Chicago and Baltimore University.

STEM Behind Hollywood is available to teachers and students on a free TI-Nspire software trial, the technology made by Texas Instruments, but children who purchased the graphing calculator get the software included at no extra charge. There is also an app available for the iPad.

Katie Martinez, a high school educator who teaches predominately lower level students in San Diego said she started using the program in the second week of school to excite her pupils.

"This is an outlet they are familiar with and comfortable talking about," said Martinez, 33, who uses the program in her algebra class. "It's easy to relate that to what we are studying in class and brings it more to life for them and makes it more accessible."

by *Emily Canal*
Forbes Staff



Combining Science with the *Art* of Teaching

Dr. Judy Willis

The implications of neuroimaging for education and learning research are still largely suggestive. Researchers have not yet established a solid link between how the brain learns and how it metabolizes oxygen or glucose.

It is premature to claim that any instructional strategies are firmly validated by a solid combination of cognitive studies, neuroimaging, and classroom research. For now, educators must be guided by a combination of the art of teaching and the science of how the brain responds metabolically and electrically to stimuli. Here are some promising areas of research and practice.

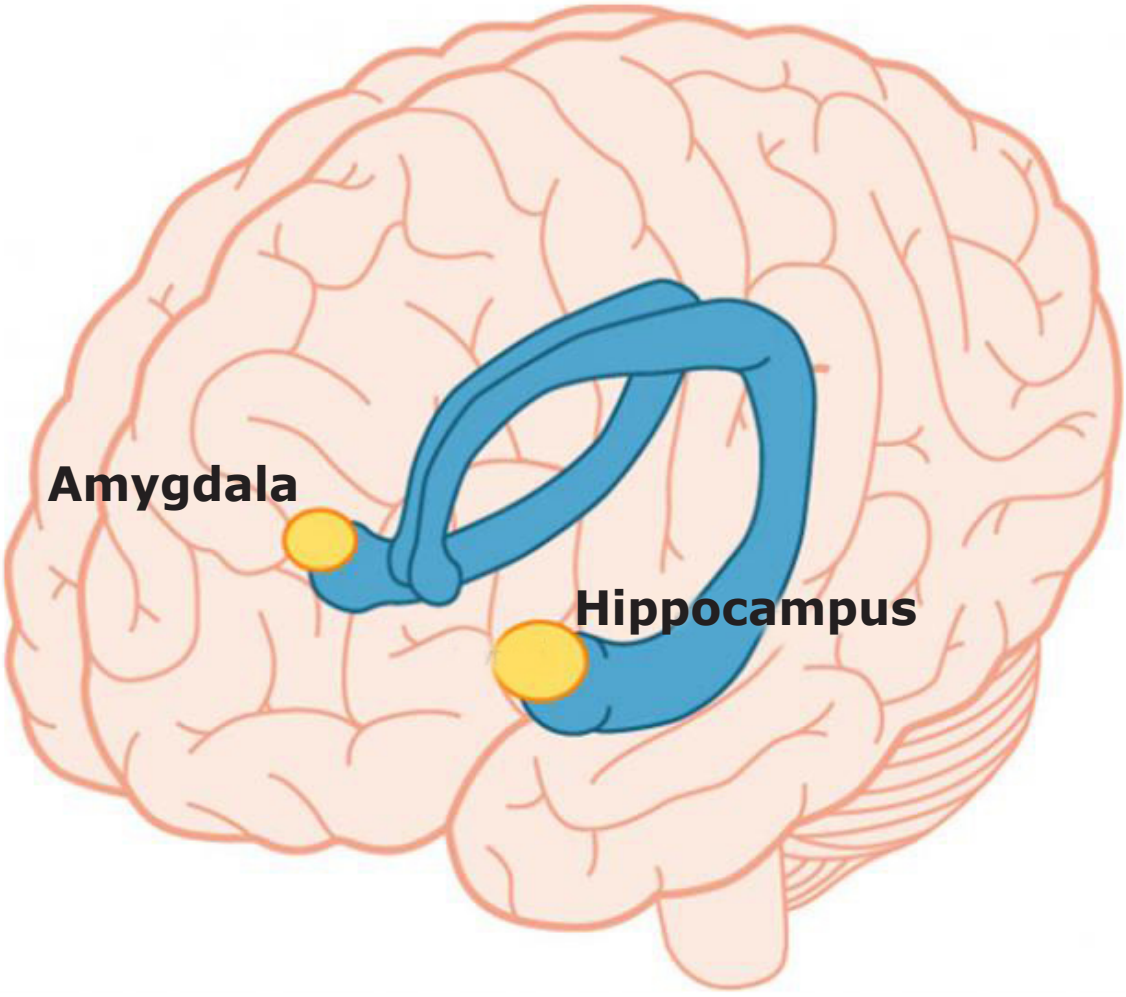
The Amygdala—Where Heart Meets Mind

The education literature has included theories about the effects of emotion on language acquisition for decades. Dulay and Burt (1977) and Krashen (1982) proposed that strong positive emotion reinforces learning, whereas excessive levels of stress and anxiety interfere with learning. Educators know from subsequent cognitive psychology studies and firsthand classroom experience that high stress, boredom, confusion, low motivation, and anxiety can hinder students' learning (Christianson, 1992).

