PRCST
Pittsburgh Regional Center
For Science Teachers

LASER

Volume 13 Issue 1 Winter 2016

LOCAL ACCESS TO SCIENCE EDUCATION RESOURCES

A New Year opens!

DId you see the full moon on Christmas Day? First time since 1977 and not again until 2034!

Certainly our warm and clear weather in the eastern U.S. gave us a wonderful opportunity. Hope you did not have clouds in your area.

In review:

- July 2015 was the warmest month ever recorded according to NOAA. Towns in Washington tied heat records with Death Valley on two separate days – 10 and 107 degrees
- May was the month with the most recorded tornadoes – 414
- Fighting the Butte Fire and Valley Fire in Northern CA in September – the U.S. Forest Service spent a record $243 Million in one week.

The Pittsburgh Regional Center for Science Teachers is in the process of phasing out active programs and workshops. It has been such a pleasure working with all of you – such talent! We need to measure any impact we may have had over these 30 years. Some of you participating in the early years may be retired and involved in other programs. But do think back and please answer this short survey. Just check those items with which you agree and return email. Your response is a treasure and we thank you so much.

- o PRCST provided current, accurate and relevant information.
- o Program and workshop ideas and structure were integrated into my lessons.
- o Resources provided were helpful in my teaching.
- o PRCST information is still being utilized in my teaching
- o Would like to receive LASER email in the future,

EDUCATION

The learning landscape is changing. At the workplace people are not learning in the traditional way. The following are six key trends we are seeing in the learning space today:

1. **Technology is going to revolutionize workforce learning.** We would see organizations leveraging technology more and more to train their workforce. Some of these technologies include web-based learning, videos, mobile learning, gamification, Apps, byte-sized learning etc. While technology is a boon and it has put a lot of control in our hands, the onus is really on us. How we leverage technology and how we turn it into practical usefulness for learning is going to be a key skill for the L&D practitioners.
2. **Learner (and not the trainer) is going to be at the center of all learning activities.** In the earlier days, the instructor used to be at the heart of all learning activities in any organization. That is slowly changing now. In future, the learner is going to be at the center-stage. The other shift related to this will be from 'push' learning to 'pull' learning. Organizations are moving from pushing learning to employees to helping employees pull (find) answers by leveraging mobile, web, videos and other forms of just-in-time learning described above.
3. **There would be a shift from content to context.** In the old world, the focus was on knowledge transfer. This was a content rich exercise and the result was usually poor learning. In the new world the focus is going to be on building 'know how' and understanding 'context' and the result is going to be rich learning.
4. **Learning will move to workplace.** As the pace of technological change speeds up, many jobs will require constant adaptation because of new information and new task requirements. In this context, the distinction between learning and work will disappear. A trend towards integrating training with on-job activities will be the result. Employees will increasingly rely on Electronic Performance Support Tools, knowledge repositories etc. to seek and receive knowledge in real time.
5. **MOOCs are going to be crucial part of learning in organizations**. While MOOCs have already become popular for students in general, we would see MOOCs making an entry into the corporate world as well. HR and L&D functions in organizations would encourage employees to take up MOOC courses to further enhance their

career development and growth. L&D practitioners will start embedding relevant MOOC courses into the curriculum for different roles.

6. **There will be greater emphasis on social and informal learning.** While the novices will learn a greater portion formally, veterans will rely more on informal learning and social learning. The truth is that formal learning works best with explicit knowledge and informal learning works best with implicit knowledge.

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Environmental Literacy and Change

The scale and pace of social and environmental change demands systems to provide citizens — young and old — with the information, skills, and tools they need to navigate a far more uncertain world than anyone predicted even a decade ago. Everyone must understand and experience that they can be part of the solution. This is the goal of environmental literacy.

