STEM MAINE

The STEM of Hockey

December 2016
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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.

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Teaching Visual Learners with Data Visualization

Visual learning tools are being used more and more in today's classrooms because of their proven effectiveness in helping students understand complex concepts. Some studies have shown that 65% of us are visual learners, and that visual aids can improve learning by up to 400%.

Earlier this month, Dr. Anselm Spoerri of the School of Communication and Information at Rutgers University presented an ACRL/Choice webinar: Teaching Visual Learners with Data Visualization—Delivering an Active Learning Experience for Engineering Students.

In this webinar, Dr. Spoerri emphasized the importance of selecting the right display format to make data patterns visible. *"It's all about being able to tap into the perceptual capabilities of the viewer so that they can gain insights into the data sets,"* he said. Dr. Spoerri outlined key data visualization design principles:

1. Interactivity. When the user interacts with the data, the display gets updated instantaneously. The New York Times delegate calculator is a great example.

2. Immediate Feedback. This function is essential for supporting interactivity. Immediate feedback allows the user to instantly extract meaningful information from the visualization.

3. Linked Displays. To explore a large information space, such as 5 – 10 data variables, multiple displays are needed to show subsets of the data space. Linked displays enable the user to explore how one selection in one display plays out in another display. An example is a stacked scatter-plot.

4. Overview > Zoom + Filter > Details-on-Demand. This three-pronged approach is also known as Shneiderman's mantra. The overview allows the data to be seen all at once. The user can then interact with that data with zooming controls and filters to focus in on a specific aspect of the data. Finally, the user can mouse over a specific item to get details-on-demand.

5. Dynamic Queries. This principle is related to interactivity, immediate feedback, and the ability to filter. For example, when a user specifies a query in a parallel coordinates display, instantaneous feedback is shown as the query is being executed.

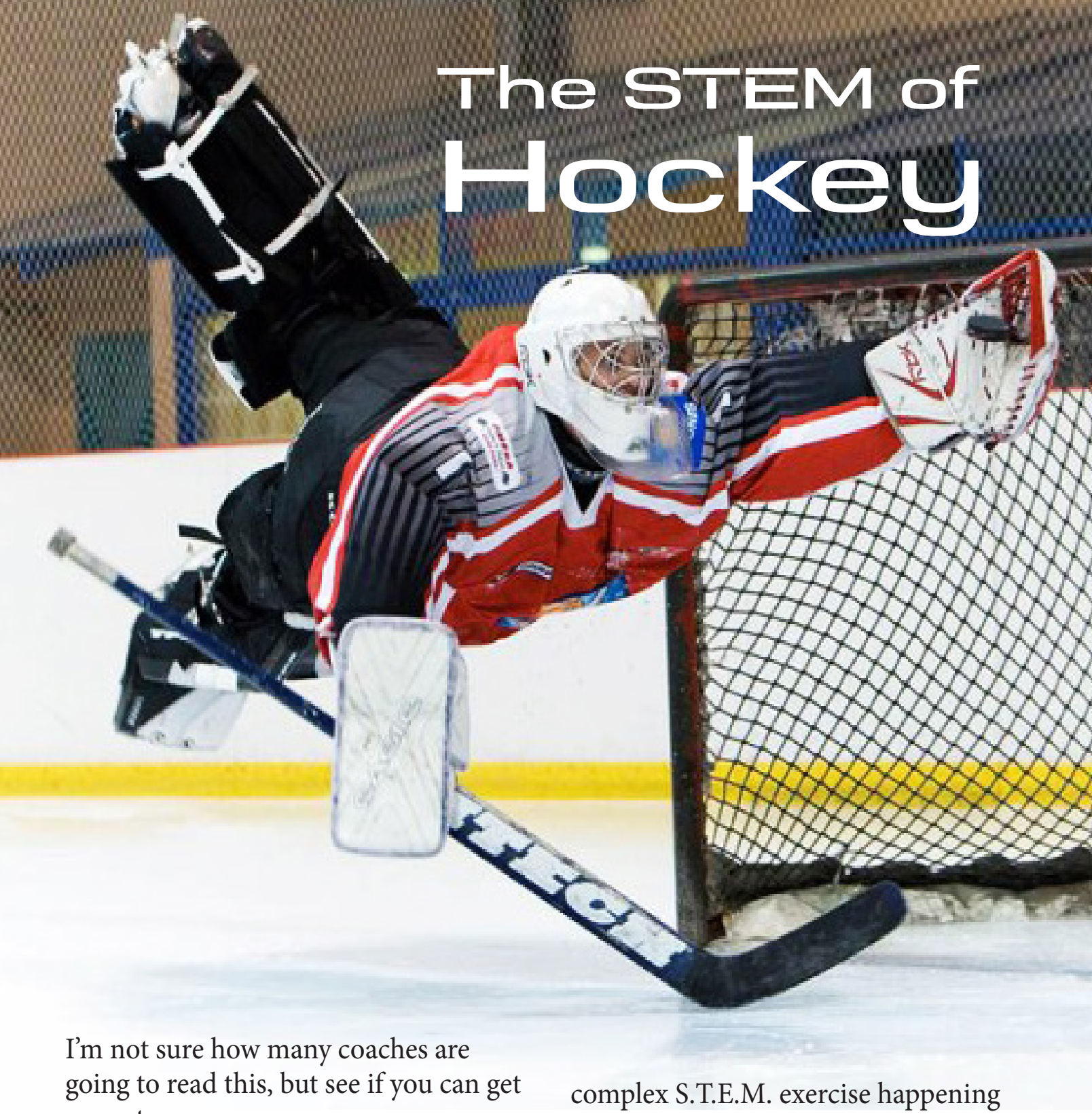
6. Focus + Context. With a very large data space, it's important that the user is able see the overall context when zooming in on specific data. A fish-eye distortion is a good example of this principle in action.

7. Animate Transitions. This design technique makes it easier for viewers to assimilate changes in data. The transitions are animated, rather than just showing the beginning state and the end state. Bubbles and motion charts achieve this.

8. Increase Information Density. The goal here is to pack in as much data as possible. "Leave no pixel behind," says Dr. Spoerri. With a tree map, the user gets a big picture of the hierarchical structure, and is able to zoom in and explore the data in more detail.

