PRCST 2013 STEM in Action Education Workshop Series

There is increased emphasis and a widely acknowledged, urgent need for improving and increasing science, technology, engineering and math (STEM) skills among our citizenry and students to navigate the modern world and access the opportunities it affords. Data on the workforce show clear benefits of a STEM related post secondary education in the current job market.

The 2013 PRCST STEM in Action Education Series provides sound basic information and continuing opportunities for teachers to visit sites where STEM careers are prominent. So often both teachers and students are given lists of STEM career possibilities. Yet there is little understanding of exactly how following a STEM track in school can lead to any specific careers. The PRCST STEM in Action Education program provides a primary experience for teachers and clarifies the range of opportunities and application of STEM skills in the workplace. It expands the knowledge of where the STEM skills may lead and where these jobs can be found. Help for teachers, as the agents of change in student education, are often left out of the process.

The initiating event for 2013 was a Breakfast meeting at the Carnegie Science Center:

STEM IN ACTION BREAKFAST
June 1, 2013 Carnegie Science Center

AGENDA

Welcome – Introductions

Report on the PRCST STEM education Series
- 2012 STEM in Action mini-workshop reports

Plans for the 2013 STEM in Action Mini-workshop Series
- Mini-workshop registration/funding process
- Potential workshop sites
  - Confirmed
  - TBD
- Earth Day Float Contest

Educator interests/suggestions

Q & A

Summary Report: The breakfast introduced teachers to the STEM in Action workshop series. Some attendees had participated last year and they talked about their experiences. Those present were asked to discuss the Earth Day Float Challenge, but no consensus was obtained. The mechanics of registration and reimbursement were outlined and the venue for the scheduled and tentative mini workshops was highlighted. Teachers offered suggestions for future workshops at the breakfast and on their assessments.

June 1 Workshops introduction	1) agree	2)somewhat	3)disagree	NA
met expectatations	11	2		
well organized	10	3		
info very valuable	11	2		
resources valuable	9	3		1
presentations informative	11	2		
Engineering Challenge exciting	9	4		
venue successful	11	2		
STEM careers identified	9	4		
will integrate into class	11	2		

Comments from assessments:

- *Looking forward to the mini workshops.*
- *In the list of the mini workshops, there is such a variety of opportunities! Very excited about the mini workshops. Thank you for arranging them.*
- *Would love Old Economy or Phipps as a venue.*
- *More movement. Just like kids, 3 hours is a long time to sit.*
- *Please do some workshops in the future on emerging stem cell careers in materials engineering, nanotechnology, tissue engineering…*

As a preface to the STEM In Action Workshop opportunities, PRCST offered a Two-Day workshop that had a focus on specific STEM areas and application of research/careers in those areas.

NEW STEM 2-Day WORKSHOP

Sponsored by The Pittsburgh Regional Center for Science Teachers (PRCST) in collaboration with the Tri-State Area School Study Council

Join in exploring REAL STEM job applications
Beyond the "talk"

All educators invited: teachers, administrators, curriculum coordinators, principals, central office

July 17-18, 2013

Thermo Fisher Scientific Inc, 100 Technology Drive #100, Pittsburgh, PA 15219
Free parking available

12 Act 48 Hours **Fee: $50** (includes continental breakfast and luncheon both days)

July 17, 2013	
8:30 am	**Registration & Continental Breakfast**
9:00 am	**Welcome**
Morning Focus: Science	
9:15 am	**"Environmental Science on the Three Rivers," Jeff Jordan,** RiverQuest RiverQuest staff will facilitate a mini-version of the flagship water quality exploration that has served more than 80,000 students since 1995. Hands-on activities include water quality assessments using chemical test kits and devices that measure pH, dissolved oxygen, turbidity, salinity and more, and a special look into the microscopic world of our rivers and streams.
10:30 am	**"Exploring the Marcellus Shale," Janine Surmick & Dani Stump,** RiverQuest RiverQuest Award-winning Shale Gas Education outreach program examining the processes, pros and cons of shale gas extraction utilizing hydraulic fracturing.
Noon	**Lunch**
12:30 pm	**Tour of Air Monitoring Lab and Ozone Report with Drew Michanowicz,** CHECK-Center for Healthy Environments & Communities
Afternoon Focus: Technology: Current Research and Applications	
1:00 pm	**"Regenerative Medicine/Tissue Engineering/3D Printing," John Murphy,** Executive Director, McGowan Institute for Regenerative Medicine
2:00 pm	**"Geoengineering Concepts – Technology on a Global Scale to Reverse the Effects of Climate Change: Local Programs Addressing Local Issues,"** **Panel Discussion:** • **NETL – Current research in Fossil Fuels: Michel Nowak, Sr.,** Management and Technical Advisor, Office of Research & Development, National Energy Technology Laboratory • **Health Implications of Fossil Fuel Extraction (Marcellus Shale) – Jill Kriesky,** Southwest Pennsylvania Environmental Health Project
2:30 pm	**Hands-on Activity: Water Cycle Backpack Pull**