See the full report at
Environmental Literacy in the United States:
An Agenda for Leadership in the 21st Century

"We are drowning in information, while starving for wisdom.
The world henceforth will be run by synthesizers, people able to put together
the right information at the right time, thinking critically about it, and make important choices wisely."
— E.O. Wilson

NEW- PA Non-Formal Environmental Education Certification through PAEE.
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Early child development: Body of knowledge

As government education experts call for toddler literacy, and baby apps proliferate, are we losing sight of materials-based learning? Infant scientists and young explorers thrive in the open air and through free play, eager to grasp the world — literally.

As educational theorists, teachers, governments and parents tussle endlessly over literacy, numeracy and testing in the under-eights, we sometimes forget that nature nurtures. We ascended as a species through incandescent curiosity — that hallmark of scientists in every century — at play in the world. Those primal, physical realities still have everything to teach us, in one way or another.

The typical child in the United States now spends 90% of the time indoors. US children aged 2–5 engage in electronic media for an average of more than 30 hours per week; for 8–18-year-olds the figure is 52 hours. Most children devote just 30 minutes daily to unstructured outdoor

play; a generation ago, it was more than 4 hours. Many parents fear letting their children play outdoors on their own, and see learning as a formal indoor process.

The centrality of nature in children's learning begins with our origins as a species. For more than 99% of our evolutionary history, humans adapted in response to mainly natural forces. We became inclined to affiliate with nature, a tendency called biophilia. If it is to flourish, biophilia demands experience and nurturance. The reliance on learning is the source of our species' remarkable inventiveness, yet it also carries the potential for us to behave in ways contrary to our long-term biological self-interests.

Alan Ewert's classic 1989 book *Outdoor Adventure Pursuits* (Gorsuch Scarisbrick) reviewed studies of children participating in nature programmes, and found that these children asked more questions than others, and were better at solving problems. A study of 262 children aged 3–12 in poor neighbourhoods in Chicago, Illinois, demonstrated richer creative play following exposure to nature (A. Faber Taylor *et al. Environ. Behav.* **30**, 3–27; 1998). Unfortunately, modern society has erected increasing barriers to children's contact with nature. Children's residential, educational and recreational environments, for example, are often highly artificial and sensorily deprived. A new paradigm is needed: biophilic design. This approach to building and landscape design encourages direct and indirect contact with nature, and an experience of place evoking children's evolved affinities for the natural world.
The direct experience of nature — light, air, plants, animals, water and landscapes — can be designed, for example, through abundant use of plants indoors and outdoors; subtle manipulations of airflow, temperature and pressure; and outside views. Nature-inspired artwork, the use of materials such as wood and wool, and designs that mimic natural form can provide an indirect experience of the living world. So, too, can sheltered spaces with long views and visual connections to the outside, and areas rich in natural features, yet orderly and understandable.
Excerpted from: *Nature*, **523**, 286–289, (16 July 2015), doi:10.1038/523286a

Published online 15 July 2015

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Introducing the Core Six by Harvey F. Silver, R. Thomas Dewing and Matthew J. Perini

This book is not a guide to the Common Core State Standards. In it, you will not find the story of how the Common Core emerged, a detailed description of what the standards cover, or an explanation of how the standards are organized. For this information, we recommend visiting the Common Core website or, for a deeper look, reading John Kendall's (2011)*Understanding Common Core State Standards*.

The Core Six is for educators who already have a strong grasp on the Common Core and are eager to do something about it. In this book, we offer a collection of research-based strategies that will help teachers and students respond to the demands of the Common Core, particularly the *Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects*, which are a "shared responsibility within the school" (National Governors Association Center

for Best Practices [NGA Center], Council of Chief State School Officers [CCSSO], 2010a, p. 4) and affect every subject area and grade level.

Regular use of the strategies in this book will help students become better at

- Reading and understanding rigorous texts.
- Evaluating evidence and using it to support positions.
- Conducting comparative analyses.
- Finding important patterns and structures built into content.
- Mastering academic vocabulary and integrating it into speech and writing.
- Understanding and contributing to meaningful discussions about content.
- Using writing to advance learning and clarify thinking.
- Writing comfortably in the key Common Core text types: arguments, informative/explanatory texts, and narratives.