Watch Dr. Spoerri's full webinar here to find out more about integrating data visualization techniques into your engineering classroom. You can also download Dr. Spoerri's free white paper: Using Interactive Data Visualization to Promote an Active Learning Experience for Engineering Students.

The STEM of Hockey



I'm not sure how many coaches are going to read this, but see if you can get yours to.

Some coaches teach another traditional class which includes them in the S.T.E.M. conversation, but sports in general has a fascinating and deeply complex S.T.E.M. exercise happening at lighting speeds in the brain of our kids and adults. S.T.E.M. and sports just may be the best example for them to grasp the concepts of personal S.T.E.M. integration and awareness.

The Hockey Puck-
(Science and Technology)

Hockey pucks are flat, solid, black disk-shaped objects made of vulcanized rubber. Regulation National Hockey League (NHL) pucks are black, 3 in (7.6 cm) in diameter, 1 in (2.54 cm) thick, and weighing 5.5-6 oz (154-168 g).

The edge has a series of "diamonds," slightly raised bumps or grooves. The diamonds give a taped hockey stick something to grip when the puck is shot. The blue pucks used in junior hockey are sometimes only 4 oz (143 g). The raised bumps on the puck affect the aerodynamics (science) of puck travel and flight when hit, causing unusual, sometimes unexpected, but often controllable direction.

Vulcanization or vulcanisation is a chemical process for converting rubber or related polymers into more durable materials via the addition of sulfur or other equivalent "curatives." These additives modify the polymer by forming cross links (bridges) between individual polymer chains. Vulcanized material is less sticky and has superior mechanical properties.

A vast array of products are made with vulcanized rubber including tires, shoe soles, hoses, and hockey pucks.

The process is named after Vulcan, Roman god of fire. Hard vulcanized rubber is sometimes sold under the brand names ebonite or vulcanite, and is used to make hard articles such as bowling balls and saxophone mouth pieces...thus, very science in nature. Someone must design and make hockey pucks.

During a game, each team keeps a supply of pucks in a freezer at all times. During games, pucks are kept frozen in an ice-packed cooler, which usually sits on the officials' bench. All pucks are frozen to reduce the amount of bounce. This has to be taken into consideration by players as the puck warms up and changes its behavior characteristics. ***(The Engineering Method - decision making)***

The Hockey Stick
(The Science, Technology and Math)

Fiber architecture enables precise location of dual kick-points, providing predictable stick bending moments for two common hockey shots.

The kick point is where the stick is stiffest verses where it can flex. When you take your shot you allow the stick to do a lot of the work for you much like a golf club. It does this by bending and then returning to its original shape. This action can exponentially increase puck speed and velocity. When your stick is flexed it has a lot of potential energy, which is then released as you take your shot. The more volume or length of the shaft that is flexed, the more velocity your shot can have. Each player must know their stick enable to control and shape the chosen shot.

For example, a mid-kick point stick will bend the entire length of the shaft because the stiffest part is in the middle. Alternatively the less length the stick has to flex the quicker you will get the shot away but it will not have as much potential energy.

The low-kick point stick has only the bottom portion of the stick that is actually doing the bending. Only a small amount of stick is gaining energy so the stick will return to normal faster


cision Making
gineering Method)
Balance
(Physics)
Energy Required (Math)
Flex Technology of Stick
Speed Estimation
(Math)
Geometric Angle of Attack

resulting in a quicker shot but not necessarily a faster/harder one.

To put this in perspective, a weaker slap (full arms and waist turn) shot may have greater velocity than a hard wrist shot because of the amount of potential energy gained from the stick. The introduction of composite sticks in 1999 enabled designers to build sticks 35 percent lighter than their wood predecessors and perfect once impossible stick designs that have since changed the game.

The stick reaches its maximum bending moment before the blade hits the puck. When it contacts the puck, the stored energy is released during the follow through. In general, a composite hockey stick must be able to withstand a nonlinear dynamic load of 1,000N to 1,200N for 1.2 seconds without fatigue in the fiber matrix during 1,000-plus cycles.

Yes, this is math terminology and both amateur and professional players want to know the potential of their equipment to fit their style of play.

Embrace the math to win.

Fiber architecture

A standard hockey stick shaft has a hollow, rectangular cross-section. The cross-sectional dimensions of the upper portion of the VAPOR APX are 0.76 inch by 1.175 inches (1.93 cm by 2.98 cm), with radiused corners (radii of 0.21 inch/5.5 mm) on each of the shaft's four edges. The VAPOR APX stick's standard length is 60 inches/1.52m.

A long and complex series of tapers are built into the lower region of the stick to connect the wider shaft to the thinner blade. The more layers you have, the more you can distribute the orientation of the fibers.

The orientation sequence in a core cross-section follows a pattern (e.g., 30°/45°/30°/19°/0°/30°), and the pattern varies depending on the area of the stick and its specified stiffness profile. When you have a good distribution of fiber angles, you have a better distribution of stress.

This is a glimpse into the math and technology that make hockey, hockey equipment and their related careers ***VERY*** S.T.E.M. in nature.

Skating-

(Physics, Math, Engineering Method - Decisions)

As I stride forward (or backward) the brain instantaneously and mathematically calculates the amount of energy in the hips, torso, arms and balance necessary to skate at a speed desired to stay within reach of the puck with my hockey stick and control it's speed and direction.

Constant changes in the body are made moment by moment as my speed changes, my direction changes, and instant decisions have to be made to avoid the opponents in my way as I move down the rink.

Based on the results of each stride down the rink, math and energy adjustments are instantly evaluated and adjusted as necessary for the next stride. This process continues throughout the skating process which may include 25 strides down the rink. Even the texture, temperature, and condition of the ice have a direct effect on the above processes.

All of this happens subconsciously, instantly and repeatedly. Ask any hockey player if they like math. Whether it's yes or no, they should.

This is the kind of S.T.E.M. integration needed for a student to understand its importance and wide range of applications. As a coach, why not bring this to the players' attention. That is the integration we're looking for.....the link between S.T.E.M. and everyday activities that are connected to S.T.E.M. careers in general.

It gets more amazing now as we incorporate the science of physiology (the study of the human body), and synchronize the act of skating with all of its physical complexities added to the previously discussed math and science.