July 18, 2013	
8:30 am	**Continental Breakfast and Welcome**
Morning Focus: STEM Components of Engineering	
9:00 am	**Engineering and Construction Using Green Design:** **Machu Picchu – Maureen Porter,** University of Pittsburgh **Current Efforts in Green Design – Matthew Mehalik,** Sustainable Pittsburgh
10:00 am	**Break**
10:15 am	**"Current 'Green' Progress"** **Panel Discussion:** • **BREATHE Project: Marily Nixon, Esq.,** Breathe Project Coordinator, The Heinz Endowments • **Monitoring Air Quality (A&WMA) – Jayme Graham,** Air Quality Manager, Allegheny County Health Department • **Green Materials/Energy Conservation – Indigo Raffel,** CCI, Inc.
11:30 am	**Hands-on activity: Life Cycle Analysis**
Noon	**Lunch**
Afternoon Focus: STEM Components of Mathematics	
1:00 pm	**"Applications in the Real World: Scale and Ratio Concepts Necessary in NASA Projects,"** Charissa Sedor, Carnegie Science Center
1:30 pm	**ThermoFisher Scientific – Jill Jones,** Director of Marketing and Product Management, ThermoFisher / Fisher Science Education
2:00 pm	**"Waste Disposal Infrastructure," Twila Simmons-Walker**, ALCOSAN
2:30 pm	**Air Dispersion Models – Pollutants – PRCST EHI Program** **New Common Core Standards for Science**

STEM 2 Day	1) agree	2)somewhat	3)disagree	NA
met expectations	12	3		
well organized	14	1		
info very valuable	13 1/2	1 1/2		
resources valuable	13	2		
presentations informative	15			
presentations organized	15			
venue success	11	4		
STEM careers identified	11	4		
will integrate into class	9 1/2	5 1/2		
these valuable opportunities	14	1		

Comments from assessments:

- *This was a well-organized, informative program that brought us up-to-date and beyond in all the STEM areas. The speakers were excellent. Thank you, Jane! Please do this every year.*
- *I would have liked to hear more about career paths taken by presenters to end up where they are in STEM.*
- *Extremely informational. More hands on activities that I could take back to my classroom.*
- *There is so much out here that I am not aware of, so this has been a great introduction to an array of opportunities.*
- *More variety of disciplines would be advantageous; for example, physicists, chemists, engineers, and mathematicians.*

WORKSHOP REPORTS - SUMMER/FALL 2013

Healthier, Safer, Consumer Products – a Make It and Take It STEM in Action Workshop
Women for a Healthy Environment **7-9 PM, June 12, 2013**

Michelle Naccarati-Chapkis, from WHE, welcomed the attendees and spoke about personal and home care products – what is harmful, what to avoid, and how to replace harmful products with healthy products. Synthetic fragrances and tricoslan, an antibacterial agent, are insidious and cause many problems for individuals and the environment.

Participants then visited four tables and made healthy products. Cynthia Hill, from Third Day Organics, demonstrated how to make an effective sunscreen without synthetic chemicals. Jackie Quimpo, of Clean Green Generation, showed how to make a healthy furniture cleaner and polishing spray. Michelle and

colleagues blended up a strawberry sugar scrub. Diane Walton, a doTerra essential oils representative, helped attendees make a tea tree oil first aid spray and an insect repellent spray.

Everyone was able to take their healthy products home with them to sample, as well as recipes to make personal and home care products to replace chemically laden, potentially harmful products. Those who attended also received a lip balm made by WHE.

Efficient Treatment for Reuse of Wastewaters STEM in Action workshop
Aquatech International Corporation **9 AM-12 Noon, June 24, 2013**

Jim Dobos, who has been with Aquatech for 22 years, met participants and led them on a tour of the work area and then presented a corporate overview. Aquatech is a 30-year-old company founded to treat water for industrial and some municipal needs. The majority of their clients are power plants, as the water needed to produce electricity must be pure to keep the equipment running smoothly. Aquatech serves a worldwide market with an increasing revenue stream. Their 2012 revenue was $147 million, an increase of almost 11% over the previous year.

