Building the Pillars of STEM
Why Does Common Core Matter?
The MSC Steering Council

The Math & Science Collaborative Steering Council sets the direction for the Collaborative. Newly elected or appointed every fall, Steering Council members represent the broad range of stakeholders in southwestern Pennsylvania—educators, universities, corporations and many more.

Math & Science Collaborative Steering Council for 2011-2012:

Mathematics Teachers

High
Tamar McPherson (Plum)

Science Teachers

Elementary
Marie Mrvos (Pittsburgh Public Schools)

Middle
Todd Binnig (Franklin Regional)

High
Dan Malone (Fox Chapel), Phyllis Jean Roberts (Pittsburgh Public Schools)

School Administrators

Superintendents/Asst. Superintendents
Matt Conner (Burrell), Tim Glasspool, (Plum Borough), Michael Loughead (South Fayette), Ronald Sofo (Freedom)

Principals
Judith Mahoney (Plum), Gail Yamnitzky (Plum), Greg Egnor (Burrell)

Curriculum Coordinators
Kathleen Gallagher (Northgate), Trisha Craig (Fort Cherry)

Others
Jack Garrow (Pittsburgh Public Schools)

Intermediate Units
Nancy Bunt, Amy Cribbs and Rosanne Javorsky (IU3), Jackie Removcik (IU7)

Regional Institutions
John Radziilowicz, Linda Ortenzo and Geri Baker (Carnegie Science Center), Patrick McShea and Laurie Giarratani (Carnegie Museum of Natural History), Lois Winslow (Children’s Museum of Pittsburgh), Jeffrey Jordan (Riverquest), Jennifer Stancil (WQED) Justin Driscoll (Pittsburgh Technology Council)

Higher Education
Mary Kostalos and Barbara Biglan (Chatham University), Sandra Bobick (CCAC), Matt Fisher, Norman Hips and Stephen Jodis (Saint Vincent College), Nancy Jacqmin and Roberta Schomberg (Carlow University), Judith Hallinen (Carnegie Mellon University), Steven Little (University of Pittsburgh) and William Hug (California University of PA)

PA Dept of Education
Dennis Gold (TSA)

Local Initiatives
Robin Shoop (Robotics Institute), Paul Anselmo (New Century Careers), Jennifer Henney (PA Science Curriculum Council), Sharon Bedard Hess and Cynthia Pulkowski (ASSET), Justin Driscoll (Pittsburgh Technology Council) Cheryl Begandy (Pittsburgh Supercomputing Center), Joan Schanck (Pittsburgh Tissue Engineering Initiative)

Foundations/Corporate
Mehran Arbab (PPG Industries), John Lease (Alcoa), Cheryl Kubelick (The Buhl Foundation), Dan Fogarty (Schroeder Industries), Jill Jones (Thermo Fisher Scientific), Dave Basil (Society of Manufacturing Engineers)

If you are interested in serving on the Steering Council, please complete the Steering Council portion of the Network Connections RSVP form on page 38 and return it no later than October 19, 2012. The 2012-2013 meetings are from 3:30 to 6 PM on 10/4/12, 2/21/13 and 5/16/13.
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3
The Vision and Mission of the Math & Science Collaborative

The Math & Science Collaborative (MSC) is Southwestern Pennsylvania’s regional approach to building the pillars of STEM by strengthening math and science education for all students. The Collaborative was formed in 1994 by a regional “congress” of stakeholders. They are comprised of all the people and organizations who share a stake in the quality of math and science education.

The Math & Science Collaborative reaches out to more than 135 public and non-public schools/districts in Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Mercer, Washington, and Westmoreland counties. There is no charge or formal process for “joining” the Collaborative. Headquartered at Allegheny Intermediate Unit, it is supported by IU funds, federal and state grants and several local foundations.

Mission
By working together, Southwestern Pennsylvania can better prepare all students to fully participate in the ever-changing future as mathematically and scientifically literate citizens. The Math & Science Collaborative coordinates efforts and focuses resources through innovative, evidence-based, regional approaches to the teaching and learning of mathematics and science from preschool through university.

Vision
All students will be able to apply the language, processes and systems of mathematics and science. Students will demonstrate this power through the quality of their work, which will:
• demonstrate problem-solving and critical thinking skills, requiring both team and individual effort and responsibility;
• involve the application of knowledge as well as its reproduction;
• require disciplined inquiry including an in-depth understanding of a problem and the integration of newly acquired information with the student’s prior knowledge;
• have value in its relevance to the student’s life and ambitions, offering a feeling of genuine accomplishment;
• require an understanding of the relevance of science and mathematics to innovation, economic development and employment;
• include the development of skills to communicate the results of the work;
• be aligned with national and state standards

To achieve this level of ability and confidence, all students will be engaged in a coherent sequence of active learning experiences, appropriate to their developmental level, that are designed to continually increase their competence, resulting in mathematical and scientific literacy. Valuable learning will occur in both formal environments like schools and universities, and informal environments like museums, parks, non-profits, and homes.

Students will be guided by educators who employ effective, engaging teaching strategies. Assessment of student progress will be utilized to support student learning. Strategies will be continually refined through a system of on-going professional collaboration. Opportunities for professional growth will include collaboration among educators, scientists and mathematicians, community members, and university, foundation and business partners. Resource information will be sought and shared nationally and internationally.

Belief Statements about Stakeholder Involvement
The general public and the many groups in Southwest Pennsylvania affected by or impacting math and science education are referred to as “stakeholders” because their economic future depends on building a productive future for all children.

While the primary responsibility for learning lies with the individual, all stakeholder groups share responsibility for enabling students to achieve educational outcomes that will build productive futures.

Stakeholders can responsibly coordinate their efforts and focus their resources to achieve a desirable future that they envision together.
Every person in a community of learners brings a unique array of life experiences and characteristics to learning. It is the responsibility of that community to motivate each to fully participate to contribute to the learning of both the individual and the group.

Distinctions of geographic location, socio-economic level, ethnicity, race, or gender must not determine the availability of resources that create opportunities to learn.

Working as the Collaborative are teachers, administrators, school board members, parents, and representatives of universities, corporations, museums and other informal educational institutions, non-profits, and foundations.

**Behind the Vision: The MSC Steering Council**

The Steering Council guides the Collaborative. Accepting new participants each fall, Steering Council members represent the broad range of stakeholders in SW PA—across schools, universities, corporations, regional assets, and local initiatives. Bringing these varied perspectives, they work together to set the direction for the Collaborative.

Steering Council Subcommittees were newly formed in 2011-2012, and will continue their work in the new school year. Refer to page 22 to learn of their work for your possible involvement. Please applaud the 2011-2012 Steering Council members, listed on page 2, for their contributions in guiding, advising and communicating the work of the MSC.

The 2012-2013 Steering Council meetings are: 10/4/12, 2/21/13 and 5/16/13. All meetings occur from 3:30 to 6 PM to allow educators to come after school. If you are interested in serving on the Steering Council, please complete the Steering Council portion of the Network Connections RSVP form on page 38 and return it no later than October 19, 2012. Staff contact information is located on page 63.
What does Research say about How People Learn?

What does research clearly say about how people learn best? And who defines which research matters? For the definitive answer, turning to the National Academies makes best sense.

Who/What are the National Academies?

According to http://www.nationalacademies.org

Four organizations make up the Academies: the National Academy of Sciences (NAS), the National Academy of Engineering (NAE), the Institute of Medicine (IOM) and the National Research Council. Known collectively as the National Academies, this organization produces groundbreaking reports that have helped shape sound policies, inform public opinion, and advance the pursuit of science, engineering, and medicine. The Academies are private, nonprofit institutions that provide expert advice on some of the most pressing challenges facing the nation and the world.

History

To meet the government’s urgent need for an independent adviser on scientific matters, President Lincoln signed a congressional charter forming the National Academy of Sciences in 1863 to “investigate, examine, experiment, and report upon any subject of science.” As science began to play an ever-increasing role in national priorities and public life, the National Academy of Sciences eventually expanded to include the National Research Council in 1916, the National Academy of Engineering in 1964, and the Institute of Medicine in 1970.

Membership

NAS, NAE, and IOM members are among the world’s most distinguished scientists, engineers, physicians, and researchers; more than 300 members are Nobel laureates. Members are elected in recognition of outstanding achievements, and membership is considered a high honor. These institutions are unique in that they attract the nation’s leading experts in every field to serve on their award-winning panels and committees.

Funding

The NAS, NAE, IOM, and Research Council do not receive direct appropriations from the federal government, although many activities are mandated and funded by Congress and federal agencies. Their work extends well beyond fulfilling federal government requests, however. Foundations, state governments, the private sector, and philanthropy from individuals enable the National Academies to address critical issues on behalf of the nation.

Focus

The National Academies charged expert committees to do the following:

• Conduct a review of research in a variety of fields that has advanced the understanding of human learning
• Draw implications for teaching from that body of knowledge, and
• Communicate their findings in a format useful for teachers, principals, superintendents and policy makers.

The work of the nation’s finest minds resulted in the publication, *How People Learn* (National Research Council, 2000). The three key findings from *How People Learn* are outlined on the facing page.

The Math & Science Collaborative regularly incorporates the sharing of these findings in professional development.

Teachers participating in Professional Learning Communities listed on page 61 of the *Journal* would be good resources for application of these principles.
### Key Findings from How People Learn

In *How People Learn* (National Research Council, 2000), the authors summarize three key ideas about learning based on an exhaustive study of the research. These three findings about student learning have parallel implications for classroom instruction, which then suggest a translation of those implications into curriculum materials.

<table>
<thead>
<tr>
<th>Key Findings</th>
<th>Key Findings: Students</th>
<th>Key Findings: Teachers</th>
<th>As a Result, Curriculum and Instruction Need To…</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First</strong></td>
<td>Students come to the classroom with <strong>preconceptions</strong> about how the world works. If their initial knowledge is not engaged, they may fail to grasp the new concepts and information that are taught, or they may learn them for purposes of a test but revert to their preconceptions outside the classroom.</td>
<td>Recognize preconceptions and adjust instruction</td>
<td>Include structured strategies to elicit and challenge learners’ preconceptions Incorporate background for the teacher about common preconceptions</td>
</tr>
<tr>
<td><strong>Second</strong></td>
<td>To develop competence in an area of a science discipline, students must (a) have a deep foundation of usable knowledge, (b) understand facts and ideas in the context of a <strong>conceptual framework</strong>, and (c) be able to organize that knowledge in ways that facilitate retrieval and application.</td>
<td>Understand the content and conceptual framework for a discipline Provide examples for context</td>
<td>Be organized around a conceptual framework Connect factual information to the framework Provide relevant examples to illustrate key ideas</td>
</tr>
<tr>
<td><strong>Third</strong></td>
<td>Students must be taught explicitly to take control of their own learning by defining goals and monitoring their progress in achieving them.</td>
<td>Provide class time for goal setting and analysis Teach metacognitive skills</td>
<td>Make learning goals explicit Integrate metacognitive skill development into content</td>
</tr>
</tbody>
</table>


The National Academies Press

The National Academies Press was created by the National Academies to publish the reports issued by the National Academies. The NAP publishes more than 200 books a year on a wide range of topics in science, engineering, and health, capturing the most authoritative views on important issues in science and health policy.
What are Common Core State Standards?
Currently, each state has its own academic standards; therefore, students across the country are learning at different levels. In June 2010, the Council of Chief State School Officers (CCSSO) and National Governor’s Association released the Common Core State Standards (CCSS) for mathematics and literacy. By June 2011, these standards had been adopted by 44 states, the District of Columbia, and the U.S. Virgin Islands. This work represents the first significant attempt in U.S. history to systematically align common standards across states. These CCSS are research-based, evidence-based, aligned with college and work expectations, include rigorous content and skills, and are internationally benchmarked.

What action is Pennsylvania taking?
Pennsylvania is one of the 44 states that have agreed to adopt the CCSS. Initial State Board adoption occurred in July 2010. Since that time, Pennsylvania has developed a set of Pennsylvania Common Core Standards for English Language Arts and Mathematics. These standards essentially mirror the content and rigor of CCSS but are formatted and reframed to reflect Pennsylvania’s perspective. Educators can go the Pennsylvania Department of Education Standards Aligned System (SAS) website at www.pdesas.org and click on Standards to view the PA Common Core Standards. In addition, the Common Core website, www.corestandards.org, maintained by CCSSO and NGA, provides information regarding the Standards. An illustration developed by the Math & Science Collaborative shows the direct connection between the Common Core State Standards (CCSS) and the PA Common Core Standards (page 18). Understanding this consistent relationship enables PA educators to use the original CCSS documents and tools with confidence that they reflect Pennsylvania’s standards.

National voices offer insight into CCSS.
Those who attended the February 2012, Network Connections event heard the keynote speaker, Dr. William McCallum, one of the authors of the Mathematics CCSS. McCallum emphasized the need for all educators to concentrate on the Standards of Mathematical Practice, which describe what should be demonstrated by students at all grade levels.

The Mathematical Practices describe what it means to really “do” mathematics:
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

The Standards of Mathematical Practice are explained in detail at www.pdesas.org and www.corestandards.org.

Upcoming Network Connections keynotes add evidence.
In the October keynote session, William Schmidt, will share research proving that making the changes recommended by the CCSS results in greater student achievement. (See page 10)

The publication of the Next Generation Science Standards is eagerly anticipated. The February Network Connections AM morning keynote session by Harold Pratt will feature their evolution (page 14). The afternoon keynote speaker, Steve Leinwand, will discuss the once-in a lifetime opportunity presented by math CCSS. (page 41)

How can the Math & Science Collaborative (MSC) help?
MSC will continue to keep the region abreast of information concerning the CCSS. Work related to the math CCSS is incorporated into all Collaborative sessions. Staff members help participants to see and understand the key advances that the CCSS have over the former Pennsylvania State Standards:
• Clear focus on key topics at each grade level
• Coherent progressions across grade levels
• Content standards that have a balance of conceptual understanding and procedural fluency
• Mathematical practices that foster reasoning and sense-making
• Clear relationships to college and career readiness

See page 9 to learn about resources for implementation of the CCSS coming from the two national assessment Consortia.
Two CCSS National Assessment Consortia include PA

(1) PARCC

The Partnership of Assessment of Readiness for College and Careers (PARCC) is a 24 state consortium committed to helping ensure teacher and student success through Common Core.