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ASCD RESOURCES

School Improvement Tool

Designed for use in schools around the world, this online tool offers educators a comprehensive needs assessment for the school year.

Memory at Work in the Classroom - BOOK

by Francis Bailey and Ken Pransky

Introduction

The primary goal of this book is to help classroom teachers figure out how to support learners—*especially* struggling learners—through a focus on human memory. By developing a deeper understanding of learning and learners, we can teach more effectively. We also have to understand classroom learning as

a process that plays out in a social and cultural context. Each chapter is a balance between science's new insights into human memory, filtered through the lens of how learning is also a cultural process, and how this informs classroom learning and instruction. We can harness this knowledge to gain fresh insights into the challenges faced by students who struggle academically. Each chapter provides a set of practical classroom strategies that address pressing issues in the education of our school-age children.

By exploring the different dimensions of memory and their implications for the social and individual dimensions of teaching and learning, this book can serve as a primer for all of us who would like to better understand why our struggling students continue to underperform academically, and how we can enrich our classroom teaching to better address their educational needs.

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How Logic Models Can Be a Strategic Planning Tool – Tom Chapel - online

Posted by *Sheila Robinson* in Uncategorized

I'm **Tom Chapel**. My "day job" is Chief Evaluation Officer at the CDC where I help our programs/ partners with evaluation and strategic planning. I took on both roles because large organizations do strategic planning and evaluation in different silos, even though both silos start with "who are we?" "what are we trying to accomplish?" and "what does success look like?"

In response, we've crafted an approach to strategic planning which employs logic models, but in a different way than for evaluation. The key steps: Compose a simple logic model of activities and outcomes (or what some might call a "theory of change"). I want stakeholders to understand the "what" of their program (activities) and the "so what" (the sequence of outcomes/impacts). Usually, we add arrows to reflect the underlying logic/theory.

1. Choose/affirm an "accountable outcome". It's great to include "reduced morbidity and mortality" in the model as a reminder of what we're about. But be sure to explain that these are areas for "contribution" and not outcomes attributable solely to their efforts.
2. Have the "output talk". The model shows which activities drive which outcomes. Outputs are the chance to define how the activity MUST be implemented for those outcomes to occur. This discussion sets up creation of process measures for the evaluator later on but at this point provides clarity for planners and implementers on the levels of intensity/quality/quantity needed.
3. Help them identify "killer assumptions". There are dozens of inputs and moderating factors (context) over which a program has less or no control. Look for ones so serious that if that input or moderator is not dealt with the program really can't achieve its intended outcomes. Depressing as this exercise can be, it spurs creative thinking— how might we work around/refine our activities to accommodate it?
4. Tie it all together with a (short) list of key strategic issues. Hit the high points —mission, vision, SWOT and move on to goals and objectives. This technique avoids the painful wordsmithing that often comes with traditional strategic planning.

Lessons Learned:

- Use existing resources. The organization may have a mission and vision, an existing strategic plan, a business plan, or a set of performance measures. Extract the starter model from these resources so they see the logic model as a visual depiction of how they already think about their program and not something completely new.
- Do the process in digestible bites and WITH the program. You want people to follow the storyline and that happens more often if they are part of the model construction.

- If in return for minimal word-smithing we inflict endless arrow-smithing, fatigue will soon set in. Declare victory when the group is 85% in agreement with the picture.