Research using neuroimaging and neuroelectrical brain wave monitoring supports the connection between emotion and learning, enabling us to see what happens in the brain during stress (Introini-Collison, Miyazaki, & McGaugh, 1991).

The amygdala, part of the limbic system in the temporal lobe, senses threat and becomes overactive, delaying or blocking electrical activity conduction through the higher cognitive centers of the brain. When the amygdala is in the overactive metabolic state associated with stress, the rest of the brain's cortex does not show the usual fMRI or PET scan activation that represents the processing of data (Chugani, 1998; Pawlak, Magarinos, Melchor, McEwen, & Strickland, 2003).

New information coming through the sensory intake areas of the brain cannot pass as efficiently through the amygdala's affective filter to gain access to the brain's cognitive processing and memory storage areas, such as the left prefrontal cortex.



"This is one of the most exciting areas of brain-based learning resea
communications among the parts of the brain when an individual

Additional evidence of the amygdala's role as an affective filter comes from real-time neuroelectric studies, which demonstrate that the somato-sensory cortex areas are the most active areas of the brain during the moments when new information is received. These are regions found in each brain lobe that receive input from each individual sense—hearing, touch, taste, vision, and smell (Andreasen et al. 1999).

Mapping studies show that bursts of brain activity from the somatosensory cortex are followed milliseconds later by bursts of electrical activity in the hippocampus, the amygdala, and then the other parts of the limbic system (Sowell, Peterson, & Thompson, 2003). This is one of the most exciting areas

of brain-based learning research because it shows which strategies stimulate and impede communication among the parts of the brain when an individual processes and stores information (Shadmehr & Holcomb, 1997).

This brain research supports educators' firsthand experience, which tells us that superior learning takes place when learning activities are enjoyable and relevant to students' lives, interests, and experiences (Puca & Schmalt, 1999). Teachers recognize the state of anxiety that occurs when students feel alienated from their reading experiences or anxious about their lack of understanding. I witnessed this response when, as a student teacher, I worked in a school district that had implemented time-and-page synchronization of its phonics-heavy reading program (Open Court). All teachers were required to cover material at a mandated pace, so that students at each grade level were on the same page of the program each day.

Second graders were brought to tears or outbursts of frustration when they were confused; their requests for help went unheeded as teachers struggled to keep to the timetable. Students were told, "Don't worry. If you don't understand or finish now, you'll be taught this same material in a lesson some time in the future."

rch because it shows which strategies stimulate and impede processes and stores information"

"Second graders were brought to tears or outbursts of frustration when they were confused; their requests for help went unheeded as teachers struggled to keep to the timetable."

Neurochemical, neuroimaging, and neuroelectric research support a learning model in which reading experiences are enjoyable and relevant. The brain research evidence reinforces the need for classrooms to become places where students' imaginations and spirits are embraced when reading time begins.

Every teacher and administrator in your school needs to know this. This is not a science issue or math issue.....it's a learning issue. Please share it with them and encourage them to read, use in class and share with parents.....STEM Magazine.

