



STEM EDUCATION – What it Means

The November issue of *NSTA Reports* notes that in order to succeed ALL American students need education in STEM fields: Science, Technology, Engineering and Mathematics. This is the position in a paper recently released by the State Educational Technology Directors Association (SETDA) and supported by the Bayer Facts of Science Education Survey XIII of U.S. STEM executives. Executives reported:

- 55% are experiencing a shortage of STEM manpower
- 95% are concerned a shortage of STEM workers will cost the U.S. its global leadership in science and technology
- 68% fear global competitors are gaining the advantage as the STEM workforce increases in other countries.

SETDA recommends integrating STEM throughout the curriculum from Kindergarten levels and exposing students to STEM careers.

This report also notes that educators need on-going and sustainable STEM professional development.

PRCST Professional Development Programs have, for many years, provided support for teachers in awareness and utilization of the value of STEM integration in the curriculum. Early programs that worked across the disciplines of Science-Technology-Society (STS) led to the later addition of Green Design in this instructional strategy.

The C³ approach of Content-Context-Conation includes, as well, an approach to education of the whole child, a component lost in focus for some years but reappearing as having a necessary place in a student's education.

The Green Design addition was developed in work with Carnegie Mellon University to add the engineering component and later an emphasis on environmental impacts – Green.

Today the term “Green” has many meanings and a variety of perceptions by different individuals. For one way to build on the current “green” fad and work toward curricular integration see the article on “Environment and Health: A Systems Approach” and related Synergy news.

NOTABLE ANNIVERSARIES

As Pittsburgh celebrates the 250th Anniversary, NASA celebrates 50 Years!

**And the Pittsburgh Regional Center for Science Teachers (PRCST)
celebrates 25 years!!!**

In 1983 an Ad Hoc Committee explored the regional critical mass needed for support for a regional center to provide professional development opportunities for area science educators. In response to the then “Crisis in Science Education”, national and regional meetings worked to find viable answers to the crisis. An outgrowth of the first Exeter Conference addressing this crisis was a regional meeting hosted by the Winchester-Thurston School, Martha Cussler, Curriculum Coordinator. Two Exeter physics professors, Richard Brinckerhoff and Art Compton, were funded by the Klingensmith Foundation to work to establish regional centers throughout the United States. PRCST was the result of this effort. At that time the suggestion was to infuse STS connections into the curricula to at **least a 10% level!** And even this was considered quite controversial. Can you imagine?

Original Advisory Board members included the Superintendent of Pittsburgh Public Schools and the Head of Intermediate Unit 3, in addition to heads of local national corporations interested in this effort. Jane Konrad was selected as Executive Director of PRCST. A full archival report will be a part of the next issue of LASER.

No Child Left Behind

In this era of No Child Left Behind it seems that STS has been relegated to a back burner. Yet providing a broad education to American students looms larger each year as a goal we need to reach. The U.S. education system in general was given a C+ by the SETDA report for providing diverse, skilled and talented workers.

New regulations for the Act of 2001 focus on three areas:

1. A uniform comparable graduation rate.
2. Public school choice and supplemental education services.
3. Accountability, assessments and transparency.

National efforts have resulted in potential inclusion of environmental education – “No Child Left Inside” in NCLB, based on the book “Last Child in the Woods by Richard Louv.

DIRECTIONS & NEW EFFORTS

PBS Online is promoting STEM learning. Elementary students can use the *Curious George Discovery Guide*, *Peep and the Big Wide World*, *Fetch* and *ZOOM* resources at pbs.org. Older students can utilize *Design Squad* to focus on engineering and design processes. Middle and High School students can gain “greater insight into scientific phenomena” by watching NOVA episodes.

In September the No Child Left Inside Act (H.B.3034) was approved by the House and authorizes funding for environmental education.

PAEE 2009 Conference

The 2009 PAEE Conference is being held at the Raystown Lake Resort and Conference Center in Entriken, PA 16638.

Thursday evening March 19th to Sunday morning March 22nd

Don't miss this unique opportunity to learn, laugh and share during the conference, afterwards you will leave invigorated and up to date with information from the Environmental Education Field.



Now is the chance to send in your nomination for one of the "Awards" that are given out at each years conference.

[Click here for a list of awards and a link to the application.](#)

"The Pennsylvania Association of Environmental Educators unites, supports, and empowers a community of Environmental Educators throughout Pennsylvania."

National Science Digital Library - NSDL

National NSDL News and Information: Whiteboard Report, Web Exhibits, and Blogs (RSS)

NSDL News and Information services inform the NSDL Community of resources and events of interest; improve communications with groups interested in participating in NSDL; keep stakeholders and the public up-to-date about NSDL's activities and capabilities; and, evaluate the impact of activities.