Rad Resource: Phillips and Knowlton: The Logic Model Guidebook (2nd edition)

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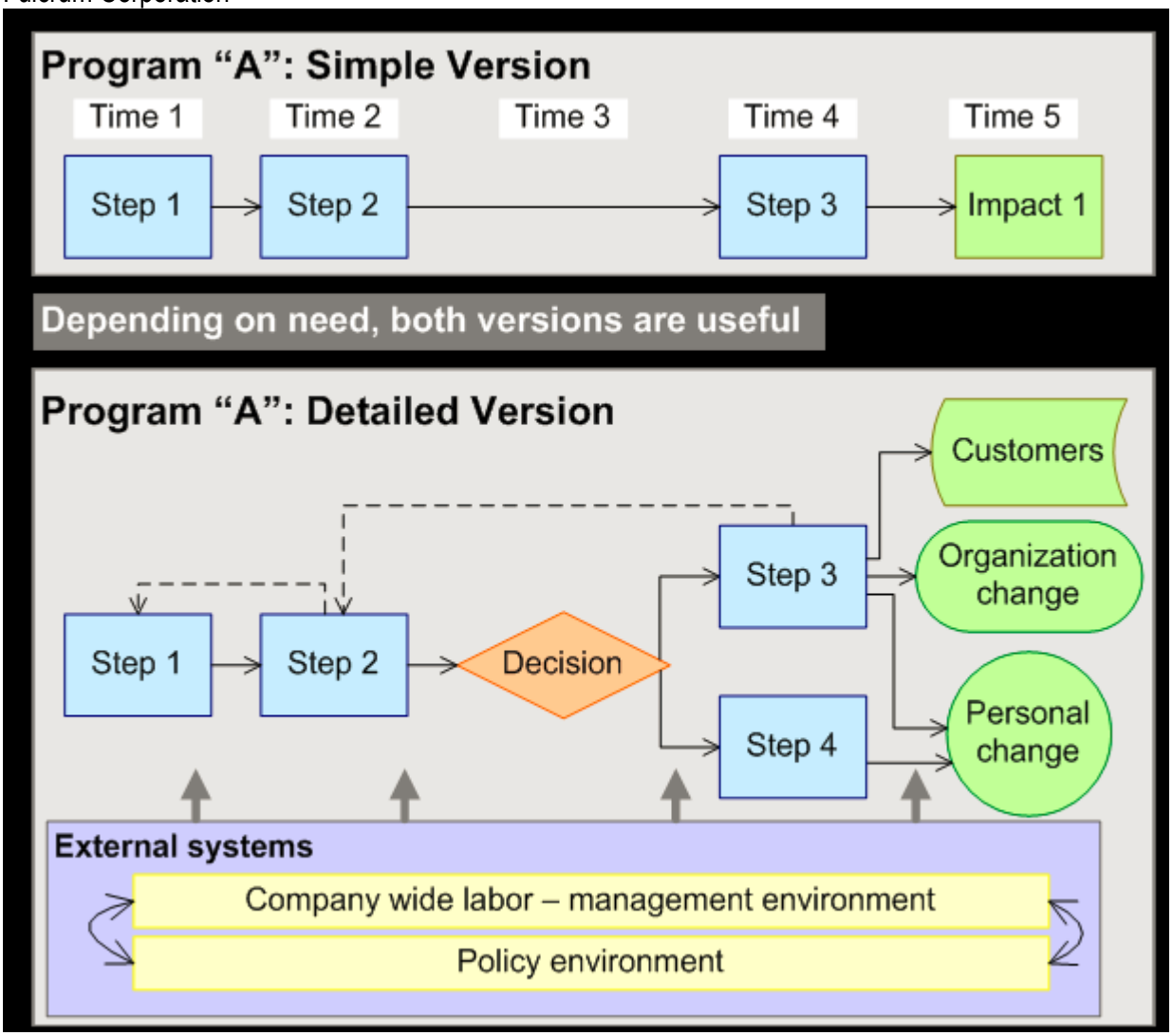
Logic Models Beyond the Traditional View: Metrics, Methods, Format and Minneapolis, Minnesota, USAConference: October 24-27, 2012

Jonathan A. Morell, Ph.D.
Director of Evaluation
Fulcrum Corporation



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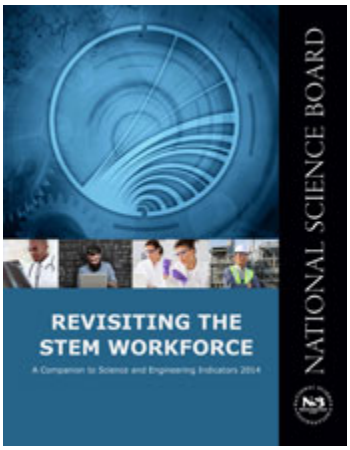
Revisiting the STEM workforce