Now our math and science calculations must be modified due to our forward, backward and diagonal motions. We cannot just skate, but skate, move our hockey stick, push forward at a specific angle instantly calculated based on our speed and direction.

The energy requirements to skate down rink will need adjusting as well to synchronize with our bodies motions.

This is so cool. No pun intended.

What is our head doing? Our eyes? Mentally we have already begun to make math calculations regarding the process of passing the puck to another player which requires a completely new set of energy calculations and geometric angles from our present position to a calculated future position of team mates and estimations about several possible outcomes. Keep in mind, our brain is making these math and science calculations while performing the skating process. Amazing.

Shooting the Puck-
(Science, Technology, The Engineering Method and Math)

Now it gets fun. When the player decides to shoot for a goal, some of the following takes place. The player uses the engineering method (a decision making process) to determine which kind of shot they wish to attempt for the best result.

Based on their instant conclusions, let's say a long shot, they instantly visualize and estimate the distance to the net and set in motion a complicated sequence to make that happen.

Based on the distance to the net, the player decides how to strike the puck. It could stay on the ice, use loft to get by the goalie, be a fast shot or a slower off speed shot. It could have some "English" or twist on it or just a "hard ball" blast...all decided instantly by the player.

(energy calculations) The player must estimate the amount of energy required to propel the puck the necessary distance, taking into consideration the geometric angles, speed, shot shape and timing (math) to reach the net.

The brains of your players are using physics, geometry, engineering, science, biology, and physiology to name a few without knowing it and possibly without ever having taken the classes. ***They were born with it.***

Decisions, decisions....

This seems to always be misunderstood. The Engineering Method is a problem solving, decision making process...often trial and error. We all use it regardless of who we are and what we do from day to day.

As a team sport, as in the real job world, success in skating the puck down rink is a small part of the equation. The entire time we are skating we are scanning the rink, looking around for our opportunity to contribute to winning.

This is a decision making process: The Engineering Method.

Where is the puck?
Where is it going?
What opponents are in the way?
Where are they headed to and what may their intentions be?
Where are my team mates?
What do I need to do to get open and then what will I do?

This is happening in the brain of every player every moment of the game. Both teams, whether your team has the puck or not is in a constant state of this decision making with its physics, geometry, estimation math, and science.....S.T.E.M.

It's the ***"What If's"*** of hockey and they really pile up to determine the outcome of the game. All the what ifs.

If a bank shot is required off the sideboard, the geometry of the angle between where the puck strikes the sideboard and deflects into the desired player or net must be calculated. I'm exhausted just talking about it. The possible scenarios are almost endless from minute to minute.

The point is, we are wired for S.T.E.M. and the awareness of how we already use it daily should be clearly present in our minds no matter what class we're in, our career choices, our recreation and our life in general.

Consider the fairly simple task of making our students aware of what they already do and how it's S.T.E.M. It makes S.T.E.M. integration much easier, logical, necessary and even fun, building confidence and curiosity..... maybe even a better hockey player!

Hockey, and every component of it, is completely S.T.E.M.

A Stanford professor says counting on your fingers is "critical" to understanding math.

By Marta Cooper

Using your fingers to count has long been the scourge of math teachers. But a new research paper published online by Stanford University's mathematics education research initiative, Youcubed, dispels the notion that finger counting isn't for smart kids.

In the paper, **professor of mathematics** education Jo Boaler cites studies from a branch of neuroscience that focuses on the part of the brain dedicated to the perception and representation of fingers (known as the somatosensory finger area). She argues that visual cues and pathways in the brain are key to the teaching and understanding of math.

Drawing on a 2015 study, Boaler and her colleagues say that we in fact "'see' a representation of our fingers in our brains, even when we do not use fingers in a calculation." In the study, researchers found that, for 39 eight- to 13-year-olds figuring out complex subtractions, the somatosensory finger area "lit up," even though the students were not actually using their fingers to do the sums.

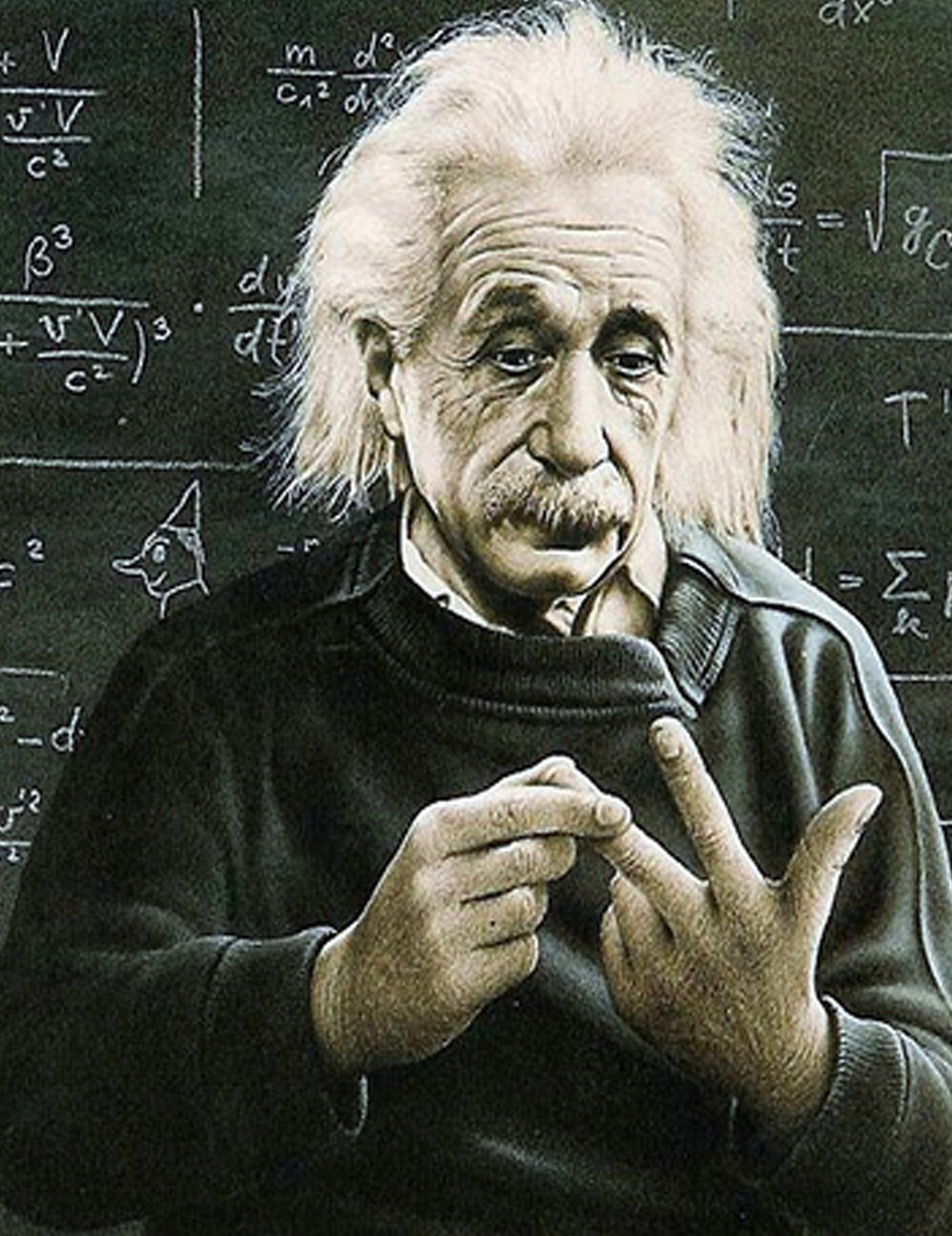
In a separate study of 47 six-year-old pupils, researchers found that participants' arithmetic knowledge increased once they had been trained on how to differentiate between their fingers.