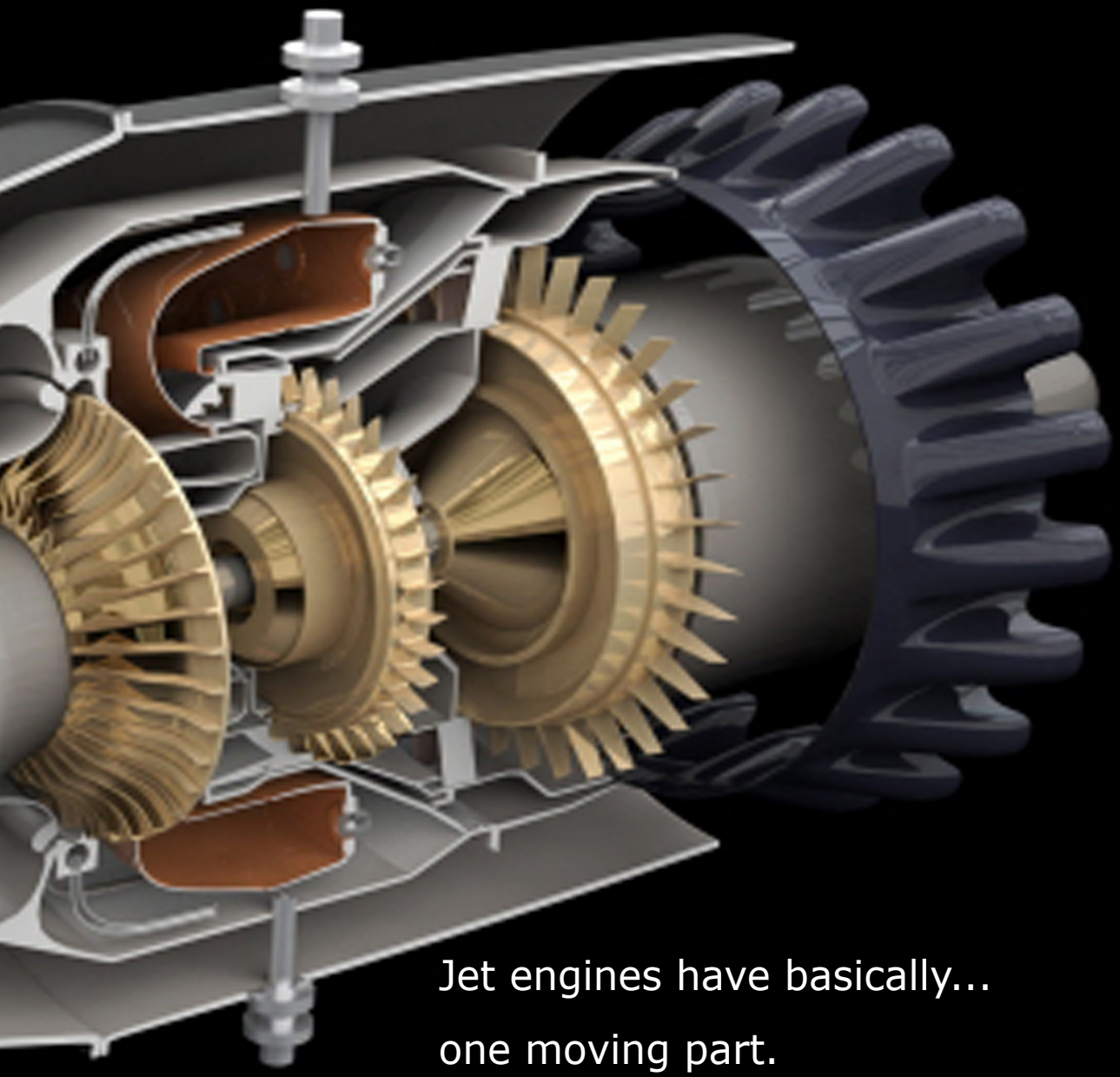
Dr. Judy Willis is an authority on brain research regarding learning and the brain. With the unique background as both a neurologist and classroom teacher, she writes extensively for professional educational journals and has written six books about applying the mind, brain, and education research to classroom teaching strategies, including an ASCD top seller, Research-Based Strategies to Ignite Student Learning.

After graduating Phi Beta Kappa as the first woman graduate from Williams College, Willis attended UCLA School of Medicine where she was awarded her medical degree. She remained at UCLA and completed a medical residency and neurology residency, including chief residency. She practiced neurology for 15 years before returning to university to obtain her teaching credential and master's of education from the University of California, Santa Barbara. She then taught in elementary and middle school for 10 years.

Currently, Dr. Willis gives neuroeducation presentations, and conducts professional development workshops nationally and internationally about educational strategies correlated with neuroscience research.


You were *born* with S.T.E.M.