Aquatech hires a wide range of engineers: chemical, mechanical, environmental, and structural are examples of some of its employees. Over 60 projects are currently underway involving purifying water for intake; treating wastewater; desalinization of seawater and fresh water during winter months and droughts; and zero liquid discharge projects. Aquatech is one of only three companies in the world to employ membrane and thermal discharge desalinization. One of the highlights was examining one large power plant image and trying to list the jobs needed to design, construct, and run a plant of this magnitude.

NASA STEM Careers Stem in Action Workshop
NASA Educator Resource Center (ERC) **2-5 PM, June 27, 2013**

Jane Konrad, Director of the NASA Teacher Resource Center, reviewed the variety of NASA STEM careers. The projects undertaken at NASA require a range of skills from professional, engineering, and scientific skills to administrative and clerical skills. Jane stressed that not all NASA jobs require advanced degrees. She talked about the scope of the programs NASA is involved in and all of the information available at NASA web sites and through the ERC.

Teachers who attended the session were interested in opportunities for students to experience science as they themselves were during the STEM in Action workshops.

NASA – ERC	1) agree	2)somewhat	3)disagree	NA
NASA Careers	5			
Digital Network	5			
Resource Bag	2			3
NASA Careers online	5			
Careers in Demand - online	4	1		
Workshop Format	5			

Comments from assessments:

- *This was a great beginning… but need more websites listed that students can use to see what is available for their future.*

- *A lot of valuable info was given by Jane and the other participants for possible resource people and resources for the classroom*

Green Buildings/Green Jobs Stem In Action Workshop
Conservation Consultants, Inc. **9 AM-12 Noon, July 19, 2013**

Ann Gerace, executive director of CCI, introduced her organization. CCI is 35 years old and was started to help low-income consumers reduce their electricity usage. Their program worked and energy use among participants was reduced between 30% and 40%. In 1993, CCI bought a house built in 1910 and decided to work together with an architect and community organizations to remodel it into an environmentally friendly green building.

Workshop attendees toured the building and saw the green roof, the recycled materials, the solar thermal panel, and photovoltaic panels as well as many other green features. They also learned about green jobs at CCI, such as energy auditors who go into homes for the electric companies who use CCI's services. Other STEM jobs discussed were architects, installers of solar devices, green roof designers, and building managers like Indigo Raffel, who conducted the tour.

CCI	1) agree	2)somewhat	3)disagree	NA
met expectatations	3			
well organized	3			
info very valuable	2	1+		
resources valuable	2	1+		
presentations informative	2	1+		
presentations organized	3			
venue successful	3			
STEM careers identified	2	1+		
will integrate into class	1			2
these valuable opportunities	3			

Conscious Wastewater Treatment STEM In Action Workshop
Alcosan **9 AM -12 Noon, July 25, 2013**

The workshop began with a tour of the wastewater treatment facility. Alcosan employs 352 people and can process 250 million gallons of water a day. 83 municipal systems run their sewage and sometimes their stormwater through Alcosan's processing equipment. Workshop participants watched water enter the plant, go through purification stages, and exit as a clear stream into the Ohio River.

David Borneman, the Director of Engineering and Construction, walked participants through their proposed Wet Weather Plan. Many of the communities that use Alcosan to process wastewater have sewer lines combined with stormwater drainage. A rainfall of .1 of an inch results in an overflow, too much water for

Alcosan to process, to the tune of 9 billion gallons a year. Alcosan had to submit a plan to alleviate this problem by 2026. The ideal plan was too costly for consumers to absorb so they devised a plan to limit the overflow to 3.6 billion gallons a year with $2 billion worth of improvements.

Alcosan	1) agree	2)somewhat	3)disagree	NA
met expectatations	8			
well organized	8			
info very valuable	8			
resources valuable	8			
presentations informative	8			
presentations organized	8			
venue successful	8			
STEM careers identified	4	4		
will integrate into class	8			
these valuable opportunities	7			1

Comments from assessments:

- *Great workshop that covered the whole process from the great tour of the plant to then taking a step back and looking where to improve in the future with the final presentation.*
- *Bob's tour was great and so informative. Very interesting – brings up a topic that we often don't think of.*

Fossil Fuels Research: All types of energy
NETL, DOE **9 AM – 12 Noon, Aug. 7, 2013**

The National Energy Technology Laboratory (**NETL**) is a secure facility, part of DOE's national laboratory system. Participating teachers toured three Research and Development Labs: the Engineered- Natural Systems Lab, the Carbon Capture Lab, and the Gasification Lab. Brian Strazisar, Dave Luebke, and Dirk Link introduced the teachers to their projects and goals as they outlined their education and scientific backgrounds.