A new NSB report says it's time to focus on a STEM-capable U.S. workforce



NSB is the policymaking body of the National Science Foundation.
Credit and Larger Version

April 21, 2015

Does the United States have a "glut" or "shortage" of STEM workers? It's a question that has long permeated policy conversations about the U.S. science, technology, engineering and mathematics (STEM) workforce. But is this the right question to ask?

Revisiting the STEM Workforce, a new report by the National Science Board (NSB), offers insights about long-standing workforce debates and seeks to catalyze constructive policy discussions about this critical and dynamic component of the nation's economy. The NSB is the policymaking body for the National Science Foundation (NSF), an independent federal agency that supports fundamental research and education across all fields of science and engineering.

Drawing on its biennial *Science and Engineering Indicators* report, the NSB's latest report highlights the growing need for STEM knowledge and skills in a 21st Century economy. In 2010, 16.5 million individuals--including many in non-STEM jobs, such as sales, marketing and management--reported that their job required at least a bachelor's degree level of science and engineering (S&E) expertise. This represents about three times the number of individuals working in occupations classified as S&E (5.4 million)

PRCST STEM in Action Program news:

For those of you who were able to hear the talk by Carolee Bull, PhD (and even meet her) while participating in the PRCST STEM inaction Program, a note of her achievement:
Dr. Bull has now been appointed as Head of Plant Pathology and Environmental Microbiology at the Penn State College of Agricultural Sciences

SCIENCE SNIPPETS

Biosimilars

Biologic drugs are made from genetically identical copies of a master cell which has been changed through a technique called gene splicing. This process involves using a master cell to establish cell lines which can hen mass produce proteins and antibodies. These then work within a patient's body to combat the disease or condition afflicting them.

FDA has not finalized guidance on the standards that biosimilars will have to meet. And there are safety issues.1. Autoimmune patients may develop an adverse effect 2. Biologic drugs cannot be taken orally but must be injected into a vein or infused under the skin.

Many diseases have multiple biologic drug options: diabetes, cancer, autoimmune disease, Hepatitis B and C, and anemia. The aim is to match the characteristics of the drug with the patient's profile. There are still many considerations about use of these drugs before FDA approval.

Seafloor Features Are Revealed by the Gravity Field
http://earthobservatory.nasa.gov/IOTD/view.php?id=87189&src=eoa-iotd
This is really interesting..take a look.
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Groundwater

About 130 million people in the United States rely on groundwater for drinking water, and the need for high-quality drinking-water supplies becomes more urgent as our population grows. Although groundwater is a safe, reliable source of drinking water for millions of people nationwide, high concentrations of some chemical constituents can pose potential human-health concerns. Some of these contaminants come from the rocks and sediments of the aquifers themselves, and others are chemicals that we use in agriculture, industry, and day-to-day life. When groundwater supplies are contaminated, millions of dollars can be required for treatment so that the supplies can be usable. Contaminants in groundwater can also affect the health of our streams and valuable coastal waters. By knowing where contaminants occur in groundwater, what factors control contaminant concentrations, and what kinds of changes in groundwater quality might be expected in the future, we can ensure the availability and quality of this vital natural resource in the future.

Major Findings

- Contaminants from geologic or manmade sources were a potential human-health concern in one of every five wells sampled in the parts of aquifers used for drinking water
- Differences in geology, hydrology, geochemistry, and chemical use explain how and why aquifer vulnerability and concentrations of contaminants vary across the Nation
- Changes to groundwater flow have also altered groundwater quality
- Our actions today are determining groundwater quality for decades to come

Summary Report for the National Water-Quality Assessment Program Principal Aquifers Series, "The Quality of Our Nation's Waters—"

Circular 1360—Water Quality in Principal Aquifers of the United States, 1991–2010

From Companion Reports

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1. Alpha-synuclein expression restricts RNA viral infections in the brain.
Beatman EL, Massey A, Shives KD, Burrack KS, Chamanian M, Morrison TE, Beckham JD.
J Virol. 2015 Dec 30.