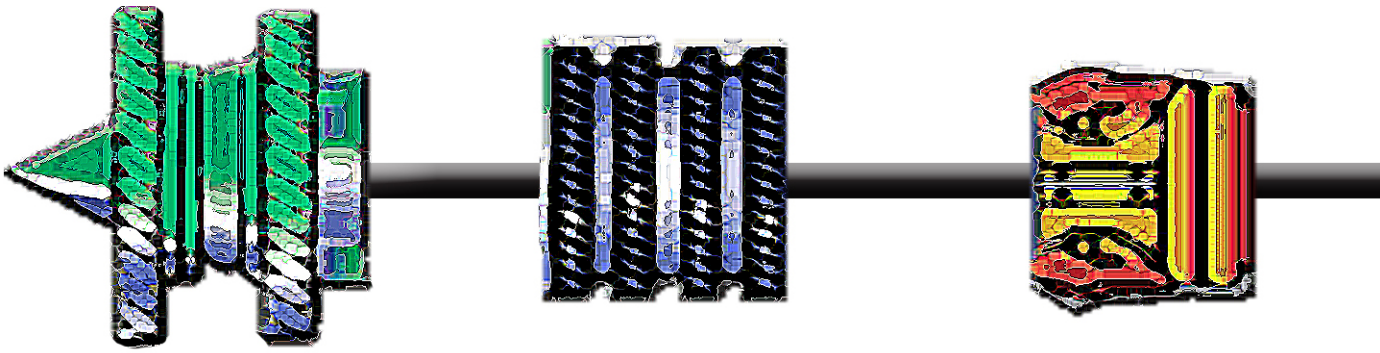
Why are Jet Planes so safe?



Jet engines have basically...
one moving part.

The average car engine has about
200 moving parts.

The #1 cause of plane crashes is...
pilot error.



Fan **Compressor** **Combustor**

The **FAN** blades spin at high speed (because of air rushing in) and **COMPRESS** or squeeze the air in the compressor.

The compressed air is then sprayed with fuel in the **COMBUSTOR** and an electric spark lights the air, fuel, mixture. The burning gases explode and blast through the **TURBINE,** then the **MIXER** out through the **NOZZLE**, at the back of the engine. As the jets of gas shoot backward, the engine and the aircraft are thrust forward.

Note that all of the major parts are connected to one single rod or shaft....making our engine one, big moving part.

When the TURBINE spins because of the COMBUSTOR blasting air and fuel through it, it turns the shaft, which is connected to the front fan, turning it faster and pulling in more air.

Turbine **Mixer** **Nozzle**

Careers in aviation and jet engine maintenance are great opportunities. Parts just wear out and have to be replaced or repaired. With thousands of jet in the sky, safe and dependable aircraft are important.

There are many more reasons why flying in general is safe, but jet engine technology continues to improve with new materials and innovations.

Many of these STEM jobs do not require college, but rather trade school, specialized aviation schools or aircraft company education programs.

In the past 50 years, the world's commercial airliners have racked up nearly one billion flight hours, providing an industry meticulous about record keeping with a steady stream of information that is used to constantly improve the design of airplanes and engines.

Starting salary for a certified jet mechanic is about $50,000 per year.

We need you to continue the innovation and improvement of jet engine technology that will save fuel, run quieter, be cheaper to build, be safer and last longer.

Jet engines may be advanced, but you will make them revolutionary.

Jets are not perfect and need replacement parts, updated materials, new software and new ideas we haven't thought of yet....***but you will.***

Are you curious about this career? That's where you start regardless of your age.
Google it.....

MARS LA

STEM Classroo

STEM Magazine is excited to propose and participate in a u
visually and mentally engaging STEM classroom experience.

The group experience includes the real time use of:

- Several computer stations and class-wide interaction
- Use of binary translation and commands to and from Lar
  flight and decent control
- Social media and internet activity
- Live video feed from Mars Lander for targeted site object
- Classroom projections from Lander camera
- Interaction with Mission Control
- Verbal communications skills between mission stations /
- Use of state of the art technologies that directly correlat
  careers

LIVE FEED

The MARS Lander and event is provided and operated by STE
staff to simulate an actual MARS landing.

All STEM skills and direct applications will be in use in

* We are looking for national sponsors for this prog

You can have a **"National STEM Outreach"** from your
any school in the nation and STEM Magazine Education
implement all of the CC curriculum and hands-on activi
501c3 Grant Qualifying.

missiondirector@stemmarslande

ANDING

m Experience

nique

nder for

tive

directors
e to STEM

EM Magazine

real time.

ram.

r location to
Staff will
ties for you.

er.com

i3 Technology Group LLC

INSTALLATION, INNOVATION, INTEGRITY

i3 Technology Group specializes in the installation of STEM software & STEM computers for K-12 education. We also offer consultation services to guide your IT team through the installation process and ensure they have a successful deployment. Please visit our website at www.i3technologygroup.com and contact our team with any questions.

Our founding members have multiple years of experience working in the K-12 Information Technology industry and installing client software for one of the nation's leading STEM software curriculum providers. We ensure the software is operational when the teachers and students are ready to embark on the wonderful learning journey of STEM.

Not sure your computers meet the specifications for STEM software?

Call (888) 261-9873 and we will check your computer specifications for FREE!

25% discount on software installation or consultation with this ad!

STEM Magazine is.....Global