Dr. Michael Nowak, Senior Management Technical Advisor, shared an overview of NETL, stressing the importance of efficient and sustainable energy usage. Dr. Novak stepped in for Traci Rodosta, who could not be there, to discuss the natural gas and oil industries. The teachers were very interested in Marcellus Shale gas extraction. Tom Sarkus, Division Director, PTFD, spoke about the coal industry and pointed out that many forms of energy are needed to meet demand. Carol Painter, of the Energy Delivery Technologies Division, illustrated how the many forms of energy are necessary for the current electric power system and how the system may be improved by Smart Grid technology. She spoke about research to improve the grid and careers in the electric power industry.

NETL	1) agree	2)somewhat	3)disagree	NA
met expectatations	9			
well organized	9			
info very valuable	9			
resources valuable	9			

presentations informative	9			
presentations organized	9			
venue successful	9			
STEM careers identified	9			
will integrate into class	9			
these valuable opportunities	9			

Comments from assessments:

- *So worthwhile – thank you for making this information available to us.*
- *Best workshop so far.*
- *Great – informational and mind boggling!*
- *Great variety in speakers and visuals that really covered topics that were geared to our group of educators. They (these workshops) need to keep coming.*

Greening Schools and Curriculum
A. W. Beattie Career Center **5-8 PM, October 8, 2013**

Clifton Bossong, Assessment Coordinator at A. W. Beattie, offered a tour of the center, one of only four Pennsylvania schools to earn the Inaugural National Green Ribbon Award in 2012. The tour focused on how the school achieved its LEED gold status and how each area of study at the school incorporates sustainable practices. Clifton also presented an overview of how the school's curriculum prepares students for a variety of STEM careers.

Beattie	1) agree	2) somewhat	3) disagree	NA
met expectations	4			
well organized	4			
info very valuable	4			
resources valuable	3	1		
presentations informative	4			
presentations organized	4			
venue success	4			
STEM careers identified	4			
will integrate into class	3	1		
these valuable opportunities	4			

Hidden Museum Careers in STEM
Carnegie Museum of Natural History **9AM-12 Noon, Oct. 12, 2013**

Dr. Cynthia Morton, Associate Curator and Head of the Section of Botany, led the teachers on a tour behind the scenes in her section. She spoke of the importance of museum collections, such as herbarium sheets, to show change over time. Dr. Morton led the teachers in extracting DNA from wheat germ and in an activity designed to illustrate how much DNA is shared between organisms. Patrick McShea, Program Officer in charge of the CMNH loan collection, introduced teachers to the collection and helped them brainstorm how they could use the museum and its resources to let students explore STEM concepts and careers.

CMNH	1) agree	2) somewhat	3) disagree	NA
met expectations	12	1		
well organized	12	1		
info very valuable	12	1		
resources valuable	12	1		
presentations informative	13			
presentations organized	13			
venue success	13			
STEM careers identified	10	3		
will integrate into class	12	1		
these valuable opportunities	13			

Teacher comments from assessments:

- Being able to explore the "Behind the Scenes" was wonderful. *The genetics activity will definitely be used in our camps! Wonderful.*
- *The workshop was very informative and provided me with many ideas to use in my classroom.*
- *Fantastic. Love it.*
- *Excellent workshop! Very interesting and informative! I really enjoyed the DNA activity and herbarium visit.*
- *This was a fantastic workshop with speakers who had great ideas to teach this information to all ages in my classroom.*
- *DNA experiment will be used in every class or group that I work with – including my preschool library group and my granddaughter's Brownie troop.*
- *This was a fantastic experience. I just wish students could have the opportunity to experience something like (this)….*

Careers in Sustainable Landscapes
Phipps Conservatory **4-7 PM, Oct. 23, 2013**

Melissa Harding organized the workshop. Amanda Joy and Melissa, both Science Education Specialists, both told their stories of how they came from different routes to Phipps and Science Education. Melissa gave participants an overview of Phipps and what the people who work there do. The teachers took a tour behind the scenes of sprouting greenhouses with Matthew Quenaudon, the Integrated Pest Management Specialist, who talked about his work and how he became interested in insects. Hannah Hardy, Director of Programming for Let's Move Pittsburgh, joined the group at the end of the tour, and spoke about her organization and her career path. The workshop ended with a tour of the Center for Sustainable Landscapes, given by Adam Haas, Interpretative Specialist, who demonstrated the green aspects of the building; the many scientists, engineers, and architects involved in the building project; and his own background leading him to Phipps and an interest in sustainability.