PARCC Tools and Resources

The tools and resources below will provide opportunities for states to engage, involve, and empower educators around the implementation of the Common Core State Standards (CCSS) and PARCC assessments. The development and dissemination of these resources will help provide district leaders, administrators, school leaders and classroom teachers with regular, hands-on experiences with PARCC tools and resources. All tools and resources will be available as they are released at http://PARCConline.org. Already available are:

- Model Content Frameworks
- Key advances in the standards between grade levels
- Fluency expectations and major within-grade dependencies
- Connections among standards, clusters, or domains
- Opportunities for In-Depth Focus
- Opportunities for Connecting Mathematical Content and Mathematical Practices

The Educator Leader Corps (ELC) is one of the ways PARCC is working to ensure success. The National Math and Science Initiative (NMSI)’s Laying the Foundation program is leading a community of over 600 educators focused on creating expertise and resources to implement Common Core. The stated goal of the ELC is to ensure that teachers in consortium states successfully implement the standards in classrooms and prepare more students for college and careers.

Pennsylvania is a participating state in PARC. While PA has not committed to implementation of the PARCC assessments, it is interested in resources to assist with Common Core implementation. Nancy Bunt, Program Director of the Math & Science Collaborative, is leading a team from PA to the training being offered by PARCC in Chicago, IL August 21-23. The team will meet again February 28-March 1, 2013.

(2) Smarter Balanced Assessment Consortium

More information on Smarter Balance can found at www.smarterbalanced.org.

In addition to their dedicated websites, the Consortia note several resources to assist in implementation of Common Core.

- Tri-State Collaborative Rubrics (alignment and quality):
  http://www.achieve.org/achieving-common-core
- Illustrative Mathematics:
  http://www.illustrativemathematics.org
- Math Progressions and other Resources:
  http://commoncoretools.me
- More on the Practices:
  http://www.mathedleadership.org/ccss/materials.html
- Key Shifts:
  http://www.achievethecore.org/steal-these-tools
Schmidt Insight: Why Common Core Matters

Inequality for All: The challenge of unequal opportunity in American schools

By William Schmidt, Michigan State University, and Curtis McKnight, University of Oklahoma
Published by Teachers College Press, July 2012

Americans have long understood that a strong educational system is the key to economic prosperity and equal opportunity. At a time of growing concern about the future of the U.S. economy, growing disparities of wealth, and a decline in social mobility, it is inevitable that the education system will be expected to play a major role in solving these problems. In an exciting new book, Drs. William Schmidt and Curtis McKnight, internationally acclaimed experts in mathematics education, argue that the central challenge in improving America’s education system is to guarantee equal opportunity to learn. Reformers on both the left and right have been consumed with equalizing resources or in fostering competition in education, but they miss the essence of schooling: the delivery of academic content by teachers to students. The ultimate test of an educational system is whether it makes sure that every student, whatever their background, is exposed to the content they need to compete in today’s society.

According to the authors, U.S. schools are failing this most basic test, and in the process wasting the talents of millions of American children – children from poor and middle class families. Marshaling wide-ranging evidence based on decades of research, Schmidt and McKnight demonstrate the alarming extent of inequality in math and science education in America’s schools. There are wide variations in what students have a chance to learn across U.S. states, school districts, schools, and classrooms. The quality of education students receive is largely due to what community they happen to live in, making academic opportunities into a kind of social lottery – one with profound consequences.

Inequality in opportunity to learn is one of the principal reasons for the lower achievement of poor and minority students. Students in disadvantaged districts tend to suffer from less rigorous content. In fact, this (weak) math and science instruction is so common in struggling districts that the content delivered in high-poverty districts has more in common with low-income districts in different states than they do with more affluent districts in the same state.

However, one of Schmidt and McKnight’s key findings is that inequality in opportunity to learn is not just a problem for poor and minority students. The reality is that the greatest variation in learning opportunities is among middle-income school districts. Parents shouldn’t assume that just because they live in a middle-class community that their child is getting an equal chance to learn math and science.

The reason unequal opportunity to learn is a threat to every student is because it is the difference among classrooms that is the biggest source of variation. Classes vary greatly in what topics are taught, for how long, and with what rigor. For example, students in different “algebra” classes could focus on basic mathematics or cover more advanced material, experiencing dramatically different learning opportunities despite sharing the same course title – even at the same school.

The book reveals that the pernicious practice of tracking, of assigning students to weaker classrooms that permanently thwart their chances to improve, is still very widespread. The importance of differences in instruction between classrooms points to the essential role of teachers. Schmidt and McKnight are quick to note that it is unfair to simply blame teachers for
struggling schools. They present strong evidence that too many teachers are inadequately prepared to teach mathematics, and are forced to pick and choose what to teach from the conflicting guidance of textbooks, state standards, and assessments. The authors are especially critical of the most commonly used mathematics textbooks, which give shallow coverage to too many topics rather than focusing on a few key topics at each grade, as is done in higher achieving countries.

Despite the tremendous challenge of ensuring equal opportunity to learn math and science, Schmidt and McKnight believe there is reason for optimism. The new Common Core State Standards in Mathematics, for example, presents an excellence chance for implementing high quality standards. The Common Core represents a chance to reform the fragmented, slipshod U.S. math curriculum that makes mathematics education a product of blind chance, and to move toward a system that really does provide every child with an equal chance at an education.

William Schmidt will present the afternoon keynote in Network Connections on October 25, 2012. See page 36 for the full agenda and to RSVP to attend.

About the Author/Speaker

William H. Schmidt is a University Distinguished Professor at Michigan State University. He serves as co-director of the Education Policy Center, co-director of the U.S. China Center for Research, and holds faculty appointments in Statistics and Education. Previously he served as National Research Coordinator and Executive Director of the US National Center which oversaw participation of the United States in the IEA sponsored Third International Mathematics and Science Study (TIMSS). He has published in numerous journals including the Journal of the American Statistical Association, Journal of Educational Statistics, EEPA, and the Journal of Educational Measurement. He has co-authored eight books including Why Schools Matter, Teacher Education Matters, and Inequality for All. His current writing and research concerns issues of academic content in K-12 schooling, assessment theory and the effects of curriculum on academic achievement. He is also concerned with educational policy related to mathematics, science and testing in general.

Reviews of Inequality for All:

“If you have any reservations on why the U.S. needs Common Core Standards you need to read this excellent book. Studying elementary schools in the U.S. and abroad, results show significant differences in students’ opportunities to learn mathematics. A rare combination of statistically rigorous work, yet easy to read, policymakers, teachers, and parents will be surprised to find how varied instruction and curricular content in mathematics is and the consequences it is having on children’s learning across all economic and social groups, including the middle class.”

—Barbara Schneider, Hannah Chair, Michigan State University

“This book presents an engaging and compelling argument about the dismal state of mathematics education in the US, illuminating how the nuts and bolts of kids’ opportunities to learn in school—curriculum content coverage—have implications for democratic principles of liberty and justice. It provides important lessons on improving US mathematics lessons.”

—James P. Spillane, Spencer T. & Ann W. Olin Professor in Learning & Organizational Change, Northwestern University
Implementing CCSSM

Looking for ready-to-use resources to understand and implement the Common Core State Standards for Mathematics (CCSSM)? Check out the National Council of Supervisors of Mathematics (NCSM) website (mathedleadership.org) for a variety of materials designed to help educators—teachers, coaches, coordinators, principals, school-based and central office administrators—lead their team, school or district’s implementation of CCSSM. Since the release of CCSSM on June 2, 2010, one of NCSM’s priorities has been to help educators interpret and understand the CCSS and to support the development and implementation of comprehensive, coherent instruction and assessment systems. This article describes CCSS Curriculum Materials Analysis Tools.

CCSS Curriculum Materials Analysis Tools and Professional Development Materials

As schools and districts develop their CCSSM implementation plans, a key consideration is selection of instructional materials. Typical questions include: “What instructional materials will best support implementation of CCSSM?” “How well do our current materials support students’ learning of the SMP and content standards? Can we continue to use them, or do we need to purchase new materials?”

The CCSS Curriculum Materials Analysis Tools and Professional Development Materials are designed to help teachers and administrators answer these questions and assess the potential of particular curriculum materials to support students’ attainment of CCSS, including the SMP. The tools and supporting professional development materials were developed by a team of mathematicians and mathematics educators, led by Bill Bush, University of Louisville, with support from the Brookhill Foundation and Texas Instruments.

Ultimately, the choice of which curriculum materials to adopt must be made by committees or individuals charged with that task. The intention of the tools is to provide assistance in collecting useful information focused on salient issues related to the CCSSM, to ensure consistency across reviewers, and promote evidence-based discussions about the extent to which particular materials will support faithful implementation of CCSSM.
The Curriculum Materials Analysis Tools consist of three tools to provide detailed information about the extent to which curriculum materials support the implementation of CCSSM. All three tools provide different lenses on which to base a comprehensive analysis and ultimately an informed decision. The materials also include a User’s Guide and professional development materials (PowerPoint slides and notes) to prepare reviewers to use the three tools.

**Tool 1** is designed to help reviewers determine the extent to which the curriculum materials develop mathematics content across grade levels, as well as within grade levels, consist with the CCSSM content standards. It focuses on key sequences of mathematics content standards across the four grade bands: K-2, 3-5, 6-8, and 9-12 in the CCSSM. Reviewers analyze content treatment through two lenses: coverage and balance. **Coverage** refers to the degree to which the materials attend to the content of particular standards. A key consideration is how easily content gaps could be filled by the district, school, or teacher. For example, it might be relatively easy to provide practice on a particular skill that might be under-emphasized, while providing lessons to address development of a concept that is not addressed may be much more difficult. **Balance** addresses the degree to which the mathematics content is developed with a balance between mathematical understanding and procedural skill in ways that are consistent with CCSSM.

**Tool 2** is used to determine the extent to which the curriculum materials provide students regular opportunities to engage in the SMP; that is, to what extent is attention to the SMP embedded throughout the curriculum materials in ways that help students develop them as habits of mind? Review criteria include: (1) To what extent do the materials demand that students engage in the SMP as the primary vehicle for learning content? (2) To what extent do the materials provide opportunities for students to develop the SMP as “habits of mind” throughout the development of content?

**Tool 3** addressed three overarching considerations that will impact the materials’ effectiveness in supporting the CCSSM: Equity/Diversity/Access, Formative Assessment, and Technology. This tool provides a series of questions to help reviewer assess the extent to which particular curriculum materials provide adequate support for teachers in these areas.

Together, the three tools provide information to help reviewers engage in evidence-based discussions and make informed decisions about the potential of particular curriculum materials to support faithful implementation of CCSSM. **The CCSS Curriculum Materials Analysis Tools and Professional Development Materials** are available on the NCSM website, http://www.mathedleadership.org/ccss/materials.html.

A number of other CCSSM resources are also available on the NCSM website, including **Great Tasks for Mathematics**, a collection of tasks for grades K-12 to support implementation of CCSSM, archived CCSSM webinars, and links to CCSSM documents, reports and tools on other websites. Also check out NCSM’s new “Coaching Corner” which provides a plethora of resources and tools for mathematics specialists, coaches and leaders of coaching programs.

**References**

The Framework for K-12 Science Education as the Foundation for Taking the NGSS to the Classroom: The Shifts that will be Required

By Harold Pratt

The Framework for K-12 Science Education; Practices, Crosscutting Concepts and Core Ideas released by the National Research Council in July 2011 is serving as the basic guidance for Achieve as its writing teams develop the Next Generation Science Standards (NGSS). Familiarity with the content of the Framework is necessary to understand the NGSS and what will be expected of science education leaders and teachers as the NGSS are implemented by states and school districts in the coming years. There are a number of significant shifts that will be required by districts, schools and teachers as they begin using and following the NGSS. Becoming aware of them now and beginning the process of planning how to address them should be the agenda of states, school districts, and schools ready to embrace the new vision of science education.

The following shifts that science educators and school systems will be required to make if the spirit and vision of the Framework and NGSS are accomplished are a combination of those from a document, Conceptual Shifts in the Next Generation Science Standards that Achieve released along with the public draft in May. (Some of the text that follows has been lifted from that document.) The shifts in that document are listed here together with the implications of those shifts for schools.

Many of the shifts outlining what is new and different in the Framework and the NGSS can be derived from a careful reading of both documents. The implications of these shifts and some of the shifts themselves depend on how the two documents will be implemented. Implementation involves instruction, instructional materials, curriculum, professional development and assessment procedures and instruments. All of which must be created from the interpretation of the two documents, but are not a part of them.

The discussion of the shifts involved will be aided by the discussion that follows.

1. K–12 Science Education Should Reflect the Real World Interconnections in Science

The vision represented in the Framework is new in that students must be engaged at the nexus of the three dimensions:
• Science and Engineering Practice,
• Crosscutting Concepts, and
• Disciplinary Core Ideas.

The Framework goes on to emphasize that:

...learning about science and engineering involves integration of the knowledge of scientific explanations (i.e., content knowledge) and the practices needed to engage in scientific inquiry and engineering design. Thus the Framework seeks to illustrate how knowledge and practice must be intertwined in designing learning experiences in K–12 science education.”