Abstract: We have discovered that native, neuronal expression of alpha-synuclein (Asyn) inhibits viral infection, injury, and disease in the central nervous system. Enveloped RNA viruses such as West Nile virus (WNV) invade the central nervous system (CNS) and cause encephalitis; yet, little is known about the innate neuron-specific inhibitors of viral infections in the CNS. Following WNV-infection of primary neurons, we found that Asyn protein expression is increased. Infectious viral titer of WNV and Venezuelan equine encephalitis virus (VEEV) TC83 in the brains of Asyn knockout mice exhibited a mean increase of 104.5 infectious viral particles compared to wild-type and heterozygote littermates. Asyn knockout mice also exhibited significantly increased virus-induced mortality compared to Asyn heterozygote or homozygote control mice. Viral-induced Asyn localized to perinuclear, neuronal regions expressing viral envelope protein and the ER-associated trafficking protein, Rab1. In Asyn knockout primary neuronal cultures, ER signaling pathways known to support WNV replication are significantly elevated before and during viral infection compared to neurons expressing Asyn. We propose a model in which virus-induced Asyn localizes to ER-derived membranes, modulates virus-induced ER-stress signaling, and inhibits viral replication, growth, and injury in the CNS. These data provide a novel and important functional role for native alpha-synuclein expression, a protein that is closely associated with the development of Parkinson's disease.

IMPORTANCE: Neuroinvasive viruses such as West Nile virus are able to infect neurons and cause severe disease such as encephalitis, infection of brain tissue. Following viral infection in the central nervous system only select neurons are infected, implying that neurons exhibit innate resistance to viral infections.

We discovered that native neuronal expression of alpha-synuclein inhibited viral infection in the central nervous system. When the gene for alpha-synuclein was deleted, mice exhibited significantly decreased survival, markedly increased viral growth in the brain, and evidence of increased neuron injury. Virus-induced alpha-synuclein localized to intracellular neuron membranes, and in the absence of alpha-synuclein expression, specific endoplasmic reticulum stress signaling events were significantly increased. We describe a new neuron-specific inhibitor of viral infections in the central nervous system. Given the importance of alpha-synuclein as a cause of Parkinson's disease, these data also ascribe a novel functional role for native expression of alpha-synuclein in the CNS.

DIRECTIONS

PAEE CONFERENCE
Breaking Bad, Creating New'
March 14th - 16th
The Inn at Pocono Manor

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Try failure in the classroom

Freedom to Fail *by Andrew K. Miller*

Redefining Failure- an exerpt:

Failure, for most of us, is a negative concept. Students who fail to do their work do poorly in school, and workers who fail to do their jobs get fired. But failure can be positive, too: in the worlds of technology and design, for example, taking risks that generate failure is considered necessary for innovation. If failure is the end of the road in some instances, it can be the beginning of an innovative journey in others.

Unfortunately, schools tend to treat failure as almost exclusively negative. Think back to a time when you failed a test or a quiz or failed to complete an assignment. Do you remember that sinking feeling that there was nothing more you could do? I remember preparing for a big history exam in middle school. There hadn't been any quizzes leading up to the exam, so I didn't know what to expect—short-answer questions? An essay question? Multiple-choice questions? Because I was unprepared for the format of the exam, I got a mediocre score, and I wasn't given an opportunity to retake the test. My failure, in this case, was treated as exclusively negative and *final.* But when treated as a necessary step toward innovation, failure can help students to

- Promote and establish a growth mindset,
- Build resiliency and a life-long learning mentality, and
- Prepare for the real world.