So important is finger perception that it "could even be the reason that pianists, and other musicians, often display higher mathematical understanding than people who don't learn a musical instrument," Boaler suggests.

While the sample sizes in the studies cited are relatively small, Boaler warns that discouraging students from using their fingers to count is essentially a way of halting their mathematical development. "Fingers are probably our most useful visual aid, critical to mathematical understanding, and brain development, that endures well into adulthood," she writes.

For Boaler, developing more visual approaches to teaching math in schools has so far been a series of missed opportunities. The topic has been presented "as a subject of numbers and symbols, ignoring the potential of visual mathematics for transforming students' mathematical experiences and developing important brain pathways," she says.

"If students are weak memorizers or number-users, but produce strong visual ideas and representations, they are often referred to special education classes," Boaler writes. "This could be the reason that some of our greatest scientists—Albert Einstein and Thomas Edison for example—were written off by teachers and even labeled as 'stupid.'"



What will define you...
...as a career professional?

The majority of American college graduates, only 30% of the U.S. population, will have an average of 3 different careers in their lifetime...not usually associated with their initial degree. I myself am one of those. (http://www.politifact.com)

That being said, how are we defined? A few simple questions to consider:

- If I have a degree in economics, but work full-time as an insurance broker, are you an economist or an insurance broker?

- If I have a degree in Mathematics, but work as an engineering consultant, are you a mathematician, or an engineer?

- If I have a degree in biology but work full-time as an architect, are you a biologist or an architect?

Every career uses STEM skills.

Consider how important your college choice really is.

Dolph Lundgren -
Well known actor and tough guy,
He's got a genius-level IQ of 160 and a master's in chemical engineering.
Is he a chemical engineer or actor?

Kenny Chesney -
The country music heartthrob holds a bachelor's degree in advertising.

Lisa Kudrow -
The actress has a bachelor's degree in psychobiology from Vassar College.

Cindy Crawford - Degree in Chemical Engineering.

Gerard Butler - A law degree from Glasgow University.

Harrison Ford - Philosophy degree.

Ken Jeong - (The Hangover)
M.D. Degree in medicine. "Dr. Ken".

John Legend - English Degree, University of Pennsylvania.

The list of examples continues and is quite long. Should you go to college? If you can...absolutely. Does it define you?
I'm not so sure.

Whatever makes you curious and drives your passion....go there.

With STEM degrees... ...it's not the school that matters.

by Patrick Thibodeau

In terms of salary, it may not matter whether you went to a prestigious, top-tier school, middle tier or a local state university. Your pay may be little different from that of your peers.

In a new study, researchers looked at STEM (science, technology, engineering and math) salaries 10 years after graduation. It compared the salaries of more than 7,000 people and found little difference in wages for STEM graduates.

But students who left with liberal arts degree, for instance, from a top school did earn more than students from a lesser school.

"We don't know why we see this difference in the impact of school ranking on STEM salaries as opposed to some other majors", said Mark H. Showalter, a professor of economics at Brigham Young University, in an interview. He is one of three researchers on the study.

It could be the result of standardization in science and engineering curriculum's, said Showalter. It's important to note that the researchers worked to make this an equivalent comparison of students. They included SAT scores as a measure of capability, family income

Michael Hilmer, an economics professor at San Diego State University. They summarized their findings in a Wall Street Journal op-ed.

The findings aren't suggesting students should skip Stanford or Carnegie

at graduation, and other demographic data.

If you look at just the raw salary data and don't account for test and income data, then you will see a difference in wages, said Showalter. The other two researchers are Eric Eide, an economics professor at Brigham Young and

Mellon and seek out a lower-cost, lower tier school. But there was little difference in salaries a decade past graduation for STEM graduates from all three school tiers. "The scatter plots look pretty much the same," said Showalter.

This data may confirm conventional

wisdom about the value of employment history, as well as other surveys that look at the issue.

Robert Half Technology recently surveyed 2,400 CIOs and asked, "What value do you place on the prestige of

their college or university?" In the survey, 71% of the respondents said they "place more weight on skills and experience" than the school.

Carla Brodley, the dean of computer science at Northeastern University, said that for computer science students, it is all about whether they can pass the technical interview which may include a coding test as part of a hiring process. "It's not clear to me that higher-ranked schools prepare you better," said Brodley. Northeastern is a well-ranked school, and Brodley said one advantage it may have is in the types of companies it attracts for recruitment, as well as the networking prospects.