This integration may be the most significant shift for teachers, administrators and instructional materials developers and will affect all elements in the implementation listed above.

An interesting side issue to the change is language shift from “abilities of inquiry” in the National Science Education Standards (NSES) to “practices” in NGSS. The practices of inquiry take the evolution of science processes found in much earlier literature to abilities of inquiry in the NSES to the new emphasis on scientific and engineering practices as outlined in the Framework and utilized in the NGSS.

The Framework describes the shift as an improvement for the following reasons.

• “It minimizes the tendency to reduce the scientific practices to a single set of procedures”
• “By emphasizing the plural practices, it avoids the mistaken idea that there is one scientific idea.”
• “It provides a clearer definition of the elements of inquiry than previously offered.”

2. Using All Practices and Crosscutting Concepts to Teach All Core Ideas All Year

As stated previously, past science standards at both the state and district levels have traditionally treated the three dimensions of science as separate and distinct entities leading to preferential treatment in assessment or instruction. Although the integration of the three dimensions was recommended in the previous national documents and in many state standards, the integration of them was left to the development of the instructional materials or the teacher. It is essential to understand that the emphasis placed on a particular Science and Engineering Practice or Crosscutting Concept in a performance expectation is not intended to limit instruction, but to make clear the intent of the assessments. The goal of the NGSS is to be clear about which practice students are responsible for in terms of assessment, but these practices and crosscutting concepts should occur throughout each school year.

3. Science Concepts Build Coherently Across K–12

The focus on a few Disciplinary Core Ideas is a key aspect to a coherent science education. The Framework identified a basic set of core ideas that are meant to be understood by the time a student completes high school. The Framework and the NGSS provide a more coherent progression aimed at overall scientific literacy with instruction focused on a smaller set of ideas, but with an eye on what the student should have already learned and what they will learn at the next level. A careful reading of the performance expectations will reveal that the outcome performances require a high level of cognitive demand that can only be gained by extensive interaction with the instructional materials. When instruction time is limited, the number of ideas that can receive this level of intense instruction must be limited.

Coherence must occur at two dimensions in the curriculum: 1) core ideas should be revisited in increasing depth and sophistication from grade band to grade band and 2) ideas should be developed coherently within a course or grade level materials by creating a conceptual storyline that builds ideas on previous ideas and prepares for the introduction of subsequent ideas.
4. The NGSS Focus on Deeper Understanding and Application of Content

The Framework identified a smaller set of Disciplinary Core Ideas that students should know by the time they graduate from high school. The NGSS are written to focus on the same. It is important that teachers and curriculum/assessment developers understand that the focus is on the core ideas—not necessarily the facts that are associated with them. The facts and details are important evidence, but not the sole focus of instruction. The Framework states, “One rationale for organizing content around core ideas comes from studies comparing experts and novices in any field. Experts understand the core principles and theoretical constructs of their field, and they use them to make sense of new information or tackle novel problems. Novices, in contrast, tend to hold disconnected and even contradictory bits of knowledge as isolated facts and struggle to find a way to organize and integrate them. The assumption, then, is that helping students learn the core ideas through engaging in scientific and engineering practices will enable them to become less like novices and more like experts.”

5. Science and Engineering Design are Integrated in Science Education from K–12

The idea of integrating technology and engineering into science standards is not new. Chapters on the nature of science and technology rests on two positions taken in The rationale for this increased emphasis on engineering and technology rests on two positions taken in A Framework for K–12 Science Education (NRC 2011). One position is aspirational; the other practical. From an aspirational standpoint, the Framework points out that science and engineering are needed to address major world challenges such as generating sufficient clean energy, preventing and treating diseases, maintaining supplies of food and clean water, and solving the problems of global environmental change that confront society today. These important challenges will motivate many students to continue or initiate their study of science and engineering.

From a practical standpoint, the Framework notes that engineering and technology provide opportunities for students to deepen their understanding of science by applying their developing scientific knowledge to the solution of practical problems. Both positions converge on the powerful idea that by integrating technology and engineering into the science curriculum teachers can empower their students to use what they learn in their everyday lives.

Interdependence of Science, Engineering, and Technology was added as a crosscutting concept in the first public draft. This crosscutting concept, which was not on the original list in the Framework, comes from the core idea in the Engineering, Technology and Applications of Science dimension in the Framework and was included to facilitate the integration of engineering into the science core ideas.

6. Science Standards Coordinate with English Language Arts and Mathematics Common Core State Standards

The timing of the release of NGSS comes as most states are implementing the Common Core State Standards (CCSS) in English Language Arts and Mathematics. This is important to science for a variety of reasons. First, there is an opportunity for science to be part of a child’s comprehensive education. The NGSS are aligned with the CCSS to ensure a symbiotic pace of learning in all content areas. The three sets of standards overlap in meaningful and substantive ways and offer an opportunity to give all students equitable access to learning standards.

7. The Definition of a Standard and its Relationship to Instruction and Assessment is New

A standard in NGSS consists of a collection of integrated performance expectations designed to guide the assessment of a core disciplinary idea and its associated practice and crosscutting concept.

This shift is new to some states and not others but it compounds the conceptual shift (#1 above) that calls for the integration of practices, disciplinary core ideas and crosscutting concepts in each performance expectation. Although they are performance expectations and appear to describe instruction, they describe the outcomes or the accomplishment of the standard by students. They certainly guide the content of instruction and may imply the instructional strategy or the sequence of instruction but they do not describe or dictate it.

8. The Grade Level Assignments of Some Elementary Core Ideas have been Moved Down.

The specific grade level assignments of core ideas may affect the curriculum organization of states and districts with adoption and implementation of the NGSS. Keep an eye on this issue since it may change in subsequent drafts of NGSS.

Harold Pratt will present the morning keynote at Network Connections on October 25, 2012. See page 36 for the full agenda and to RSVP to attend.
The Standards Aligned System (SAS), developed by the Pennsylvania Department of Education, is a comprehensive, research-based resource to improve student achievement. SAS identifies six elements that impact student achievement: Standards, Assessments, Curriculum Framework, Instruction, Materials & Resources, and Safe and Supportive Schools. Schools and educators across Pennsylvania are supported in their efforts to implement SAS by the development of a state-of-the-art portal.


The SAS portal is designed to organize and deliver educational content carefully aligned to the Pennsylvania Academic Standards and provide educators with integrated classroom tools to enhance their teaching effectiveness. The SAS portal also provides Pennsylvania educators with leading edge networking technologies that create opportunities to communicate and collaborate with peers across the Commonwealth.

**SAS Features**

The SAS portal includes important educational resources and information needed by educators to enhance daily practice.

**Standards**
- Searchable databases of all Pennsylvania Academic Standards and Assessment Anchors

**Assessments**
- An assessment creator, as well as information on state exams and graduation requirements

**Curriculum Framework**
- Big Ideas, Essential Questions, Concepts and Competencies for all content areas

**Instruction**
- A collection of videos and best practice strategies to meet needs of diverse learners

**Materials and Resources**
- Searchable, aligned classroom resources, learning progressions, lesson plans, and a Voluntary Model Curriculum

**Safe and Supportive Schools**
- An evidence-based framework for school and student safety, positive educational environment and engagement

**SAS Registered Users**

Registered SAS users can access SAS tools to communicate, create and store curricular content, and assess student performance.

**Classroom Diagnostic Tools**
- Assess students in core content areas (grades 6-12)

**Curriculum Mapping**
- Create and share curriculum maps using the Pennsylvania Academic Standards and Curriculum Frameworks

**ePortfolio**
- Organize and store digital resources

**Professional Development Center**
- Complete online courses for Act 48 credit at no cost to Pennsylvania educators
- Access courses related to Pennsylvania’s Teacher Evaluation System

**Professional Learning Communities**
- Communicate and collaborate with peers through threaded discussions and forums

**Publish Your Best**
- Create lesson plans to submit for publication on SAS portal

**Website Builder**
- Create websites to enhance communications between home and school
This illustration shows the direct connection between a particular Common Core State Standard and the Pennsylvania Common Core Standard. Understanding this consistency enables educators to use the original Common Core standards with confidence that they reflect Pennsylvania’s required standards.
Effective Teaching….Hmmm!

by Sam Shaneyfelt

What is effective teaching? If you listen to groups of middle and high school students, as Robyn Jackson and her colleagues at Mindstep, Inc. do yearly, students want more interactivity. They want the opportunity to ask questions about the concepts being addressed. They want to be engaged in content discussions with other students and the teacher. They don’t want to be dragged through the curriculum in a slow death-march towards the state test; they want to be engaged. AND they want to know how the content that is being discussed is relevant to their lives.

The effective teacher is a learning teacher. In the daily lessons, the teacher continually seeks ways to expose the ongoing thinking and learning of the students. That information can then be analyzed and teaching adjustments can be readily made to help students to better achieve. The teacher is continually learning about the thinking and learning of his/her students. Furthermore, the effective teacher learns from colleagues. No one has all the answers to what makes students learn better. Teachers working together in learning communities to enhance teaching practice is becoming a necessity as all educators strive to learn how to be more effective in the teaching practice. In learning communities, teachers investigate concepts and how to effectively teach those concepts to develop student understanding. Teachers share student artifacts, and together, they analyze those materials to determine what works best with students. Effective teachers seek research and discuss that material together, constantly seeking better ways to improve the learning of all students.

When applying the research on How People Learn (previous article) to the classroom, the effective teacher must continually deal with four areas to provide all students with experiences that will enhance their learning. (1) The learning environment must be a community of respect where students feel free to express ideas, make mistakes, seek assistance from others and help others to understand the content. That community must be a safe, structured community, both in and out of the classroom. (2) When beginning a new concept, effective teaching requires the teacher to investigate the learners, each individually, to know what the interests, strengths, weaknesses, and preconceptions are. (3) The effective teacher designs lessons incorporating pertinent knowledge, skills and attitudes that students must acquire. Students must be challenged to think, critically and creatively. Even more importantly, the design and instruction must help the student to be able to transfer this new information to support the acquisition of future related knowledge and to apply that newly acquired knowledge to better understand different facets of the surrounding world. (4) Effective teaching
makes student thinking visible so that feedback can be provided. This ongoing assessment, thereby, guides future learning. Furthermore, just as teachers reflect on their lessons and the learning that occurs, students must be taught to reflect on their learning. “What am I learning, why am I learning it, and how can I use it?” To be effective, the teacher must balance these four components daily to provide the best learning opportunities for all students.

Research, also, verifies that even “good” teachers need professional development to help them to extend and refine those aspects that create for effective teaching. As long as the motivation is there, all teachers can be effective teachers. BUT the appropriate supports need to be put into operation. Professional development needs to be addressing the needs of the teachers. Learning communities need to be established, enabling teachers the opportunity to learn together ways to better address the learning needs of the students. AND, although relatively new to the world of education, the conference following the observation must be a collaborative conference in which the administrator has gathered evidence of student thinking and learning during the observation. This evidence then serves as the basis for discussion with the teacher in the post conference.

Promoting teacher growth is the objective. Everyone must always be mindful of the fact that learning never stops for any educator.

The State of Pennsylvania has adopted a new teacher assessment rubric, one based on the Charlotte Danielson Framework. The Framework details aspects of a teacher’s responsibilities that solid research studies have verified as contributors to the advancement of student learning. The new assessment rubric designates four domains of teaching responsibility:

- **Planning and Preparation**
  - Demonstrating Knowledge of Content and Pedagogy
  - Demonstrating Knowledge of Students
  - Setting Instructional Outcomes
  - Demonstrating Knowledge of Resources
  - Designing Coherent Instruction
  - Designing Student Assessment
- **Classroom Environment**
  - Creating an Environment of Respect and Rapport
  - Establishing a Culture for Learning
  - Managing Classroom Procedures
  - Managing Student Behavior
  - Organizing Physical Space
- **Instruction**
  - Communicating with Students
  - Using questioning and Discussion Techniques
  - Engaging Students in Learning
  - Using Assessment in Instruction
  - Demonstrating Flexibility and Responsiveness
- **Professional Responsibilities**
  - Reflecting on Teaching
  - Maintaining Accurate Records
  - Communicating with Families
  - Participating in a Professional Community
  - Growing and Developing Professionally
  - Showing Professionalism

The complete rubric with the descriptors for each category can be located at [www.pdesas.org](http://www.pdesas.org). Click on **Instruction**.

In her book, *Enhancing Professional Practice: A Framework for Teaching*, Danielson outlines the benefits of such a rubric. If properly used, the rubric:

- Offers the teaching profession a shared vocabulary for communicating about excellence
- Provides a pathway to excellence
- Provides a structure for discussions among teachers
- Sharpens the focus on professional development
- Serves to communicate to the larger community the array of competencies needed to be an effective teacher.

Related to the previously addressed research, proper use of the rubric requires the observation of the student thinking and learning in the classroom. Lessons must incorporate challenging tasks and assessment procedures that expose the student thinking. The post conference must be collaborative in nature, thereby contributing not only to the teacher individual growth, but also to the growth of the educational institution.

Considering all that has just been written, to be effective in teaching, the teacher must:

- Be willing to take risks
- Understand the individual learning needs of students
- Know the standards that need to be developed and teach to those standards
- Provide students with collaborative learning experiences
- Challenge student thinking with pertinent tasks designed to assist in developing conceptual understanding
- Continually assess the student learning
- Assist students in taking responsibility for learning
- Work collaboratively with colleagues
- Become a life-long learner.

Effective teaching goes hand-in-hand with change. No longer is the “sage on the stage” considered to be the appropriate method of teaching. The classroom becomes one of active learners who delve deeply into the concepts being developed, a classroom where students investigate, discuss, and question. The teacher plans for and facilitates this process. Always the focus is on the **LEARNER**. To quote a few verses from “The Student Prayer,” written by Umberto Maturana Romesin,

Don’t instruct me; let’s walk together.
Let my riches begin where yours end.
Show me that I can stand on your shoulders.
What Support Did the Collaborative Provide This Past Year?