The iTunes U website offers free access to audio and video from leading educational institutions. Content will be added on a regular basis.

www.apple.com/education/itunesu_mobilelearning/itunesu.html

The Kids Science Challenge

The Kids Science Challenge is a national science and engineering competition to engage students to design skateboards, join SETI astronomers in the search for extraterrestrial intelligence, explore new ways to improve the quality of water, and to invent a new candy flavor. www.kidsciencechallenge

Using a Science and Literacy Framework, designed by Charlotte Rappe Zales and Connie S. Unger in the November issue of *Science and Children*. This is a five step model helping to integrate and develop both science and literacy processes.

TreeVitalize

TreeVitalize is a public-private partnership to help restore tree cover, educate citizens about planting trees as an act of caring for our environment, and build capacity among local governments to understand, protect, and restore their urban trees.

With expansions statewide, TreeVitalize hopes to plant one million trees across the Commonwealth in the next five years. Throughout 2009 the effort will be launched in metropolitan areas statewide. See www.treevitalize.net

SCIENCE SNIPPETS

A new **Center for Healthy Environments & Communities (CHEC)** aims to explore the relationships between ecosystems and human health, build collaborative partners and alliances, create synergy among various communities of interest, be a resource center for data, educational materials and general information on environmental conservation as well as healthy and sustainable living. One of the flagship programs is the Allegheny River Stewardship Project – a community based environmental health project exploring water contamination in the Allegheny River. Dr. Conrad D. Voltz, department of environmental and occupational health, University of Pittsburgh Graduate School of Public Health, is directing the study. The study was begun by the Center for Environmental Oncology (CEO), Pittsburgh Cancer Institute and suggests that fish caught in Pittsburgh's rivers contain substances that mimic the actions of estrogen, the female hormone.

Dr. Voltz cited the goals of the project are to use fish as environmental sensors of chemicals in the water and the aquatic food chain, to determine the origins of these chemical contaminants.

Climate Change introduction and definitions can be found on the EPA's website: www.epa.gov/climatechange/glossary.html There is also basic information about the terms climate change and global warming: www.epa.gov/climatechange/basocinfo.html Climate change may result from natural causes, natural processes and human activities.

A recent study found changes in both polar regions, contradicting the 2007 report of the IPCC that said Antarctica was the only continent where the human impact on the climate had not been observed. Peter Stott of the Met Office Hadley Centre said, "in both polar regions the observed warming can only be reproduced in our models by including human influences – natural forcings (increases) alone are not enough."

Chemical DBT and the Immune System

A team of researchers at the University of California have issued a report on the mechanism of toxicity of a chemical compound called Dibutyltin (DBT). This is a part of

a class of highly toxic and widely distributed chemical compounds called organotins. DBT is most commonly used as an anti-fouling agent in paint (as in fishing and ship building industries). It is also used in the production of polyvinyl chloride (PVC) plastic tubes and bottles.

Closely related is TBT tributlin, another well know pollutant. Concern about the side effects of TBT led the United Nations' International Maritime Organization to organize a global ban on its use. It is metabolized into DBT by the body's liver. Humans are exposed by drinking water from PVC pipes. Because it is so poorly broken down, DBT remains in the environment and it appears that its toxic effects are more rapid and more pronounced than those of TBT.

Mercury and emissions

Some amount of elemental mercury, which scientists say is toxic to humans and animals, occurs naturally on the surface of the Earth. Since the Industrial Revolution in 1750, the rate at which mercury is deposited into the environment has tripled.

The government gives it third-place priority in its list of 275 hazardous substances right after arsenic and lead. It's a real problem in the U.S.

Coal fired power plants are the greatest single source of airborne mercury in the U.S. But emissions remain unregulated. One camp says mercury pollution is a global problem, thus U.S. control will not help much. Another camp says that while a global problem, mercury is also regional and local. Areas nearest to mercury emitters are disproportionately contaminated. And if emissions from nearby sources are controlled, mercury in the nearby food chain diminishes measurably.

A new method for identifying mercury sources relies on the ratio of mercury isotopes – mercury atoms with differing numbers of neutrons – to find where mercury originates. Scientists gather coal from fields around the world, burn it, capture the escaping mercury, and determine its unique isotopic “fingerprint”. When that fingerprint is again detected in the environment, it is matched to coal bed around the world – U.S., China, Kazakhstan, and elsewhere.

The Eco-Crunch

The planet is headed for an ecological “credit crunch”, according to a report by conservation groups. This report contends that our demands on natural resources overreach what the Earth can sustain by almost a third.

The Living Planet Report is the work of WWF, the Zoological Society of London, and the Global Footprint Network. It says that more than three quarters of the world's population lives in countries where consumption levels are outstripping environmental renewal....making them “ecological debtors”.... Overdrawing the agricultural land, forests, seas, and resources of other countries to sustain them. This reckless consumption of “natural capital” is endangering the world's prosperity with economic impacts including high costs for food, water, and energy.

Countries with the biggest impact on the planet are the U.S. and China, together accounting for some 40% of the global footprint. The U.S. and United Arab Emirates have the largest ecological footprint per person, while Malawi and Afghanistan have the smallest. In the UK, the “ecological footprint” – the amount of the Earth's land and sea needed to provide the resources we use and absorb our waste – is 5.3 hectares per person.