Northeastern has about 1,000 undergrads enrolled in computer science, a five-year program with a cooperative education component that includes spending two or three six-month periods at an actual company. Brodley said, however, that it matters a lot where you went as an undergrad if you are planning on graduate school.

A top-tier school will open more doors for an undergrad. But after 10 years "it's really about the experience you have." If you have worked at an Apple or Google, "you're still getting the call from a hiring manager - even if you only have a community college degree."

STRESS

5 Senses of Stress Reduction for Teachers and Students

Soothe Away Chronic Stress and Pain with Brain-Friendly Remedies

By Dr. Linda Karges-Bone

Although the holiday break may give us some relief from our classroom stressors, the ***holiday stress*** has begun.

So for now, and later when we head back to class, consider the following not for your the educator, but for your students who are not only seriously stressed but wholly ill-equipped to handle it.

"If you are distressed by anything external, the pain is not due to the thing itself, but to your estimate of it; and this you have the power to revoke at any moment."

- **Marcus Aurelius**

What did the Roman emperor Marcus Aurelius know about stress? Hmmmm. He had 13 children, a wife who was known to frolic frequently with gladiators and to poison her enemies, an addiction to opium, and a few large-scale skirmishes such as the Parthian Wars. Stress. Yes indeed! But this Emperor was also known as Marcus Antoninus Philosophus, "Marcus Antoninus the Philosopher."

http://www.roman-emperors.org/marcaur.htm

He spent a great deal of time studying, thinking about, and applying his knowledge of philosophy. This quote reflects his belief that stress is not simply a product, it is a process.

Stress is undeniable, largely unavoidable, and for those who deal with chronic pain, illness, or dysfunction, a daily consideration. However, it is our personal estimation of the stress and willingness to confront and shape it that make the difference.

If you or a client, friend, patient, or loved one lives life with the company of a chronic illness such as arthritis, cancer, insomnia, MS, chronic fatigue syndrome, lupus, respiratory disorders, or pain from a surgery or injury, then it is critical to find ways to modify and manage one's perception of stress. Let's begin with a definition:

"Stress is defined as an organism's total response to environmental demands or pressures." (http://www.mindbodypro.com/learningcenter/stress.htm)

A "total response" suggests that the body's reaction to the stressor, that which introduces or causes the stress, is systemic. All the body systems react: the heart, the lungs, the muscle groups, and the brain. Therein lies the key.

"Marcus Aurelius ***DOES*** look stressed"

The brain is made up of multiple systems that coordinate and control the body. One of these systems, and indeed one that is considered to be operating at a more simplistic level, is the limbic system.

The limbic system filters and screens environmental information and can help to persuade the brain to perceive or process a situation in a more palatable or preferable way. The limbic system allows colors, scents, tastes, sounds, and textures to become healing buffers against the harsh reality of negative stress associated with chronic pain and illness.

How can one apply the research on stress reduction and the brain to making daily living more pleasant, healthful, and productive? Let's consider some strategies for involving the 5 Senses in Stress Reduction.

Color Me Relaxed

Color is a powerful tool in improving mood and modifying the impact of stress on the body and brain. In fact, there is an entire field called "color therapy" devoted to the task. According to author Brian Greenfield, "Color therapy is based on the ancient art of using color and light to treat disease. Practitioners believe that by altering the colors that surround us, it is possible to enhance health and well-being. "A consultation with a color therapist might be a bit far reaching for most folks, but there are some practical applications of color therapy that one could incorporate with ease.

Use cooling, calming blue tones in the class, at home or simply your clothing as well as your bedroom or bath. Some researchers refer to a cardiac blue that actually lowers blood pressure.

Break blue tones up with a color such as cream or white. Too much blue is thought to be depressing.

Indigo or purple is a color associated with muscle strength and tone. One might want to wear warm-ups of this color for a boost during a workout or therapy session.

A bottle of colored water or clear vases filled with colored marbles in tones of blue or indigo would be soothing when placed in the line of vision in a room or office where one spends a great deal of time.

Red is a color associated with stimulation and energy. If one is having trouble keeping a healthy appetite, consider eating off a red plate or setting the table with red napkins and glasses.

Color the palette as well. Researchers investigating antioxidants, those powerful agents that stop free radicals from destroying or "pillaging electrons from healthy cells in the body" (The Doctor's Book of Food Remedies), tell us that antioxidant-rich foods are one of the best ways to prevent, slow down, or reverse chronic illness.

In fact, up to 30% of all cancers could be prevented by changes in diet. Dr. Keith Block, medical director of the Cancer Institute at Edgewater Hospital in Chicago says: *"We're discovering that there are compounds in food that can actually both prevent and help fight cancer at the cellular level."* What are the colors of a healing palette?

Plan every meal to include at least 5 colors, with emphasis on rich, deep colors including greens and oranges.

Avoid black and white colors in meals. That means reducing the amount of meat and simple carb's.

Choose fresh, organic, colorful foods and use herbs to zing things up. As one ages, foods may lose appeal. A variety of sensory experiences, including generous applications of color help to make foods a medicine against stress.

Touch and Texture Tame Stress

There is a Chinese proverb that says: ***"Tension is who you think you should be. Relaxation is who you are."*** During a chronic illness or time of stress, it is dangerous to try to deny the fact that you need more rest, more touch, and more soothing.

Therapeutic Massage is one way to boost the body's natural immunities, yet a lot of folks deny themselves the healing opportunities of massage because it seems frivolous or decadent. They miss a marvelous opportunity to employ the proven healing opportunities of touch as they deal with chronic stress.

Massage can help one to rely less heavily on pain medication and to become more flexible and energetic in the face of chronic stress. Here's the result of one study that looked at how massage could reduce one's reliance on pain medication:

Here are some simple strategies provided by the Mckinley Health Center, Office of Student Affairs, a part of the University of Chicago.

Slow-Down Techniques

10-SECOND BREATHING
In an acute situation, when your mind or body is racing out of control, slow down your breathing to a 10-second cycle, 6 breaths a minute. Find a clock or watch with a second hand and inhale for 5 seconds (odd number on clock face) then exhale for 5 seconds (even number). Keep it up for 2-5 minutes, or until your pace slows down.

60-SECOND BREAK
Close your eyes and take a deep breath. Visualize yourself lounging on a sunny beach or watching the sunset or relaxing in the shower or sauna. I use this every time I have to check my blood pressure!