By Sam Shaneyfelt

Again, this year, the professional development provided by the Collaborative was designed to establish productive professional learning communities within and across districts. So why professional learning communities? The professional learning community concept is one gaining more and more momentum in the field of education. Research verifies that in schools that effectively incorporate professional learning communities, student achievement levels do increase. The sole purpose of the concept is to create an environment in which adults are learning so that they can better help students learn.

In this past year, elementary, middle school, and senior high school participants, representing both mathematics and science, worked together in STEM Professional Learning Communities. These participants engaged in four areas of study:

- Visual Representation
- Student Discourse
- High Level Tasks
- Cooperative Learning.

Each of these areas was studied in-depth over a two-day period. Participants learned to effectively employ strategies related to these areas into day-to-day lessons to enhance student learning. In the ten days of training, participants worked on tasks with colleagues from other districts or with colleagues from other levels within their districts. Following each of those days, educators returned to their schools and worked with at least one other school colleague to share and continue the study of the ideas presented by the MSC staff. Participants incorporated the new strategies into daily lessons and returned to the next sessions with artifacts that were shared and discussed.

Additionally, this past year, the Collaborative staff piloted a slightly different approach to in-district professional development. Eight districts agreed to participate in the Communities of Practice pilot. As defined by Etienne Wenger, “Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly. A growing number of people and organizations in various sectors are now focusing on communities of practice as a key to improving their performance.” The district communities of practice teams were composed of teachers and administrators. Following the Instructional Rounds process developed by Elizabeth City, et.al., at the Harvard School of Graduate Studies, the district teams first identified the problem of practice that they would focus on for the year. The district team members then led their math and science colleagues in weekly meetings. The content for the weekly meetings focused on what the professionals would do to effectively change teaching practice identified by the problem of practice. Improving student learning was the ultimate goal.

During the school year, three learning walks, led by MSC staff, were conducted. Educators visited math and science classrooms to observe students, not teachers. They accumulated data pertaining to what the observers saw students doing or saying that were indicators of learning related to the problem of practice. The data was then analyzed by the district team and then shared with colleagues in the buildings. In-building teams determined and worked on next steps, always focused on improving student learning.

Teams in each of the eight districts experienced success at various levels and expressed the desire to continue the process in the 2012-13 school-year. A key outcome of the pilot was the enhancement of the teacher leadership. Teachers were taking charge and working with colleagues to improve student learning. In some districts where only certain grade levels participated, nonparticipating administrators and teachers expressed a strong desire to join in the communities of practice process in the 2012-13 school-year.
ASSET and MSC Join Forces on STEM

The STEM Summit Pittsburgh 2011 was convened by the Tech Council on August 31, 2011 in partnership with the Math & Science Collaborative (MSC) and the Carnegie Science Center. Notes from the SUMMIT working lunch were compiled by MSC into a report published in January by the Tech Council, Moving Toward U.S. Goals for STEM Education, Recommended Actions for SW PA. Actions were organized by five key sectors: Higher Education, Employers/Business, Policymakers, K-12 Education, and Informal Education. One priority across the sectors recommended: “Collaborate across organizations, programs and sectors.”

At its March meeting, MSC’s Steering Council reviewed the Summit report to select actions ripe for their pursuit. With preliminary charges, subcommittees met in April and May to flesh out recommendations. They reported back to the MSC Steering Council in May about planning in progress toward (1) piloting a regional IHE Institute in May 2013 to share strategies to strengthen IHE foundational STEM instruction; (2) modeling Educator/Corporate Collaboration on Common Core (EC4); (3) developing an interactive web-based resource to connect STEM resources to those seeking them, and (4) providing professional development that models collaboration between MSC and ASSET.

SHARED VALUES

Key leadership of MSC and ASSET met with K-12 district representatives and interested regional resource partners as an MSC Steering Council Sub-committee to discuss the relative strengths of the two organizations, and to define a plan of action to move forward. The common philosophies guiding professional development were immediately apparent, as were the shared strong rooting in research and tools from national organizations such as the National Research Council, the National Academies, and the Exploratorium. Underlying messages were supported by both organizations: that all students can learn math and science, that all students should learn math and science, that math and science are the pillars of STEM, that effective teaching must make learning accessible to all students, and that the Common Core State Standards in Mathematics, and the emerging Next Generation Science Standards are crucial to making these messages a reality (See page 8). It was noted that ASSET and MSC also collaborate with many of the same Resource Partners, such as the Carnegie Science Center, the Pittsburgh Tissue Engineering Initiative, and the Children’s Museum.

MSC STRENGTHS/EXPERIENCE

Established in 1994 by a regional congress of stakeholders, MSC worked from the platform of the Carnegie Science Center for its first years. MSC facilitated the participation of Southwest Pennsylvania in TIMSS 1999 to compare the workforce region, as though it were a country to international student teaching and learning in math and science. Headquartered at the Allegheny Intermediate Unit (AIU) since 2002, MSC is now situated as an integral part of the formal education system. Therefore, it brings access to training in and understanding of the legislative policies and mandates that schools face. Winning National Science Foundation Math Science Partnership (MSP) funding in 2003 to place math and science expertise within the IU system, its staff includes highly skilled professional developers with deep content knowledge in K-12 mathematics and secondary science. MSC has a history of providing administrative training, curricular reviews and intensive professional development in K-12 mathematics and secondary science, carefully coordinating district change via its multiple Math Science Partnership grants. It was contracted by PA Department of Education (PDE) to build capacity of IUs statewide to strengthen the teaching and learning of K-12 mathematics by offering multi-year Teacher Leadership Academies in elementary and secondary mathematics. Separately individual IUs and districts from both northeast and northwest Pennsylvania have contracted for its Science Academies. MSC offers all districts its Math Coach Network, MSC Journal and Network Connections conferences as regional vehi-
cles to build awareness of potential professional development approaches. For example in past years, MSC featured sessions showcasing the variety of K-12 curricula addressing engineering. All educators are also welcome in MSC professional development. In June 2012, MSC hosted a National Leadership Academy on the Common Core presented by the National Council of Supervisors of Math (NCSM).

ASSET STRENGTHS/EXPERIENCE

ASSET STEM Education is an independent nonprofit learning organization, allowing it more flexibility than the formal education system. With a mission to significantly transform educational practices to inspire, engage and empower every learner, ASSET was established by Bayer Corporation and several community partners in 1994. It inspires innovation and excellence by providing highly effective educator professional development, hands-on, minds-on classroom materials and consulting services to schools, universities and organizations. All ASSET programs are results-oriented, research- and inquiry-based and align with national and state standards.

Initially started as a pilot program in two school districts, National Science Foundation (NSF) grants fueled initial growth to 30 school districts in Allegheny County. With the conclusion of the NSF grant, ASSET successfully transitioned to a fee-for-service nonprofit model, with all 30 districts staying on board as paying customers.

Based on its proven model of sustainability and results, ASSET was selected to implement a five-year program of hands-on, minds-on elementary science across the state from 2006-2011. In 2010, ASSET competitively won a U.S. Department of Education Investing in Innovation (I3) Grant to establish Regional Professional Development Centers across Pennsylvania and implement an Advanced Professional Development Program targeting the special needs of teachers and students in rural and high-need schools. Today, ASSET impacts 125,000 students and 4,000 teachers in more than 100 school districts, charter and private schools across Pennsylvania. With the i3 Grant, ASSET will impact 224,000 students by 2015.

ASSET is the first endorsed professional development provider for the Engineering is Elementary (EiE) Program developed by the Museum of Science in Boston. EiE fosters engineering and technological literacy among children through a research-based, standards-driven and classroom-tested curriculum that integrates engineering and technology concepts and skills with elementary science topics. (See page 22).

PLANNED COLLABORATION

ASSET and MSC are focusing this collaboration on engineering—to build awareness of the unique potential role of engineering at the K-12 level. The format of MSC Network Connections is changing to emphasize a theme for each conference, and to feature two keynoters. The theme for February is Focus on Engineering. The opening keynote will feature a local award winning engineer and the role of K-12 education in his journey. ASSET and MSC staff members will collaborate on planning and facilitating two of the breakout sessions. Resource Partners will be invited to feature resources focused on the role of engineering in their organizations for the Resource Fair. Other sessions offer additional perspectives. (See page 40).

In complete agreement on the necessity of intensive professional development to accomplish change, ASSET and MSC are also planning joint professional development related to engineering for the Summer of 2013. Watch for more details as the year progresses.

To be fully met, the challenge of preparing all students for a STEM-rich future requires all hands on deck. ASSET and MSC are modeling that collaboration, and invite others to join the work.
Campaign: math + science = success® is Launched!

Since 1994, the Math & Science Collaborative (MSC) has worked to strengthen the teaching and learning of math and science by applying research and collaboration from kindergarten through college. math + science = success® represents both research and collaboration. The campaign originated in a Georgia Math Science Partnership funded by the National Science Foundation, where their research found that TV ads changed public perceptions. Given their long-time partnership, MSC introduced the campaign to the Carnegie Science Center (CSC), whose own strategic planning had landed on the same need. CSC brought in WTAE 4 (ABC), who had led several effective public awareness campaigns. The three organizations sought corporate sponsorship for a campaign that would be extensive enough to impact the region. At a June press conference, with the addition of Pittsburgh’s own FedEx Ground as a major corporate sponsor, the partners launched the campaign.

Increased math and science literacy among young people is essential for our economic development. The U.S. Bureau of Labor and Statistics has estimated that jobs requiring STEM (science, technology, engineering, and math) training will increase 24% by the year 2014, representing more than 1.5 million jobs. Math and science are the pillars of a firm STEM foundation. Currently the region has hundreds of unfilled jobs requiring math, science and technology. Why? Because the human resource needs are not met by the skill sets of graduates.

In the same vein, if young people are to thrive and contribute to the region, they need to understand the skills needed to prepare for their futures. Math and science are sometimes perceived as “too hard” by American students, and their parents and teachers may not understand the importance of ensuring that they develop capacity in mathematics and science. In fact, a recent SW PA marketing survey found that 80% of respondents did not believe that all people could learn math and science, and just as many were not aware that to be successful in the 21st century, all students must learn math and science.

The math + science = success® campaign is designed to help young people and their parents realize all jobs require solid math and science skills. The campaign includes TV spots, materials, and events that help parents to encourage and support their children – and that schools can use to get the word out. Visit http://www.mathsciencesuccess.org/southwest-pennsylvania/ to see how you can get involved.

math + science = success® addresses priority recommendations emerging from the 2011 SW PA STEM Summit.

1. Promote the power of STEM through innovative marketing to multiple constituencies.
2. Advocate for and model diversity by taking intentional action to change the face of STEM to include women and minorities.
3. Collaborate across organizations, programs and sectors.
4. Increase involvement by recruiting participants to enable the urgent action needed in all sectors.
5. Publicize STEM career opportunities to get the details out to all stakeholders that mastery of STEM opens the doors to a tremendous variety of engaging careers at all education levels.

“What excites me about the math + science = success® campaign is the power of its messages. “All students can learn math and science. All students must learn math and science for both their and our country’s future.” For too long, we’ve acted like only a select few are capable of attaining those skills and knowledge. Now we know, in fact, there is no ‘math gene.’ Rather, learning math and science is like putting on the jeans we wear. It may take some tugging, but everyone can get them on.” Nancy R. Bunt, Ed.D., Program Director, Math & Science Collaborative

“The math + science = success campaign® is a true community partnership designed to change perceptions and behaviors about math and science education. We hope many others choose to join this effort.” Ann Metzger, Co-Director, Carnegie Science Center
The Math & Science Collaborative (MSC) was awarded the inaugural Carnegie Science Center award in the new category of “Leadership in STEM Education.” The award was announced in the Pittsburgh Business Times special insert, featured on WPXI TV 11’s “Our Region’s Business” television show, (available at “http://youtu.be/rYqtk1NUF4), and ultimately presented the crystal award pictured here accompanied by the showing of a video vignette at the annual awards ceremony in May 2012. The award commendation read,

“The Math & Science Collaborative has brought southwestern Pennsylvania into national prominence for gaining measurable traction in strengthening the teaching and learning of math and science—by applying research and collaboration from kindergarten through college.”

The night of the award, many in the audience who have collaborated through MSC were invited to stand in order to receive applause as the true winners evidence that “working together, we can do better.”

Carnegie Science Awards

The Carnegie Science Awards program celebrates and promotes outstanding contributions in science and technology in western Pennsylvania. Now in its 16th year, the Carnegie Science Awards have honored the accomplishments of more than 400 individuals and organizations.

Award recipients have made significant breakthroughs in a wide range of categories—from corporate innovation to regenerative medicine, from the environment to advanced materials. Student winners are selected each year from the participants in Carnegie Science Center's Pittsburgh Regional Science and Engineering Fair. Several categories are designed to honor educators, and MSC exemplifies the outstanding achievements in education that Carnegie Science Awards recognize annually.

The Carnegie Science Awards program is Carnegie Science Center’s signature fundraiser. Proceeds help fund Science Center exhibits and educational programs that cultivate young people's interest in science and inspire them to explore career opportunities in STEM fields—science, technology, engineering, and math—a particularly critical mission at a time when, in the Pittsburgh region alone, it's projected that more than 150,000 new STEM-educated employees will be needed in the next 10 to 15 years.

For more information, visit www.carnegiesciencecenter.org.
Computational reasoning, the use of computational models and tools in the teaching of secondary science and math, comprises understanding how to analyze, visualize and represent data using mathematical and computational tools. Computational Reasoning is part of an important scientific and engineering practice that helps students understand complex science concepts (Next Generation Science Standards Draft, 2012).