This is more than twice the 2,1 hectares per person actually available for the global population.

Tadpole Study

2008 is the Year of the Frog, when zoos and wildlife advocates the world over are focusing attention on the "amphibian crisis." Since 1980, 120 species of frogs, toads, salamanders and other amphibians have gone extinct, and as many as half of the remaining 6,000 species are endangered. The causes are many, and not all well-known: The causes almost certainly include a fungus and habitat loss, but may also include global warming and chemical contamination.

Amphibians, with their permeable skin, are considered important early warning signals for problems in the environment that may affect human health. Here's the gist of a new study: Take a little bit of a poison, and it may not be dangerous. Mix a little bit of a lot of "safe" poisons, and it can be deadly.

The poisons in this case are the world's 10 most widely used pesticides. The dead in this case are amphibians. The University of Pittsburgh research on "contaminant cocktails" is published in *Oecologia*. Lead author Rick Relyea tried three mixtures to see how they affected the tadpoles of gray tree frogs -- whose songs bring spring forests to life -- and leopard frogs. *From The Daily Green November, 2008*

RESOURCE DATABASE

NASA NEWS

NASA is now offering Radio Astronomy for schools. The NASA Radio JOVE project helps students hear and learn to distinguish among types of sound bursts. This serves as a basis for understanding how scientists listen to Jupiter and the Sun: their magnetic fields produce radio waves sounding like popcorn popping, waves breaking on a beach, or pebbles being thrown on a tin roof. Schools can purchase a low-cost radio telescope kit from NASA, build their own model, or go online to see radio spectrographs and hear streaming audio from professional radio observatories. See <http://radiojove.gsfc.nasa.gov>

NASA eClips are 5-10 minute video segments that are online resources for teachers, sorted by grade levels and topic. Accompanying educator guides. The K-5 section is entitled "Our World" and compares the natural with the designed world. Middle school clips focus on connecting classroom math to 21st century careers and technologies. The High School section "Launchpad" piques interest in science and engineering. These are updated weekly and related teacher guides can be found at www.nasa.gov/education/nasaeclips.

Websites 4 Kids Four sites let kids find basic background information on various topics within a given subject – also quizzes, slideshows, videos and real-world examples of concepts in astronomy www.astronomyforkids.com , biology www.biologyforkids.com, chemistry www.chemistryforkids.com, and physics www.physicsforkids.com.

National Institutes of Health offers a History of Medicine section at www.nlm.nih.gov - especially for/teachers and students section- with print and non-print materials.....going across time periods and cultures. Often NLM related lesson plans and online games and activities.

ToxMystery is an online game at <http://toxmystery.nlm.nih.gov> where children ages 7-11 can learn about common household hazards. Available in English and Spanish. FREE

BAM!Body and Mind informs kids about healthy lifestyle choices. Information and games. Teaching materials linked to national standards for science and health. From Center for Disease Control and Prevention (CDC). www.bam.gov

U.S. Department of Energy features learning about fossil fuels, a series of online interactive lessons for elementary and middle level students. Focus is on coal, oil, and natural gas. www.fe.doe.gov/education/energylessons/index.html

U.S. Environmental Protection Agency (EPA) has a tool for translating phrases like “metric tons of carbon dioxide” into more everyday terms, such as “the carbon dioxide emissions of a passenger car over two months”. See www.epa.gov/cleanenergy/energy-resources/calculator.html

American Society for Landscape Architects created an online resource for middle school students and teachers that focuses on green roofs and the environmental benefits. www.asla.org/greenroofeducation

Climate Change: Connections and Solutions – a 2 week curriculum encouraging students to think critically about climate change and to work collaboratively to devise solutions. For grades 6-8 and 9-12. www.facingthefuture.org

CALENDAR of EVENTS

Dec. 3-5 Pennsylvania Science Teachers Association PSTA Convention
[Hershey Lodge & Convention Center](#)
P.O. Box 446
West Chocolate Ave. & University Drive
Hershey, PA 17033
Phone: 717-533-3311

2008 NSTA AREA CONFERENCES

- Charlotte: Oct. 30–Nov. 1
- Portland: Nov. 20–22
- Cincinnati: Dec. 4–6

2009 National Conference - New Orleans - March 19-22

March 19-22, 2009 - PAEE ANNUAL CONFERENCE - Raystown Lake Resort and Conference Center in Entriken, PA 16638

April 2-4, 2009 *IASTS Conference*

The 24th Annual **International Association of Science, Technology & Society** Conference will be held April 2 to 4, 2009 at the RIT Inn and Conference Center, Rochester, New York

PRCST thanks our contributors:

Air & Waste Management Association
Center for Environment Oncology
NASA Space Grant Consortium
PA DOE – Office for Environment/Ecology
PA DEP Education Grants Office
Pittsburgh Foundation – Nancy Hannon Gordon Fund
Society for Analytical Chemists of Pittsburgh (SACP)

K to 12 Program - SACP/SSP