5-MINUTE VACATION
Close your eyes and take a few deep breaths. Then visualize a favorite place or activity. Let your imagination carry you away to a special spot that's refreshing and relaxing.

BOTHER LIST
Write down a list of all the worries, pressures and concerns that are crowding your mind and clamoring for attention. Then burn the list or tuck it in your wallet for later attention.

PEACEFUL FOCUS
Focus on something pleasant and beautiful in your immediate environment (a blade of grass, a painting, a color). Concentrate on the beauty you see and breathe it in. Allow that beauty to slow you down.

Arne Dietrich, professor of social and behavioral sciences at the American University of Beirut studied participants who engaged in 50 minutes of moderate exercise and found that their blood levels shows a 200% increase in cannabinoid anandamide, a chemical that reduces the sensation of pain.

Scent-sational Stress Reducers and Tasty Tonics

Color, touch, and now scent and taste should be considered as methods for reducing the stress and hence the pain and fatigue associated with chronic illness. Which scents and tastes show promise in reducing stress?

The scent and taste of ginger is potent. Researchers in Denmark cite the blocking of prostaglandins as the reason.

The scent and taste of coffee can be energizing. Those with heart problems would want to take care, but the aromatic brew is known for boosting thinking and energy.

Peppermint has a strong track record for decreasing fatigue. Try a peppermint infuser to tuck into one's pocket during a walk or therapy session.
http://www.athletegift.com/about.htm

Water is unscented and taste-free, yet it is perhaps the most powerful cleanser and healer in our arsenal of natural remedies. Clearly, H20 deserves its own story, but it is interesting to note that researchers at NutriSystem are marketing a new product called "Aquaescents", water bottles with "fruit scented" tops that "trick the brain into thinking that one if filling up on fruity punch." Nutrisystem.com

Green tea. The scent and chemical punch of green tea are powerful. NIH studies are underway now, investigating the potential for green tea to diffuse lymphoma cells. Subjects who drank four cups of green tea a day showed increased alpha wave activity, associated with a calm state.

Vanilla is useful in reducing anxiety. Vanilla on a cotton ball is often given to patients as they go through an MRI scan to calm them down.

Orange. The scent and taste of orange boost energy and creativity.

The Sound of Stress Washing Away

All five of the senses should be tapped to prepare a holistic response to stress, in the same way that stress affects all systems of the body. The auditory response, in the form of music and sound can be a useful tool in stress reduction. In one government study, bone marrow transplant patients who received a music therapy intervention showed a significant reduction in both pain and nausea.

Music changes our reaction to stress. It is interesting to note that: "Scientists in Florida have found that just 20 minutes a day of music was enough for patients to report more than a 50% reduction in pain levels.

Over the 14-day listening period, the amount of natural pain relief continued to increase. The research was published in the Journal for Advanced Nursing.

It was based on tests on 66 older people with chronic osteoarthritis.

Osteoarthritis is the most common degenerative disease in humans. Previous studies have shown that music can improve motivation, elevate mood, and increase feelings of control. It is thought to release endorphins, which reduce pain, decrease blood pressure, the heart rate, respiratory rate and oxygen consumption."

Each person reacts to stress in a unique way. Of course, it may be easy to say that one should approach stress in a certain fashion of one has never dealt with a particular stressor. Still, it is likely that each of us will have need at some point to draw on the strategies discussed in this piece.

Can one completely alleviate the impact of stress? One researcher sums it up nicely: "The prognosis for recovery from a stress-related illness is related to a wide variety of factors in a person's life, many of which are genetically determined (race, sex, illnesses that run in families) or beyond the individual's control (economic trends, cultural stereotypes and prejudices).

It is possible, however, for humans to learn new responses to stress and, thus, change their experiences of it.

A person's ability to remain healthy in stressful situations is sometimes referred to as stress hardiness. Stress-hardy people have a cluster of personality traits that strengthen their ability to cope. These traits include believing in the importance of what they are doing; believing that they have some power to influence their situation; and viewing life's changes as positive opportunities rather than as threats." http://www.mindbodypro.com/learningcenter/stress.htm

How "stress hardy" are you? Perhaps the tools and techniques described in this discussion will help you, a student, parent, or loved one to become more "stress hardy" a valuable attribute in a stressful world!

Electrician

is a **great STE(A)M** career.

By Brian Reynolds

In the modern age electricity is a necessity for every type of building and to perform numerous functions like providing light, climate-control, security systems, heat, and many other functions. The work of electricians is to connect, assess, and repair systems that use electronics in both residences and commercial structures. The majority of electricians work in the construction industry or in maintaining and repairing.

School? *Apprenticeships.....*

Electricians put in electrical systems by first reading the specifications (language arts) for hospitals, residences, schools, and other structures. The specifications or blueprints show where circuit boards, power outlets, and load centers need to be. There are numerous guidelines that electricians need to adhere to.

These are set forth by local government, state governments, and the National Electric Code. In commercial buildings they begin by installing pipe or tubes inside walls and install circuit boxes (engineering). Next they complete the circuits by dragging the insulated wires through the conduit. For certain types of jobs electricians might use wire that is covered in plastic rather than conduit.

Whatever type of wire electricians use, they need to attach the wires to circuit breakers or transformers and connect the wires by using special connectors that are designed for the purpose. Finally they examine their work for any flaws like improper connections, incompatibility with other systems, and safety issues. They do this using tools like ohmmeters, oscilloscopes, or voltmeters (technology).

Aside from installing a structure's entire electrical system, workers might also be involved in the installation of low voltage systems, which consists of video, information, and audio systems like telephones, internet connections, intercoms, and alarm systems (science).

Being an electrician can be physically demanding.

They might also put in fiber optic cable or coaxial cable which are used with computers and operating controls for machinery.

Electricians are also involved in the repair and upkeep of electrical systems. This work can be very different based on the type of facility the electrician works at. Some workers focus on performing maintenance for homes, where they might update an older house's electrical system or replace circuit breakers when new appliances are installed.

Workers who are employed at large industrial facilities might repair machin-

ery, transformers, electrical generators, or the operational controls on equipment or robots. Workers who are involved in offices or smaller industrial facilities might be called upon to perform all of these tasks.