At last year’s Network Connections conferences, educators from the Maryland Virtual High School in collaboration with the Pittsburgh Supercomputing Center (PSC) presented sessions on computational reasoning using Excel Spreadsheet Modeling, Vensim Systems Modeling, and NetLogo Agent Modeling to mathematics and science educators. Participants learned how computer models could be useful in their classrooms. After this experience, mathematics and science educators were enthusiastic about using computational reasoning with their students. Teacher comments indicated that teachers embraced computational reasoning as a valuable strategy to help their students learn math and science concepts. Specifically, teachers commented on their realization that modeling applies to both math and science, and can be used to make students aware of the connections between the two disciplines. Teachers also noted that modeling does not have to be limited to high school, but is a useful tool for middle school students to increase their understanding of important math and science concepts. Overall, teachers felt that they gained a more in-depth understanding of systems modeling as a result of the introductory three hour session.

Via the stacking of nested Styrofoam cups, students can develop a mathematical model using a “just add data” Excel spreadsheet. From this they can explore how the mathematical model is related to the physical model of the stacked cups. They can also explore random and systematic errors involved in the model.
Now not all things are linear and can we examine a model to predict future behavior? Systems or time-dependent models in Vensim allow us to build concept-like maps that with some input parameters can model more complicated systems. A systems-based model of the predator-prey interactions between the moose and wolves of Isle Royale in Lake Superior allows students to see how small changes in environmental conditions can upset the natural balance between predator and prey.

Suppose you flip a coin ten times in a row, do you always get five heads? Another type of model uses probability to examine behavior. Students can use the simple "Butterfly Genetics" agent models (NetLogo) to explore the concept of Mendelian inheritance. They progress through a series of models that help them visualize genotype and phenotype, dominant and recessive traits and Punnett's squares.

The Pittsburgh Supercomputing Center, in collaboration with educators from the Maryland Virtual High School and the Math & Science Collaborative, provides resources and professional development for mathematics and science teachers. For more information, please visit the website at www.psc.edu/index.php/cast.
The process of conducting science is presented in many science textbooks as a linear process: Make observations, define the problem/develop a question, develop a hypothesis, test the hypothesis, collect and analyze data, draw conclusions, and communicate results. In this scenario, after a researcher completes a cycle, he/she returns to the beginning and starts over. However, there have been several studies done that looked at the practices of research scientists. These studies have shown that scientists do not conduct research in a step-wise linear process, but rather that the order of these steps depends on the nature of the research.

One model that has been proposed to explain the actual process of scientific research is the activity model put forth by William Harwood and depicted above. He found, by interviewing research scientists from a range of disciplines, that the many practices of scientific research (such as observing, investigating and communicating) are all interconnected. Also, asking questions is central to all the practices in the model. Scientists are always asking questions, which may lead to experimentation, conducting observations or communicating with other scientists, etc. But the order in which they carry out these practices depends on the nature of the research itself.

Consider the discovery of the element buckminsterfullerenes first published in *Nature* in 1985. Three scientists with different backgrounds and interests came together to conduct a single set of experiments to answer their separate questions. Sir Harold Kroto was a professor at the University of Sussex who studied interstellar compounds. He wanted to work with Richard Smalley and Robert Curl (at Rice University in Houston) because they were experienced at producing beams consisting of clusters of atoms. Elements typi-
cally form clusters containing a specific number of atoms; they do not form clusters with just any number of atoms. These three scientists (for different reasons) were interested in finding out whether they could form clusters of carbon atoms in specific sizes. Indeed they did; they found that carbon preferentially form clusters containing 60 or 70 atoms. They conjectured that the 60-atom cluster (C60) was a ball-like structure shaped like a soccer ball and proposed that structure in their Nature paper; many further physical and chemical tests were needed to verify this to be true. Professors Kroto, Smalley and Curl received the Nobel Prize in 1996 for their discovery of “buckyballs”.

Another structure of carbon is graphene, which is a single flat layer of carbon atoms arranged in a hexagonal pattern. Graphite (found in pencils) is simply hundreds of layers of graphene. Although the isolation of graphene is recent (first published in 2004 by Andre Geim and Konstantin Novoselov, who were awarded the Nobel Prize for their work in 2010), the structure and properties of graphene have been known for a long time. The first theoretical studies of graphene were done in 1947 and theoretical research continued in the decades afterward, but no one could isolate a single sheet of graphene until Professors Geim and Novoselov accomplished it in 2004. Similar to fullerenes, the ability to generate graphene in the laboratory has spawned a great deal of research on their chemical and physical properties.

In an article published in the Journal of Chemical Education, John Olmsted looked at what sort of research activities had been recognized with the Nobel Prizes in Chemistry and in Physics. He found that “several types of activities (such as description, exploration and theorizing) are highly valued. This suggests that chemists (and physicists) use several different, yet equally valid and useful, ways of approaching science; in other words, that instead of ‘the scientific method’ there are several scientific methods.” (J.Chem.Ed. 2010, 87, 1045.)

At the October Network Connections, one of the breakout sessions will focus on the “scientific method”, both how participants perceive it and some common myths. Using case studies of a variety of scientific research from various disciplines, participants will look more closely at the practices actually involved in the research under examination. The final part of the workshop will focus on exploring the practices of science and engineering listed in the National Research Council document, A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Our intent is that participants will see how explicitly focusing on the full range of practices described in the NRC document is an integral part of helping students learn science and prepare for the challenges and issues they will face as adults in the 21st century.
Carnegie Science Center’s Chevron Center for STEM Education and Career Development

By Linda Ortenzo, Director STEM Programs

In 21st Century America, a strong foundation in STEM grows ever more important, as a technology-driven economy increasingly demands a globally competitive workforce. Over the next decade, more than one million additional STEM graduates will be needed to fill economic demands. In western Pennsylvania alone, industries will require more than 150,000 new STEM employees. That’s why Carnegie Science Center established the Chevron Center for STEM Education and Career Development, backed by strong financial support from Chevron and founding partners California University of Pennsylvania, Duquesne Light, Eaton Corporation, LANXESS Corporation, NOVA Chemicals, and PPG Industries Foundation.

Launched in November 2011, the Chevron STEM Center is driven by four over-arching goals: collaboration, great teaching, inspired learning, and a committed community.

Collaboration
The Science Center seeks to sharpen the focus of existing STEM programs throughout the western Pennsylvania region and approach them in a more concerted way. This is best achieved by convening STEM stakeholders to coordinate efforts for the greatest impact. The formation of the Chevron STEM Center and its initiatives engage a wide range of partners from business, higher education, foundations, and non-profits.

Great Teaching
Working with partners at the Math & Science Collaborative, the University of Pittsburgh, and California University of Pennsylvania, Science Center staff is establishing a Teacher Excellence Academy (TEA) to enhance instructional strategies such as hands-on, project-based learning and real-world applications of technology. To date, this initiative includes partnerships with Pine Richland and Upper St. Clair school districts to help them strengthen their math and science curricula that will inspire students to embrace STEM studies for the long haul.

With support from The Heinz Endowments, TEA collaborators will establish a STEM Endorsement for school districts employing best practices in STEM education. To launch this effort, the Science Center and Upper St. Clair High School produced and conducted a unique pilot summer workshop for teachers and students called Panic at the Point! The workshop integrates formal and informal methods into a story that provides real-world context. A report on the evaluation of this program will be produced in early fall 2012.

Inspired Learning
Our STEM Programs prepare today’s students to become tomorrow’s innovators by:

• Exciting and inspiring students to explore cutting-edge STEM topics in a fun, dynamic atmosphere.
• Offering a myriad of educational events, workshops, competitions, and opportunities for young people.
• Providing accessible information about careers and related issues to students.
• Helping to build a community of scientifically and technologically literate people.

Several Science Center programs, like the annual Engineer the Future and ChemFest weekends, feature dozens of hands-on demonstrations by local corporations. Twice yearly, SciTech Days follows a similar model for four-day periods, and adds hands-on workshops, large-scale theater programs, and presentations by experts. The event serves 6,000 students annually.

The Science Center’s Pittsburgh Regional Science and Engineering Fair (PRSEF) celebrates the scientific accomplishments of more than 1,100 students in grades 6-12. Some of these young scientists went on to compete at Intel International Science and Engineering Fair, held this year in Pittsburgh, thanks to the strong reputation of PRSEF and the efforts of Carnegie Science Center.

Future City Competition and Chain Reaction Contraption Contest provide middle and high school students with the opportunity to work collaboratively using engineering principles to solve problems in comprehensive and creative ways.

The Science Center’s new 5 Digital Video Competition gives middle and high school students a chance to share the impact of STEM in their lives. This fall, participants will produce brief videos in various genres and
post them on YouTube for judging and public voting. In their videos, students are encouraged to explore these five “i’s”: innovations; issues; individuals; inspiring careers; incredible income potential.

The Science Center’s regional outreach includes the Science on the Road program that serves more than 212,000 students annually. Science on the Road targets K-8 classrooms throughout the region by combining high-energy assembly programs, featuring videos of real scientists and inquiry-based activities that reinforce classroom concepts.

Early learning activities – funded in part by a grant from PNC’s Grow Up Great with Science program – brings Science Center staff with dynamic, interactive programs to 133 Head Start classrooms in Pittsburgh Public Schools and Westmoreland County. Teachers receive classroom kits and learn how to incorporate hands-on scientific learning into their lessons to get kids excited about science.

Committed Community

The Science Center partnered with the Math & Science Collaborative and WTAE 4 to launch the community awareness campaign: math + science = success®. Sponsored by Pittsburgh-based FedEx Ground, the campaign aims to encourage students to enroll in higher level math and science courses. A math + science = success® Public Day at the Science Center on March 9, 2013 will give visitors a chance to learn about STEM careers and interact with local companies and universities.

In the future, the Science Center plans to launch a STEM Resources Map: An online, searchable directory of regional STEM education programs and activities for grades PreK-12. This database with benefit parents, teachers, administrators, students, businesses, community groups, and nonprofit organizations with STEM programs/resource offerings within thirty-six counties across Pennsylvania, West Virginia, Ohio, and Maryland.

For more information on Chevron STEM Center programs and initiatives, contact Linda Ortenzo, Director, STEM Programs, 412.237.1821, or OrtenzoL@CarnegieScienceCenter.org

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Expanding the Role of Women in STEM

Despite comprising half of the overall work force, women hold only 23% of science and engineering positions in America’s public and private sectors. By working with like-minded regional and national partners, the Science Center focuses on girls ages 11-17, who are most at risk for not engaging in science, as well as their peers, teachers, and counselors.

The Science Center addresses these challenges through programs that engage, educate, and inspire girls to pursue careers in STEM. Tour Your Future takes girls inside the workplaces of female STEM professionals. BrainCake.org and CanTeen.org are online communities for girls that feature activities, virtual mentoring, and blogs. Click!, the Urban Science Adventure, is a six-day “spy themed” STEM camp for middle school girls and recently became an online experience at ClickSpySchool.org. Designed for educators, The Girl Solution: A Gender Equity Toolkit provides ways to better engage and sustain girls’ interest in STEM at a time when they are likely to lose interest in these critical subject areas: grades 4-8.

The Science Center’s goal is to convey positive messages about math and science in order to help girls envision themselves as scientists of tomorrow. A priority for our girls’ initiative in the coming months is to create opportunities for boys to take part in some of these programs to learn that girls are good at STEM subjects and should pursue STEM careers as much as boys. These programs will also feature female STEM professionals, so that boys can see women as authority figures in these fields.

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**Annual STEM Programs**

<table>
<thead>
<tr>
<th>Program</th>
<th>Date</th>
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<tbody>
<tr>
<td>Fall SciTech Days</td>
<td>Nov. 6 - 9, 2012</td>
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<tr>
<td>Chain Reaction Contraption Contest</td>
<td>Dec. 7, 2012</td>
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<td>Future City Competition</td>
<td>Jan. 19, 2013</td>
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<tr>
<td>StormFest</td>
<td>Feb. 15 – 16, 2013</td>
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<td>Spring SciTech Days</td>
<td>Mar. 5 – 8, 2013</td>
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<td>Pittsburgh Regional Science &amp; Eng. Fair (PRSEF)</td>
<td>April 5 – 6, 2013</td>
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<td>i5 Digital Video Competition</td>
<td>April 25, 2013</td>
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Is Pittsburgh the new Portland? That was the buzz this year when close to 1000 children’s museum professionals from the Americas, Asia, Europe, the Middle East, Africa and Australia gathered in Portland, Oregon this spring for the Association of Children’s Museums Interactivity 2012 conference when it was announced that Pittsburgh will be the site of the 2013 conference, April 30 through May 2. Professionals, students and individuals with a strong interest in the intersection of informal learning, museums, early-childhood development, community-building, design and multicultural understanding are invited to InterActivity 2013: Reimagining Children’s Museums. Convened annually by the Association of Children’s Museums (ACM) the three-day conference features networking opportunities, hands-on professional development training sessions, inspirational speeches, research presentations and an exhibit hall.
The Children’s Museum of Pittsburgh, named one of the “ten best children’s museums in the country” by Parent Magazine in 2011, has recently completed a $6.2 million dollar renovation of the city park in its front yard to add to its appeal. It is drawing nearly 250,000 visitors a year that reflects the national trend of children’s museums as the fastest growing museums in the world. Because children’s museums focus on the process of learning through play and exploration while naturally embracing the inquiry process through the intersection of science and art, conference-goers will not be disappointed in Pittsburgh - or with the Museum. It’s only natural that the theme of re-imaging children’s museums would happen in a city that has remade itself from its gritty steel-making image into one of vitality and innovation with lots of green spaces and green technology.