Phipps	1) agree	2) somewhat	3) disagree	NA
met expectations	10+			
well organized	10			
info very valuable	10			
resources valuable	9	1		
presentations informative	10+++			
presentations organized	10			
venue success	10			
STEM careers identified	10+			
will integrate into class	10			
these valuable opportunities	10			

Comments from assessments:

- *Everyone should love what they do and you are a wonderful example! Thank you for taking the time for us!*
- *Excellent!*
- *Wow!*
- *Fantastic! I learned a lot and had fun.*
- *Going behind the scenes and meeting the variety of staff was wonderful! All the speakers were passionate and energetic and entertaining. Thank you!*
- *Excellent opportunity. I only wish these opportunities were available to students to experience. It was an inspiration.*
- *These people were really excited about their work and did a great job of giving us the information. Also an excellent overview of STEM jobs that aren't your typical option.*

Bird Health, Husbandry, and Training
The National Aviary **9 AM – 12 Noon, Nov. 2, 2013**

Trisha O'Neill, Director of Education, welcomed participants with an overview of the Aviary and a discussion of why birds were good exploration tools for science classes. Dr. Jacqueline Saint-Ange , Associate Veterinarian, took the teachers into the hospital. As she introduced her avian patients, she spoke of all of the skills and people needed to insure the health of the Aviary's birds. The teachers were the given the opportunity to feed wetland birds and talk to Nikki Majeran, the Lead Aviculturist of that area. After experiencing the *Beaks* show, the Manager of Animal Training, Cathy Schlott, explained the training techniques used to produce the birds' behaviors. She introduced some of the trainers and all spoke of their interests and how they became interested in animal behavior.

The wrap-up was interrupted by a bird that had gotten out of its environment; was flying around the Atrium where the concluding event was taking place. The bird had injured itself on the panes of glass and we needed to leave so that it could be rescued.

National Aviary	1) agree	2) somewhat	3) disagree	NA
met expectations	9			
well organized	9			
info very valuable	9			
resources valuable	9			
presentations informative	9			
presentations organized	9			
venue success	9			
STEM careers identified	9			
will integrate into class	9			
these valuable opportunities	9			

Comments from assessments:

- *Thank you for this wonderful opportunity – it was a revelation in how much is available here!*
- *The best yet!*
- *This and all the Stem workshops have been exceptional!!*
- *This was a great workshop that really focused on the STEM jobs and all the opportunities the Aviary has for our students to get started.*
- *Super excited to revisit. Excellent!*
- *Loved this workshop. I haven't had my students to the Aviary in about ten years. That will change!*
- *Thanks to all the Aviary staff for sharing their knowledge and stories about their background and path to work at the Aviary!*
- *What we experienced dealing with what occurs behind the scenes, gifted high school students need to see.*

Assessment Results from 9 Workshops Combined

9 workshops	1) agree	2)somewhat	3)disagree	NA
met expectatations	78	6		
well organized	79	5		
info very valuable	78.5	5.5		
resources valuable	74	8		
presentations informative	81	3		
presentations organized	71*			
venue successful	78	6		
STEM careers identified	68	16		
will integrate into class	71.5	9.5**		3
these valuable opportunities	77	2		5***

* *Assessment from June 1 workshop did not have this question*

** *Some participants were educators who did not teach in classrooms*

*** *Last question on form; some teachers skipped it*

Addendum

From our feedback, we see that in some cases the STEM careers were not identified as clearly as was needed. At some sites the STEM jobs were demonstrated but not actually documented. Continuation of this program will work to see that more job opportunities are made more clear.

Item of Note!!!

One of our initial keynote speakers at the Carnegie Science Center in 2012 was Dr. Carolee Bull, Research Plant Pathologist with USDA in Salinas, CA. In addition to may other awards, Dr. Bull recently was given a national award at a service in Washington, D.C.

Subject: 2013 Secretary's Honor Award Winner (Informational Email)

Dear Dr. Bull:

Congratulations! You were selected to receive a Honor Award from the Secretary of Agriculture. The Secretary's Honor Awards (SHA) are the most prestigious Departmental awards presented by the Secretary and recognizes exceptional leadership, contributions, or public service by individuals or groups who support the mission/goals of the United States Department Agriculture (USDA).

The Agricultural Research Service (ARS) is extremely proud of your contributions to USDA and our Nation. It's no doubt that you are an example of a stellar public servant.

You are invited to participate in the following activities in your honor:
Research, Education, and Economics (REE) Mission

Here receiving the award with Agriculture Secretary Tom Vilsik - also from Pittsburgh!!!!

So teachers -your students can achieve great things! Inspire them.