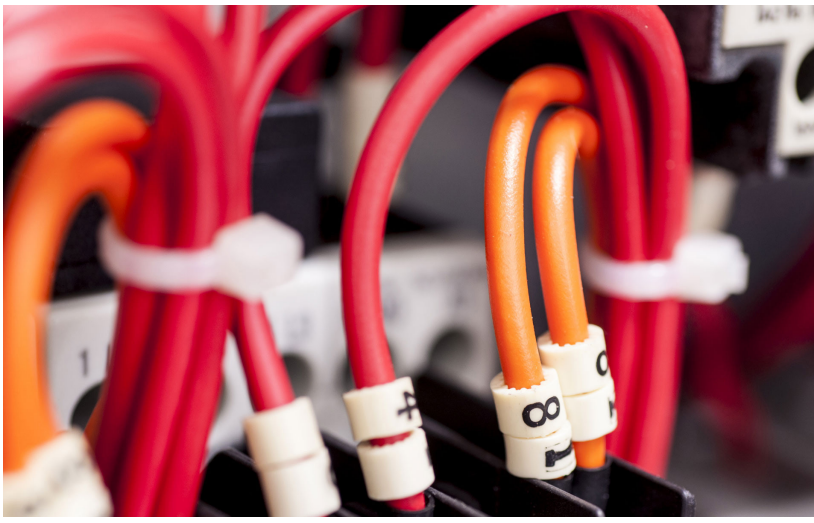
The work electricians perform also depends on the type of electrician they are. Maintenance electricians do a lot of work that prevents problems from happening. They make regular assessments of equipment and electrical systems, identify potential problems, and then take steps to correct them. Workers might also work in a consulting capacity and make recommendations concerning the type of system a company might want to install and whether they should update their systems to increase safety or efficiency (engineering method).

Then, when problems do occur, they are called in to efficiently and effectively get the system up and running again. This work might involve replacing wires, fuses, circuit breakers, or connections (math).

Then, when problems do occur, they are called in to efficiently and effectively get the system up and running again. This work might involve replacing wires, fuses, circuit breakers, or connections.

Electricians sometimes have to work with extremely intricate systems or equipment, and so they often have to collaborate with other specialists like engineers or people who work with other machinery.

Being an electrician can be physically demanding. They have to manipulate heavy conduit, be on their feet for a lot of the day, and they have to work in difficult places like on ladders or in small spaces. They could work in a variety of conditions, from outside, where they're exposed to the elements, or in cramped places.



Their work is potentially hazardous as well, as they are exposed to electrical shocks, falling from scaffolding, or cutting themselves with sharp tools. They have to adhere to strict safety guidelines and be alert. Also, some electricians have to be willing to relocate when construction sites are in remote locations.

"Independence....if you want it."

The majority of electricians work normal hours, though they may be called upon to work overtime to complete a project. Maintenance jobs often have to be performed during evenings or weekends when commercial facilities are closed. Many electricians also have to be on-call in case problems arise.

Some corporations that are open around the clock have three different shifts of electricians so there is always someone present.

The majority of workers enter the profession through an apprenticeship program. These programs provide comprehensive training of many different electrical tasks so apprentices are more likely to be hired. Most apprenticeships last from three to five years.

However, not everyone completes an apprenticeship. Some workers learn by observing and being taught (arts)by more experienced electricians. Other workers complete three year programs that train them to be residential (homes) electricians.

Generally apprenticeships involve both coursework and practical experience. Programs usually require a minimum of 144 hours of coursework, where trainees learn how to read blueprints, theory, math, building code guidelines, electronics, and safety procedures.

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How Important Is The Classroom Environment For Learning?

by Pat Kozyra
Author of the book "Tips and Tidbits for Parents and Teachers".

When you walk into your child's classroom, any grade level, do you get positive vibes that say, *"I'd really like to learn in this classroom!"*? Here's what I said to parents in my book "Tips and Tidbits For Parents and Teachers – celebrating 50 years in the classroom and sharing what I have learned".

There are nine things that the educational and professional experts tell us which constitute a good physical and learning environment for your child in the classroom. Is your child fortunate enough to learn in this kind of environment?

1. The classroom atmosphere is inviting (there are regularly renewed displays of student work; student interests are reflected in classroom activities; the teacher is enthusiastic and encouraging).

2. The classroom is a safe environment (specific steps are taken to foster a classroom atmosphere of mutual respect and cooperation, free of bias, in which students feel able to take risks as they learn).

3. There are clear behavioral expectations (rules and consequences are negotiated with students and consistently upheld).

4. Physical aspects of the classroom are appealing (the arrangement of the classroom is flexible, providing areas for individual and group work; the furniture and resources are appropriate to the age and needs of the students) .

5. The teacher has high expectations for all students (the teacher helps students to understand the relationship between achievement and effort; the teacher displays confidence in their ability to learn, the students approach learning confidently).

6. Each student is treated as an individual (the expression of personal approaches to learning, ideas, and opinions is encouraged; the teacher know the students).

7. Learning experiences are success-oriented (each student has daily opportunities to experience success in his or her learning).

8. Active independent learning is encouraged (each student is expected to be actively involved in class learning experiences and to help others in this process).

9. Advocacy and support are provided (each student has a specific teacher advocate or mentor who is able to provide support and guidance when needed).

The classroom should not only look and smell clean and well taken care of by the custodial staff, but also, there should be no evidence of mice, rats, birds, cockroaches ,bats and squirrels, which can contribute to an unhealthy situation for the students who spend most of their day there, especially those that suffer from things like asthma.

Another thing parents might want to look for is evidence of music in the curriculum. Is there a piano or guitar or some other musical instrument in the room ? Is music being played when the children enter the room before school begins? Perhaps the white board is used for this kind of thing. Is there a music program or has it been dropped with budget cuts along with the library? Is there evidence of a classroom library with lots of books to read when students are finished their work.

And lastly, was the classroom set up attractively on the very first day of school? In order to make that happen I think most teachers spend out of their own pocket (many times during the year) and never get reimbursed for it due to a strict budget or lack of funds. If there was any time I always felt those purchases were necessary, it was definitely for the first day of school.

Yes, call it advertising – very important advertising!