Look around. Communities and cultures have changed seemingly overnight. The distance between near and far, formal and informal, real and virtual are not as great or distinct as they once were. Just as our formal education systems throughout the country are challenged to change, children’s museums, and museums in general, need to fundamentally rethink how informal education provides the interactive experiences that help learning become deeply meaningful to individual learners in the context of community, school and family. **InterActivity 2013: Reimagining Children’s Museums** will be a panoramic exploration of what it means to experience a children’s museum in the 21st century, and a reimagining of the conference itself.

An InterActivity Pre-Conference: 21-Tech will be held on April 29. Led by the Children’s Museum of Houston and its partners, the discussion will feature the latest effective use of Personal Mobile Technologies by gallery facilitators in their work with visitors. 21-Tech is about utilizing existing content with simple adaptations; making use of open source existing mobile applications; and developing and articulating immersive strategies for training exhibit facilitators.

Concurrent sessions on May 1 and 2 will feature seven professional content tracks including Programs & Education and Exhibits & Environments. Sessions in these tracks that explore Science, Technology, Engineering and Mathematics (STEM) are branded with a STEM icon. The InterActivity 2013 Preliminary Program outlining the full conference and pre/post conference agenda will be posted mid-December 2012 on the ACM Web site, [www.ChildrensMuseums.org](http://www.ChildrensMuseums.org).

The conference will be hosted by the Children’s Museum of Pittsburgh with conference headquarters at the Wyndham Grand Pittsburgh Downtown, with special programming at Byham Theater and other Pittsburgh cultural institutions. For further information, contact, ACM Program Officer, Education, Korie Twiggs at 703-224-3100 or Korie.Twiggs@ChildrensMuseums.org; Children’s Museum of Pittsburgh Program Manager and InterActivity 2013 Host Liaison Angela Seals at 412.322.5058 or ASeals@PittsburghKids.org.
During rainfall and when snow melts, the sewage collection systems quickly become filled to capacity causing untreated, diluted sewage to enter the three rivers and area creeks and streams. Since the rivers are the only source of drinking water, these overflows pose negative public health and environmental impacts.

To reduce, and in some instances eliminate, these sewer overflows, ALCOSAN has developed a multi-billion dollar Wet Weather Plan that will allow for more sewage capacity both in the sewer lines and at its treatment facility located along the Ohio River on Pittsburgh’s North Side.

The Federal Environmental Protection Agency (EPA) estimates that 60% of non-point source pollution in the waterways comes from stormwater carrying urban and agricultural pollutants. These pollutants include litter swept off streets, lawn fertilizers and pesticides, pet waste, garbage dumped in storm drains, household hazardous waste, and more. Instead of the pollutants within the flows reaching the treatment plant, they enter the waterways through sewer overflows.

Low Impact Development (LID) techniques are proven effective and can greatly reduce the amount of storm water runoff and non-point source pollution entering the region’s waterways.

The Pennsylvania Department of Environmental Protection (PA DEP), through its 2012 Environmental Education Grants Program, will sponsor a mini workshop series in conjunction with the Allegheny County Sanitary Authority (ALCOSAN) and the Allegheny Intermediate Unit (AIU) for 50 middle and high school science and math teachers during the Fall, 2012, and Winter, 2013 Network Connections Conferences. The mini workshops will highlight practical, hands-on classroom activities to introduce students to LID techniques and connect concepts related to the academic standards for environment and ecology, science and technology and engineering education, and mathematics. The workshops will be offered as break-out sessions during the Network Connections Conferences at the Carnegie Science Center. Interested participants must agree to the following:

1) Attend both the October and the February Network Connections mini-workshops on LID & Storm Drain Stenciling
2) Lead a group of students to conduct a storm drain stenciling project near their school, or within the community in which the school is located in the spring of 2013.

Participants will receive a lunch voucher at both workshops.

To register complete the information as designated on the Network Connections registration form. (page 38)
Network Connections
October 25, 2012 and February 7, 2013

What is Network Connections?
Teams of teacher leaders and administrators from school districts in Southwestern Pennsylvania come together for a full day joined by representatives from universities, corporations, and non-profits to explore tools for effective professional development that can be accessed by their districts. A variety of sessions offer proven approaches focusing on the big ideas of mathematics and science. The plenary Keynote sessions give all participants the chance to hear relevant information.

INTERACT Time:

**Invitation**
**To**
**Effectively**
**Reflect**
**And**
**Collaborate**
**Together**

INTERACT enables district/school teams to work together to consider how to use the information gathered during Network Connections to strengthen mathematics and science instruction. A planning form is provided.

Who Attends?
Each district is invited to send teacher leaders (elementary, middle, and high school mathematics teachers, elementary, middle, and high school science teachers, librarians, guidance counselors, technology coordinators), and administrators ( principals, curriculum coordinators, superintendents). This district leadership team is expected to represent their district’s perspectives, to report back to their district/school/department to share information about the resources and to leverage involvement in relevant opportunities. Independent, charter and private schools are welcome to participate, but are encouraged to partner with each other in making subsequent professional development appointments.

How Do I Get Involved?
If you are interested, contact your district’s point person (see page 55) or your superintendent to express your interest in serving and to learn of available opportunities.

Do I Need to RSVP for Network Connections?
YES! Each participant should complete and return the tear-out RSVP form included in this Journal (pgs 38 and 39) by the due dates noted on the form. Your preference of morning sessions will help determine where to hold certain sessions. Some sessions may have to be closed. Also, you may indicate a willingness to serve on the Steering Council for 2012-2013 on your October RSVP form.

Where Do I Go for Network Connections?
Both Network Connections will be held at the Carnegie Science Center on Pittsburgh’s North Side, next to Heinz Field. While participants are responsible for their own lunch, it will be available for purchase in the Science Center cafeteria. Parking is available for a reduced rate per car. Car pooling is advised.

For further information, contact **Barbara Ash at 412-394-4600 or barbara.ash@aiu3.net.**
Network Connections: Common Core/NGSS Matter

FALL: October 25, 2012
LOCATION: Carnegie Science Center

7:30 AM to 8:00 AM Carnegie Science Center Lobby
8:00 AM to 9:00 AM Opening Keynote Session: Harold Pratt

The Framework for K-12 Science Education: Practices, Crosscutting Concepts and Core Ideas (National Research Council, July 2011) is the guide for Achieve as their writing teams are developing the Next Generation Science Standards, and is essential grounding for K-12 educators contemplating NGSS. Harold Pratt, former President of NSTA, and consultant to the development of SW PA’s own early K-12 Science Framework, focuses on the content of the NRC Framework, a brief introduction to the NGSS and the shifts that will be required by districts, schools and teachers as they implement the emerging standards.

Morning Session: 9:15 AM to 12:00 Noon

A. Reducing Non-Point Source Pollution in Local Waterways (Part 1) 6-12 Science
This is the first of two sessions provided by ALCOSAN and MSC, sponsored by the Pennsylvania Department of Environmental Protection 2012 Environmental Education Grants Program. This session highlights practical, hands-on classroom activities to introduce students to LID (Low Impact Development) techniques. It connects concepts related to the academic standards for environment and ecology, science and technology and engineering education, and even mathematics. Participants must agree to attend both the October and February Network Connections sessions and lead a group of students to conduct a storm drain stenciling project near their school, or within the community in which the school is located in the spring of 2013. Participants will receive a lunch voucher at both sessions. See page 34.

B. Developing a Math Strand Over Time - Elementary K-6 Mathematics
Participants will explore a Common Core math content strand to see how conceptual understanding is developed. Be prepared to do the math! This session is elementary in nature.

C. Developing a Math Strand Over Time - Secondary 7-12 Mathematics
This session is geared to the secondary level. Participants will explore a Common Core math content strand to see how conceptual understanding is developed. Be prepared to do the math!

D. Getting at the Content Through the Math Practices K-12 Mathematics
Participants will explore the Standards of Mathematical Practices in depth. The emphasis will be on how to provide students with learning activities designed to teach them how to use the practices so that they can better understand the concepts that are being developed.

E. What is Happening in PA with NGSS? K-12 Science
This session will discuss bridging from PA Science standards to the Next Generation Science Standards (NGSS). How will NGSS impact science education in PA?

F. The Myth of the Scientific Method K-12 Science
The “scientific method” has been part of science courses and textbooks for decades. But how closely do those six steps, presumably done in a linear fashion, actually reflect how science is done? Participants in this session will draw from various examples of actual scientific discoveries to develop a more authentic model of the scientific method and compare this model to the “practices of science and engineering” described in the National Research Council’s 2012 report A Framework for K-12 Science Education. See related article on page 28.

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G. How Can Administrators Recognize Effective Instruction in Math K-12 Mathematics
What does effective teaching look like in the mathematics classroom? When the Standards of Mathematical Practice incorporated with the Common Core content standards are effectively planned for and delivered in the classroom, a student mind-engaging mathematics environment contributing to the learning for all students is created. See page 19 for related article.

H. Digging into Next Generation Science K-12 Science
Following the morning keynote, participants will dig deeper into the “Framework for K-12 Science Education” to better understand the development of the Next Generation Science Standards and how to effectively use the content in their science instruction. See related article on page 14.

LUNCH & RESOURCE FAIR
12:00 Noon – 1:00 PM
Enjoy lunch on your own and explore the Resource Fair.

PM KEYNOTE SESSION
“How Following the Common Core is Connected to Higher Achievement”

William H. Schmidt
Center for the Study of Curriculum
Michigan State University
1:00 PM – 2:00 PM

William H. Schmidt received his undergraduate degree in mathematics from Concordia College in River Forrest, IL and his Ph.D. from the University of Chicago in psychometrics and applied statistics. He carries the title of University Distinguished Professor at Michigan State University and is currently co director of the Education Policy Center, co director of the US China Center for Research and director of the NSF PROM/SE project and holds faculty appointments in the Departments of Statistics and Educational Psychology. Previously he served as National Research Coordinator and Executive Director of the US National Center which oversaw participation of the United States in the IEA sponsored Third International Mathematics and Science Study (TIMSS).

RESOURCE FAIR
2:00 PM – 2:30 PM
Enjoy another chance to engage with the 15+ Resource Partners in the lobby of CSC.

INTERACT TIME
2:00 PM – 3:30 PM
Invitation to Effectively Reflect and Collaborate Time
This time is set aside for participants to share experiences and plan with district colleagues to strengthen math and science education in their districts. The team will collaboratively develop an action plan to disseminate relevant Network Connections information and experiences.
Network Connections RSVP Form

FALL: October 25, 2012 from 8:00 AM to 3:30 PM

LOCATION: Carnegie Science Center, Pittsburgh
Please check website for directions www.carnegiesciencecenter.org/
(Check-in begins at 7:30 AM)

Please complete and return this form by fax to (412-394-4599) or mail to Math & Science Collaborative, Allegheny Intermediate Unit, 475 East Waterfront Drive, Homestead, PA 15120 no later than October 19, 2012.

In response to past Network Connections evaluations, the format is changing this year. Continental breakfast will not be provided. There will be two keynotes: one opening the morning, and one immediately after lunch in the PM.

From:
Name: ________________________________ School:______________________________________
Organization/District: ____________________________________________________________
Address: ______________________________________________________________________
Phone: ________________ Fax: ________________ E-mail: ________________________

Primary Affiliation (Check one of the boxes below that best describes what you do.)

☐ Elem. Teacher of Math ☐ Middle Math Teacher ☐ High School Math Teacher
☐ Elem. Teacher of Science ☐ Middle Science Teacher ☐ High School Science Teacher
☐ Supt./Asst. Supt. ☐ Curriculum Director ☐ University/College
☐ Technology Coordinator ☐ Principal/Asst. Principal ☐ Guidance Counselor
☐ Provider ☐ Business/Industry ☐ Other

(Refer to the October 25, 2012 Agenda (next page) for full description or online at www.aiu3.net/msc

Morning Session

Check One in-depth session that you are most interested in attending. Registration is required.

☐ A. Reducing Non-Point Source Pollution in Local Waterways, Part I
☐ B. Developing a Math Strand Over Time - Elementary
☐ C. Developing a Math Strand Over Time - Secondary
☐ D. Getting at the Content Through the Math Practices
☐ E. What is Happening in PA with NGSS?
☐ F. The Myth of the Scientific Method
☐ G. How Can Administrators Recognize Effective Instruction in Math
☐ H. Digging into Next Generation Science Standards

Afternoon Network Connection Session
Includes Lunch (on your own), Keynote Speaker, Resource Fair and INTERACT Time
All participants must attend their district meeting during INTERACT time.

☐ Steering Council. Make sure your perspective is represented on the Collaborative’s
meetings are: 10/4/12, 2/21/13, and 5/16/13.
Network Connections RSVP Form

WINTER: February 7, 2013 from 8:00 AM to 3:30 PM

LOCATION: Carnegie Science Center, Pittsburgh
Please check website for directions www.carnegiesciencecenter.org/
(Check-in begins at 7:30 AM)

Please complete and return this form by fax to (412-394-4599) or mail to Math & Science Collaborative,
Allegheny Intermediate Unit, 475 East Waterfront Drive, Homestead, PA 15120 no later than February 1, 2013.

In response to past Network Connections evaluations, the format is changing this year. Continental breakfast
will not be provided. There will be two keynotes: one opening the morning, and one immediately after lunch in
the PM.

From:
Name: ________________________________ School: ____________________________________________
Organization/District: ________________________________________________________________
Address: ______________________________________________________________________
Phone: ________________ Fax: ________________ E-mail: ________________________

Primary Affiliation (Check one of the boxes below that best describes what you do.)
❑ Elem. Teacher of Math  ❑ Middle Math Teacher  ❑ High School Math Teacher
❑ Elem. Teacher of Science  ❑ Middle Science Teacher  ❑ High School Science Teacher
❑ Supt./Asst. Supt.  ❑ Curriculum Director  ❑ University/College
❑ Technology Coordinator  ❑ Principal/Asst. Principal  ❑ Guidance Counselor
❑ Provider  ❑ Business/Industry  ❑ Other

(Refer to the February 7, 2013 Agenda (page 40) for full description or online at www.aiu3.net/msc)

Morning Session

Check One in-depth session that you are most interested in attending. Registration is required.