- So, what are we waiting for? Isn't it time we encouraged students to embrace failure as fun, exciting, and filled with possibility rather than as something to dread?

Changing Mindsets

Fear of failure is one of the leading causes of anxiety for students. We've all been fearful of screwing up a presentation or getting an *F* on a test. But if we frame failure through a growth mindset, we can mitigate students' fears of it and even have them embrace the idea that they can "fail forward." What if we recast the word *fail* as an acronym that stands for "First Attempt in Learning"? By talking about failure in this way, we reinforce the idea that failure is a beginning rather than an end. And our actions should match our words: We should do what we can to encourage students to grow from failure.

According to Judy Willis, a leading expert on the brain and learning, "fear of risking mistakes reduces the active participation and construction of knowledge because the sensory input (instruction) cannot pass through the RAS (reticular activating system) and amygdala to the prefrontal cortex" (Willis, 2014). When we fear failure, the chemistry of the brain literally gets in the way of more learning. Indeed, research has shown that people who don't have a growth mindset are much less likely to seek out constructive feedback on their work or to be interested in further learning than those who do (Dweck, 2006).

Used in the classroom: PRCST programs
More was learned from failures in lab investigations. A new approach was true inquiry – what happened? Why? How can we find out? Essential questions leading to expanded investigations. One model was from a first year Civil Engineering class at CMU where the first investigation was designed by the professor to "fail". This served not only to replace fear (since each student also failed) with wonder and further inquiry (what happened ?).

The Sense of Wonder can enhance education at every level. See Rachel Carson "Sense of Wonder".

> "Both Skepticism and wonder are skills that need honing and practice. Their harmonious marriage within the mind of every schoolchild ought to be a principal goal of public education".
> Carl Sagan – Sagan 1996, p. 306

As part of risk taking – PRCST programs included risk assessment….a "what if" approach. For addressing risk assessment at early levels. Students were asked to explore their thinking in relevant situations: e.g. Can I cross this street before the truck/car reaches me?

"Most great people have attained their greatest success just one step beyond their greatest failure"
Napoleon Hill
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Drive a Rover on Mars Never done in real time since it takes signals 20 minutes each Way. For a simulation try:
www.marsquestionline.org/coolstuff/drivearover
www.jpl.nasa.gov/video/details.php?id=1373

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Database

Fisher Science Education Blog – www.headlinesciencenow.com

Biotechology From the American Farm Bureau Foundation for Agriculture – Grades 7-10.Studet handouts and aligned with NGSS Standards. http://bit.ly/1PWjjWW

Habitat Earth in the Classroom from CA Academy of Science. Networks of life on Earth – guides, lessons and videos - grades 3-12 http://bit/ly/1NUg7OJ

World of 7 Billion Contest Resources and contest for HS students Feb. 25 deadline. http://bit.ly/1QL6u1M

Electrical Safety in the Classroom OSHA Safety Data Sheets www.osha.gov/Publications/OSHA3514.html

NGSS Standards by States National Academies Press Washington, DC www.nextgenscience.org www.nap.edu/catalog/18290/next-generation-science-standards-for-states-by-states

Explore the PRCST website for information about programs and resources. www.prcst.pitt.edu
Or: www.prcst.org

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CALENDAR OF EVENTS

Looking ahead:

NSTA Conferences: 2016
Mar.31-Apr.3 NSTA National Conference, Nashville, TN www.nsta.org/nashville

Area Conferences 2016
Oct. 27-29 Minneapolis, MN
Nov. 10-12 Portland, OR
Dec. 1-3 Columbus, OH

July 27-29 5th Annual STEM Conference Forum and Expo hosted by NSTA

Apr.2-4 Annual ASCD Conference and Exhibit Show, Atlanta, GA Early discount

ends 2-3-16. www.ascd.org/annual conference

July 13-15, 2016 Accelerating Science Education Conference from the Mobile Laboratory Coalition. Columbus, OH, Sheraton Columbus Hotel, Capitol Square, Reservations open Feb. 22.

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