During my teaching career, the way my classroom looked and was set up, was always very important to me. I can honestly say I was very proud of that aspect – so much so, that over the years, I documented my classroom setting and bulletin boards with film and photos.

In fact, one of the factors in my getting an exciting assignment to the art department in my early years was due to my very attractive bulletin boards at my school which were noticed by board officials.

This kind of thing makes students proud to be a part of that classroom and proud that their work and products were valued enough to be displayed – not put into "file 13" if you know what I mean. It is very important that something valuable, memorable, or significant happens to their products /work and they are appreciated.

When I was coordinator of a Pre-School, I became very aware of how important it was to monitor the amount of physical contact my teachers had with the students. When teachers show favorites by hugging and kissing and having only certain children sit on their knees, it does not take long for the ramifications to be obvious.

Some parents told me that only they themselves would be the ones to carry and kiss their children and not the teacher. Some children, even at that young age, noticed the different treatment and told their parents.

As a result, I insisted that children only be carried and held if an injury or accident occurred. I came to Hong Kong from Canada and the rules regarding touching students in my country were very strict. Perhaps parents should be observant about equal treatment of all students as well.

So the answer to the question I posed in the title of this article is obviously a resounding YES!!!

What It Takes to Be an Antarctic Engineer

Jim O'Sullivan and Julius Rix demonstrate the essential qualities of resourcefulness and endurance

By Lucas Laursen

There is no visible horizon in the waters beneath the Ross Ice Shelf. So electrical engineer Jim O'Sullivan built an artificial one for the pilot of the submersible remotely operated vehicle (ROV) that he and a team of scientists were testing there in 2008.

The team didn't lack for data: The ROV's orientation, speed, and depth were numerically displayed on the pilot's screen. But it is difficult to convert numbers into spatial awareness. The ROV was at risk of crashing into

the delicate creatures, such as sea spiders, that it was supposed to be observing.

Fortunately, O'Sullivan had come across a similar problem in a different setting: aviation. As a pilot, he had an instrument rating, "which was useful for understanding how to navigate without being able to see," he recalls. When flying blind, pilots use half a dozen different instruments to maintain their situational awareness, including an artificial horizon.

O'Sullivan found open-source software that could convert the ROV's telemetry data to display an artificial, underwater horizon. This example of engineering on (and under) "the Ice,"—as Antarctica is known—demonstrates the need for ingenuity and improvisation beyond anything training can provide.

In fact, those characteristics are precisely how British Antarctic Survey (BAS) engineer Julius Rix got his job: "My boss told me I got my first job with him because of my hobby working on old cars," Rix says. Unlike O'Sullivan, who went to Antarctica as a contract engineer for a one-time gig and now advises startups in and around Palo Alto, Calif., Rix has grown increasingly involved in Antarctic engineering.

Rix got that first job maintaining ionosphere-measuring equipment at Halley Research Station on the Brunt Ice Shelf in 2008 after doing a Ph.D. in vehicle dynamics.

After two years, he took a medical-imaging job in the United Kingdom. But his old boss lured him back a few years later to move the equipment from the old Halley station to a new one. Now he is a staff engineer at the BAS Cambridge office and has returned to Antarctica twice with a

scientific team searching for the world's oldest ice.

At Rix's Cambridge office, a tangle of hats, gloves, goggles, and giant fuzzy boots nearby attest to his frequent visits to a nearby walk-in freezer, with ice core samples and drilling equipment. In between visits to Antarctica, Rix must troubleshoot the drilling equipment and try to anticipate what might go wrong in the field, packing accordingly.

Still, teams are unlikely to anticipate everything and must be prepared to adapt. "Learn as many skills as you can," he advises prospective Antarctic engineers.

Recent job ads for electrical or electronics engineering jobs in Antarctica confirm that while jobs are available for those seeking an unusual workplace, a diversity of experience and willingness to embrace difficult living conditions are prerequisites.

Engineers on the Ice do everything from building new facilities to maintaining telescopes and tagging along with scientific teams for temporary projects, as O'Sullivan did.

The diversity of roles means that many kinds of engineers can go, but be warned: The competition is stiff.

Several nations operate Antarctic research programs. Interested applicants should monitor these programs' websites and those of any private contractors supporting national programs. Hiring tends to be seasonal: Opportunities spike for the Antarctic summer. Another method is to seek out scientific research projects that may need an engineer and approach them directly. O'Sullivan got his field gig through an introduction from a mutual contact.

Both O'Sullivan and Rix emphasize the difficulties that come from Antarctica's remoteness. "Probably the isolation was the hardest part," O'Sullivan says. That goes for digital communication almost as much as physical isolation: Few satellites dip that far south, and visitors must be prepared for limited Internet bandwidth. Rix noted that his wife didn't like his being away so long and the uncertainty of when he would return.

Language Arts IS a S.T.E.M. Subject

by *Publisher*

Definition: *Reading, spelling, literature, and composition that aim at developing the student's comprehension and capacity for use of written and oral language.*

It's simply that "..comprehension and capacity..." that stretches across every subject your students will study from this day forward. Who would have thought that language arts could determine the futures of the kids falling asleep halfway through class?

Technology – From scribbling on a rock to typing on our iPad, technology has been and will continue to be an integral part of how we express ourselves and communicate. The technology of spell check is a life saver for a writer, and the access to every type of literature through the net has brought learning and access to new heights. Sorry to say, I don't miss the library and the card catalogue, but I'm sure I would have done better in school with current technology resources.

Engineering – Once again the engineering method has a home here. The composition of a term paper is a series of problem solving challenges that take us from "Here is your assignment" to

the final spell checked version that most effectively completes the criteria of the assignment resulting in the best possible grade.

The value of reading, spelling, composition, and communication easily translate into every career you can imagine. Doing them well is of greater benefit, naturally resulting in greater opportunities, salaries and other levels of success. The process of implementing the engineering method through the effective use of language arts skills can only result in better outcomes of problem solving regardless of the area of our life where the problem arises.

- Identify the problem

- Propose possible solutions

- Test those solutions for viability

- Evaluate the results of your testing

- Pick the best solution

- Re-evaluate the problem with your solution in place.

Every career requires Language Arts. Every career is a STEM career.

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