❑ A. Reducing Non-Point Source Pollution in Local Waterways, Part II
❑ B. Engineering Processes - Elementary
❑ C. Engineering Processes - Secondary
❑ D. Job Shadowing Panel
❑ E. PDE Approach to Engineering
❑ F. How Can Administrators Recognize Effective Instruction in Science
❑ G. Using High Level Tasks Effectively in Science
❑ H. Using High Level Tasks Effectively in Math

Afternoon Network Connection Session
Includes Lunch (on your own), Keynote Speaker, Resource Fair and INTERACT Time

All participants must attend their district meeting during INTERACT time.
Network Connections: Focus on Engineering

WINTER: February 7, 2013
LOCATION: Carnegie Science Center

7:30 AM to 8:00 AM Carnegie Science Center Lobby
8:00 AM to 9:00 AM OPENING KEYNOTE: “A Local Success Story of Engineering”

In previous years, video clips of the Carnegie Science Award winners have been featured to share the innovation occurring in SW PA. With the special focus on Engineering of this conference, come meet a winner in person. Henry Thorne, 2012 winner of the Carnegie Science Center Award for Entrepreneurs, will describe how his K-12 education enabled him to create award-winning innovation.

MORNING BREAKOUT SESSION: 9:15 AM to 12:00 Noon

A. Reducing Non-Point Source Pollution in Local Waterways (Part 2) 6-12 Science
This session provided by ALCOSAN continues to explore practical, hands-on classroom activities to introduce students to LID (Low Impact Development) techniques and connect concepts related to the academic standards for environment and ecology, science and technology and engineering education, and mathematics. Participants must have attended Part 1 at the October Network Connections. Participants will receive a lunch voucher at this session. See page 34.

B. Engineering Processes – Elementary K-6 Math & Science
Begin early to put the E back in STEM. Join ASSET and MSC facilitators for an interactive session exploring the connections at the elementary level between the engineering design process and the practices of the Mathematics Common Core and the emerging Next Generation Science Standards. See page 8.

C. Engineering Processes - Secondary 6-12 Math & Science
Put the E back in STEM with increasing depth. Join ASSET and MSC facilitators for an interactive session exploring the connections at the secondary level between the engineering design process and the practices of the Mathematics Common Core and the emerging Next Generation Science Standards. See page 8 for a related article.

D. Job Shadowing Panel K-12 Math & Science
What role do the Common Core Practices and NGSS play in preparing students for careers? How does seeing them in action in the workplace help educators provide students with effective learning experiences? K-12 educators, who are participating in a pilot program that takes them into three local corporations, will share their findings.

E. PDE Approach to Engineering Math & Science
How is Engineering approached by PDE? David Bauman, PDE Science Advisor, will share PDE’s approach to this key component of STEM.

F. How Can Administrators Recognize Effective Instruction in Science K-12 Science
What does effective teaching look like in the science classroom? When science content standards are effectively integrated with Science and Engineering Process standards, a student mind-engaging science environment is created. Student interest in and acquisition of science concepts dominate! See page 19.

G. Using High Level Tasks Effectively in Science K-12 Science
Engaging in the engineering design process requires the use of high level tasks. Through an active hands-on process, participants will investigate the characteristics that are essential for standards-based, challenging science tasks.

H. Using High Level Tasks Effectively in Math K-12 Mathematics
Engaging in the engineering design process requires the use of high level tasks. Through active engagement in the math, participants will investigate the characteristics that are essential for standards-based, challenging math tasks.
LUNCH & RESOURCE FAIR
12:00 Noon – 1:00 PM

Enjoy lunch on your own in CSC Café. Avoid lines by exploring the Resource Fair.

AFTERNOON KEYNOTE
1:00 pm – 2:00 PM

“How to Implement Common Core Opportunities to Strengthen Teaching and Learning”

Steve Leinwand

Steve Leinwand is a Principal Research Analyst at the American Institutes for Research (AIR) in Washington, D.C. and has over 30 years of leadership positions in mathematics education. His work at AIR has included technical assistance to the General Electric Foundation and to the Microsoft Math Partnership, involving work in Seattle, Louisville, Cincinnati, and Milwaukee. He has overseen the development of the Algebra Assessment for the ongoing High School Longitudinal Study and co-authored “What the United States Can Learn from Singapore’s World-Class Mathematics System (and what Singapore can learn from the United States).”

Before joining AIR in 2002, Leinwand spent 22 years as Mathematics Consultant with the Connecticut Department of Education where he was responsible for the development and oversight of statewide activities in K-12 mathematics education. Steve has served on the Mathematical Sciences Education Board during the development and publication of “Everybody Counts”, as president of the National Council of Supervisors of Mathematics, and on the NCTM Board of Directors where he helped to review NCTM’s “Principles and Standards for School Mathematics.”

RESOURCE FAIR
2:00 – 2:30 PM

Enjoy another chance to engage with the 15+ Resource Partners in the lobby of CSC.

INTERACT TIME
2:00 PM – 3:30 PM

Invitation to Effectively Reflect and Collaborate Time
This time is set aside for participants to share experiences and plan with district colleagues to strengthen math and science education in their districts. The team will collaboratively develop an action plan to disseminate relevant Network Connections information and experiences.
The Resources for Educators directory, found at www.pa-edresources.net, is an on-line database for educators to find resources and opportunities in SW Pennsylvania. While it contains resources for all disciplines, the mathematics and science ones are most updated. Resource Providers enter information about their programs year-round, and portions of this information are published twice annually, in the Math & Science Collaborative (MSC) Journal (fall publication) and Coordi-net (spring electronic publication).

The resources fall into five categories: Professional Education (events for educators), Consultant Assistance, Student Enrichment Programs, Material Resources, and Grant Information. The “Resources Listed by Content Area” section that begins on page 45 of this Journal was pulled from those appearing in the Professional Education section of the directory. A sampling of Student Enrichment Programs may be found beginning on page 43.

Do You Have Resources You Would Like to Publicize to K-12 Educators?
If you have resources that would be of interest to our region’s educators, you could become a partner. Open an account today by following the directions at, www.pa-edresources.net. You will receive a login ID and password within 24 hours. Assistance is also available at 412-394-4636 or by e-mail gabriela.rose@aiu3.net. Resources relating to mathematics and science that are entered by February 15, 2013 and include dates between March and August will be included in the spring electronic MSC Coordi-net. Resource Partners can also share information by reserving a table to display their offerings at the Resource Fair, a key component of the biannual Network Connections conference. (See page 35).

Interested in Partnering with other Resource Providers?
MSC’s Resource Partner Network, open to all regional informal science educators, IHE partners, government agencies and professional organization leaders, is convened by MSC three times each year. Each of meetings provides updates on local, state, and national initiatives related to standards, policies and research. At least one of the meetings is held at the site of a Resource Partner to enable partners to see firsthand what is offered by the hosting resource. Network Meetings offer opportunities to share information, collaborate on projects and share resources. Meeting dates and times are found below. To be reminded of future Resource Partner meetings, please contact Barbara Ash at barbara.ash@aiu3.net.

<table>
<thead>
<tr>
<th>Resource Partners Network Meetings (2012-2013)</th>
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<tbody>
<tr>
<td>Date</td>
</tr>
<tr>
<td>Monday, September 10, 2012</td>
</tr>
<tr>
<td>Monday, January 14, 2013</td>
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<tr>
<td>Monday, April 8, 2013</td>
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</tbody>
</table>

Already a Resource Partner?
Please be sure to update your information regularly, adding new items of interest and deactivating those that have already occurred.

Working Together, We Can Do Better!
If you know of any providers or resources that may be of interest to other educators, please contact Math & Science Collaborative so that the provider will be invited to post their resources. If you are aware that any of the information on Resources for Educators can be updated, likewise let MSC know!
Student Enrichment Programs

AIU Academic Events
The Allegheny Intermediate Unit offers various competitions such as Science Bowl, History Bowl and K’Nex Challenge. Programs are available for students in grades 3-12. Contact Amy Cribbs, Academic Events Specialist, Allegheny Intermediate Unit, at amy.cribbs@aiu3.net.

AIU Apprenticeship Program
Over 35 apprenticeships are offered throughout Allegheny County that allow students, grades 10-12, to explore different careers by working and learning from professionals in the field. For further information, go to apprenticeships.aiu3.net or contact Amy Cribbs, Academic Events Specialist, Allegheny Intermediate Unit, at amy.cribbs@aiu3.net.

Birds in the Burgh
Using the hands-on approach to learning, your students will discover the fascinating world of avian species through fun and educational activities designed to stimulate young minds about the living environment. The Birds in the Burgh series is standards-based and incorporates many cross-curricular activities, so it can be used across the disciplines! Choose from Bird Detective, Bird Identifier, or Bird Watcher. Contact the Audubon Society at 412-963-6100.

Birds of Prey
Your students will have an up-close experience with living raptors! Utilizing live birds of prey and hands-on discoveries, students will explore each raptor’s natural history, the similarities and differences among species, the importance of habitat and habitat conservation, and direct and indirect human impacts on these fascinating creatures. Avian ambassadors will be “on hand” to assist you and your students throughout this unique combination of classroom and active laboratory classes. Contact the Audubon Society at 412-963-6100.

Career Symposia
Career Symposia are one day events, held at a local high school, where students learn about different career areas from a keynote speaker and small panel presentations.

Four different career clusters are offered – Business, Information, Government and Law; Arts, Humanities and Communications; STEM; Health and Human Services. School districts may attend in person or join through videoconferencing. For more information, please contact Amy Cribbs at amy.cribbs@aiu3.net or 412.394.4193.

C-MITES Weekend Workshops
Weekend Workshops are offered in the fall and spring at Carnegie Mellon University. These 3 and 6-hour workshops are designed for gifted students in kindergarten through 9th grade. Students register for workshops on a first-come, first-served basis. See the C-MITES website for a registration form at www.cmu.edu/cmites/ww.html.

Educational Loan Collection
A wide variety of earth science and life science materials, such as assorted feathers, fossils or mineral specimens, or thematic units consisting of dozens of items and associated lesson plans, are available for teachers to borrow for classroom use. For further information, contact Patrick McShea, program Specialist-Teacher Resources, Carnegie Museum of Natural History, at mcsheap@carnegiemnh.org.

Everything Including the Kitchen Sink
Ben Sota builds a circus show out of everyday junk to help us understand that our modern world calls upon our creative ability to look at old materials in new ways to meet challenges. Presented by the Children’s Museum of Pittsburgh, 412-322-5058.

FIRST Lego League
With the help of LEGO® MINDSTORMS™ Robotics Invention System™ technology, young participants can build a robot and compete in a friendly, FIRST-style robotics event specifically designed for their age group. Using LEGO bricks and other elements such as sensors, motors, and gears, teams gain hands-on experience in engineering and computer programming principles as they construct and program their unique robot inventions. Teams are made up of mentors from Higher Education, secondary school and industry. Registration is available online May 1-September 30. Visit web page at www.usfirst.org/roboticsprograms/fll/default.aspx.

Focus Field Trips
Science related field trips include Everything Green, Build-a-Boat Challenge, Factors of Flight, and Electric Cardboard Cars. For more information or to reserve a program or field trip, go to www.pittsburghkids.org.

In-School Program and Traveling Classroom Program
In-School topics include dinosaurs, African wildlife, Arctic life, Seneca culture, and Ancient Egypt. Programs are 45-60 minutes in length and can accommodate 10-25 students. Traveling classroom programs include fossils, dinosaurs, insects and African wildlife. Programs are 45-90 minutes in length and can accommodate 10-25 students. Contact the Carnegie Museum of Natural History at 412-688-8687.

Mathematical Olympiads for Elementary and Middle Schools
Your school’s math club meets weekly for an hour. Club members explore a topic or strategy in depth, using Creative Problem Solving in School Mathematics (or other sources), or they practice for the contests, using nonroutine problems from Math Olympiad Contest Problems Volume 2 or Mathematical Olympiads Contest Problems for Elementary and Middle Schools (or other sources). The highlights for students are the five monthly contests, given from November to March. No traveling is required. Contact Mathematical Olympiads at 866-781-2411.

Meet the Scientists Videoconference Series
Videoconferences provide an opportunity for your students to interact with Museum scientists and discover how they incorporate the scientific method into their research. Please contact Sue McJunkin of the Carnegie Museum of Natural History at 412-622-3235.
**National Engineers Week Chain Reaction Contraption Contest**

Powered by Westinghouse Electric Company and presented by Carnegie Science Center and Engineers’ Society of Western Pennsylvania, the Chain Reaction Contraption Contest is a spirited competition for 9-12th graders. The contest fosters an interest in engineering by challenging students to create a contraption that will accomplish a specific task using a series of steps. This program will be held on December 7, 2012 at Carnegie Science Center. Visit www.chainreactioncontest.org/ for further information.

**Outdoor Discovery Programs**

Audubon Society of WPA Outdoor Discovery Programs at Beechwood Farms are a unique blend of outdoor adventure and hands-on learning designed for students K-12. Our naturalists are trained to lead small groups of students through fun and educational activities along our trail system. Contact Scott Detwiler at 412-963-6100.

**Pennsylvania Technology Student Association (TSA)**

The Technology Student Association (TSA) fosters Science, Technology, Engineering and Mathematics (STEM) education through personal growth, leadership and opportunities in Technology, Innovation, Design and Engineering (TIDE). Middle and high school members apply and integrate science, technology, engineering and mathematics concepts for the challenges of a dynamic world through co-curricular activities, problem solving, competitive events and related problems resulting in academic development and endless possibilities in our global society. It is a Career and Technical Student Organization (CTSO) which has been an integral part of technology education programs across the country for the past 32 years. Students involved in TSA participate in activities that help prepare them for the future—ideally, for fulfilled personal lives, rewarding careers and civic responsibility. TSA offers camaraderie, co-curricular educational programs and competitions at regional, state and national conferences. Visit us at www.tsaweb.org.

**Science on Stage-Assembly Programs**

Carnegie Museum of Natural History presents touring productions for school assemblies. Dinosaurs, Paleontology, Tropical Rain Forests, Biodiversity, and Insects are among the topics addressed in these educational entertaining programs for elementary and middle school. Contact the Carnegie Museum of Natural History at 412-622-3233.

**SciTech Days**

SciTech Days at Carnegie Science Center feature interactive experiences with our region’s top companies: hands-on workshops, online teacher resources, and clear links to Pennsylvania education standards and anchors. Experience a mock crime scene complete with witness-crime scene complete with witnesses. Discover careers as forensic investigators, autopsy technicians, pathologists, histologists, and more. Explore the other reaches of the Universe from within! Creating the Digital Cosmos takes your students behind-the-scenes in the Buhl Digital Dome, a leading provider of high definition planetarium shows for science centers and planetariums. Students experience robotics, the environment, and much more. Check the website www.scitechspec.org for a listing of all programs. (See article on p xx.)

**Stuffee**

Children’s Museum of Pittsburgh’s seven-foot tall health-teaching mascot Stuffee, and a Stuffee Teacher can come to your class and bring to life lessons on biology, anatomy, nutrition and personal wellness. For further information, go to www.pittsburghkids.org.

**Tales that Tell Why**

This entertaining but informative assembly program presented by Broadway actor Tim Hartman explains the scientific method and puts it to the test with scientific explanation of why we have seasons. Contact the Children’s Museum at 412-322-5058.
The following pages contain entries describing a variety of math and science related opportunities occurring between September 2012 and August 2013.

**Organization by Disciplinary Topics**

These resources are organized by the disciplinary (Math or Science) focus of the session. Within the larger discipline of science, the sessions are further organized by the strands of the Pennsylvania Academic Standard i.e., Biological Sciences, Earth & Space Science, Inquiry, and Physical Sciences.

A full description of each professional development opportunity is listed under the topical area that is a major focus. If it addresses several topics it is listed under the most relevant topic or in the Inquiry strand.

**Registration Contacts**

The Provider Organization is designated at the end of each professional development description. Use the Provider Organization name to check the alphabetical listing for appropriate registration contacts in the listing of “Contacts for Provider Organizations” on page 53. Please note that the information in the Directory is subject to change. Before attending any workshop or conference, be sure to check with the “Contact” for each entry to be sure you are registering correctly.

**Other Ways to Search These Opportunities**

If you prefer searching for opportunities by particular grade level, dates offered, or location of the opportunity, please go to www.pa-edresources.net where you can search these same entries using those criteria. See page 42 for directions. This database also contains information for opportunities that have dates outside of the reporting range for this current publication.

### Mathematics

**Developing Algebraic Thinking Academy**

Developing Algebraic Thinking (DAT) has three primary goals: to deepen the teacher's own understanding of mathematics, to develop their mathematical reasoning and problem solving capabilities, and to provide teachers with opportunity to reflect on and develop their own teaching practices. During this course, teachers will examine mathematical tasks and the impact of cognitive demand, use multiple representations to study functions, compare quantities with ratios and proportions, and define the similarities and differences between linear, quadratic, and exponential functions. Teachers will experience a student-centered approach to broaden their understanding of algebra and the standards-based pedagogy. This course is worth 45 credit hours.

- **Credit Hours:** N/A
- **Grade Level(s):** 6, 7, 8
- **Location:** TBD
- **Fee:** 1085.00
- **Provider Organization:** Carnegie Learning

**Foundations for Teaching Inquiry-Based Mathematics Institute**

Designed for teachers K-8 and based on the information found in “How Students Learn: Mathematics in the Classroom” (developed by the National Research Council), participants will: 1. Explore current inquiry-based math research and teaching practices 2. Utilize strategies and tools to enhance learning 3. Engage in best practices of inquiry teaching 4. Work within a professional learning community to develop an action plan that integrates research-based strategies into classroom practices.

- **Presented By:** ASSET Resource Teacher
- **Credit Hours:** N/A
- **Grade Level(s):** K, 1, 2, 3, 4, 5, 6, 7, 8
- **Location:** Bayer Professional Development Academy at ASSET
- **Fee:** Call for pricing
- **Provider Organization:** ASSET STEM Education

**Hands-On Mathematics Education for Pennsylvania**

**Learning and Teaching**

Are you searching for a way to improve students’ conceptual learning of the Pennsylvania Academic Anchors for Mathematics which is reflected in the Pennsylvania System of School Assessment (PSSA)? If so, Project HOME PLaTe may be the “homerun” for you! HOME PLaTe provides workshops and year-long support for K-12 teachers in schools near Indiana University of PA and Edinboro University who are having difficulty meeting the target goals of No Child Left Behind in Pennsylvania (NCLB). Participating teachers will be surveyed to determine their teaching needs, and HOME PLaTe activities are developed to expand their teaching techniques with a multitude of experiences and teacher-friendly, ready-to-use materials provided in our workshops. Teachers link their schools’ current curriculum with hands-on activities using data collected by all ability level students. Administrators will support teachers in their reformed lessons since participating teachers must provide evidence of activities which were done with their students. The strategies that teachers will use with children will be modeled by the HOME PLaTe instructional staff, and teachers’

For the latest information, visit the Collaborative’s web site at www.aiu3.net/msc
content knowledge will be improved at a deep conceptual level through the activity approach. These techniques will ultimately impact students by requiring them to think deeply about the mathematical content while using a hands-on approach that utilizes technology appropriately. Students will have fun and learn mathematics without even knowing it, and they will improve their attitude toward Math Class! To become a member of the HOME PLaTe “team” (which is sponsored by the Pennsylvania Department of Education with NCLB’s Title II Eligible Partnership funds provided by the United States Department of Education) or to request “relief” with in-service needs in your school district, please contact the Center for Statistics Education at Indiana University of Pennsylvania (CSEPA Office) at (724) 357-6239. We personally invite all of you to “hit one out of the park” by becoming a HOME PLaTe member soon!

Credit Hours: 90 Hour(s)
Grade Level(s): K,1,2,3,4,5,6,7,8,9,10,11,12
Location: Indiana University of Pennsylvania & Edinboro U.
Fee: Please contact IUP
Provider Organization: Center for Statistics Education in PA at IUP

National Council of Teachers of Mathematics

The mission of the National Council of Teachers of Mathematics is to provide the vision and leadership necessary to ensure a mathematics education of the highest quality for all students.

With nearly 100,000 members and more than 230 Affiliates throughout the United States and Canada, NCTM is the world’s largest mathematics education organization. NCTM’s Principles and Standards for School Mathematics, published in 2000, provides guidelines for excellence in mathematics education and issues a call for all students to engage in more challenging mathematics. Its content is extended online through the E-Standards (standards.nctm.org) and Illuminations (illuminations.nctm.org). NCTM publishes four professional journals: Teaching Children Mathematics, Mathematics Teaching in the Middle School, the Mathematics Teacher, and the Journal for Research in Mathematics Education. Other publications include the monthly member newsletter, the NCTM News Bulletin, and more than 200 educational books, videos, and other materials.

NCTM's Web site, nctm.org, features resources such as Student Math Notes and Mathematics Education Dialogues. NCTM's Web site also includes information about jobs, new products, and NCTM and its programs. NCTM sponsors the World's Largest Math Event, held annually in April, and publishes a colorful activity booklet with related activities teachers can use across the grades.

Credit Hours: N/A
Grade Level(s): K,1,2,3,4,5,6,7,8,9,10,11,12
Fee: Contact NCTM
Provider Organization: National Council of Teachers of Mathematics

Professional Development Programs for teachers of gifted students

C-MITES provides professional development workshops for Act 48 credit several times a year on the Carnegie Mellon University campus. These workshops often feature noted speakers in the area of gifted education and have included topics such as developing mathematical talent, differentiating instruction, acceleration, encouraging diverse populations in mathematics, science and technology.

Presented by: Dr. Ann Lupkowski Shoplik and others as scheduled.

Credit Hours: 5.0 Hour(s)
Grade Level(s): K,1,2,3,4,5,6,7,8
Location: Carnegie Mellon University
Fee: varies by length of workshop
Provider Organization: Carnegie Mellon Gelfand Cntr. for Service Learning

Spark Enrichment Programs

Spark network members are doing great things to improve the ways children live, learn, and play in the greater Pittsburgh region. You can get involved with the Spark network by attending Spark-sponsored activities and events, participating in Spark-supported projects and programs, and connecting with others interested in new approaches to learning and creativity.

Credit Hours: N/A
Grade Level(s): Toddler,Preschool,K,1,2,3,4,5,6,7,8,9,10,11,12
Fee: Varies
Provider Organization: Spark

Environmental Science: Exploring the World of Freshwater Ecology

Explore watersheds and indicators of water quality on board the green vessel Explorer. Teachers who complete the one day workshop are eligible for 6 Act 48 hours. Schools who are signed up to bring a class to a RQ program can send 1 teacher FREE per 30 students registered. Participants are responsible for bringing their own lunch each day as well as paying parking fee each day for parking in the Science Center parking lot.

Presented By: RiverQuest Environmen-
Food Land & People

Food, Land & People is an interdisciplinary curriculum addressing the interdependence of food production, environmental quality, and the sustainability of human cultures. Today, less than two percent of Americans live or work on farms, and mainstream education provides little information about the links between food production and its connection to population, soil, water, energy, and habitat preservation. This program uses a variety of skills to teach students how to apply the knowledge base they have learned about food and fiber into their everyday lives. Activities emphasize the development of critical thinking skills needed to balance an understanding of the complex interdependence of food systems and environmental conservation. It can be infused into other areas beyond environment and ecology, such as science, language arts, social studies, reading, mathematics, economics and technology. Participants should bring a bag lunch and dress for the outdoors.

Participants of this course will receive and be trained in the use of the 55-lesson Food Land & People curriculum guide. The course will use the guide’s hands-on, multidisciplinary activities enhanced with field sessions in the 134-acre Beechwood Farms Nature Reserve. Teachers will also be given time to meet in grade level groupings to discuss application strategies, and to develop workable unit plans that incorporate lessons from the focus areas of the course, including field trips and guest speakers. Teachers will also align all activities to the Environment and Ecology Standards.

Presented By: Scott Detwiler
Credit Hours: 6 Hour(s)
Grade Level(s): 4,5,6,7,8,9,10,12
Location: RiverQuest EXPLORER
Fee: Free to RiverQuest customers; $20 all others
Provider Organization: RiverQuest

Growing Futures in STEM: Tissue Engineering and Regenerative Medicine in the Classroom

A starfish can grow a new arm, but YOU can't. A salamander can regenerate a severed leg, but humans have to rely on man-made prosthetic limbs. Can Pittsburgh researchers and clinicians fabricate new tissues and organs or induce damaged tissues to regenerate? Can K-12 STEM educators translate the promise of TERM to diverse student populations to reinforce learning and excite interest? PTEI is partnering with the MSC to engage teachers and students to the wonders of tissue engineering and regenerative medicine (TERM) and spark interest in STEM (science, technology, engineering and math) careers in their own backyard. Throughout the 2-day course, teachers engage in inquiry-based learning and become more confident and comfortable with TERM content and concepts. Participants uncover misconceptions, explore bioethics and learn about cutting-edge research taking place in their own backyard. Teachers become skilled at how to reinforce the big concepts in STEM through the lens of TERM. TERM is an ideal STEM education exemplar and an enticing hook to capture students interest.

Presented By: PTEI in partnership with MSC
Credit Hours: 1 Credit(s)
Grade Level(s): K,1,2,3,4,5,6,7,8,9,10,11,12
Location: Beechwood Farms Nature Reserve
Fee: AIU sets fee
Provider Organization: Audubon Society of Western PA

Growing Up Wild Educator Workshop

GROWING UP WILD features field-tested, hands-on activities about wildlife, people and the environment. Each activity includes art projects, reading, music, math connections and outdoor learning as well as content about specific groups of animals or ecological concepts. The activities are designed to address development and learning in all areas including social, emotional, physical, language and cognitive domains. Growing UP WILD is correlated to the national Association for the Education of Young children (NAEYC) Standards and the Head Start Domains. Growing UP WILD is also an approved training for ACT 48 and through Pennsylvania Quality Assurance Program (PQAS).

Presented By: Angela Belli, Beth Bollinger, and Joe Stefko
Time Frame: 09/22/2012 9:00AM - 4:00PM
Credit Hours: 6.0 Hour(s)
Grade Level(s): Toddler, Preschool, K, 1, 2
Location: Winnie Palmer Nature Reserve at SVC
Fee: $20
Provider Organization: Saint Vincent College Environmental Education Ctr.

Introducing Students to Biotechnology and Bioinformatics, the Science of the Future

This workshop will provide participants with
hands-on laboratory experience and a review of background concepts in Biotechnology and Bioinformatics. Currently the workshop is limited to 9th & 10th grade biology teachers. Topics include the Isolation of Human DNA, DNA Fingerprinting, Protein Purification, and Genomic Informatics. Workshop is contingent on the number of participants. All Westmoreland County teachers who have successfully completed the workshop are eligible to sign out the laboratory modules during the school year. Each module provides the necessary laboratory equipment and teaching materials to bring the experiment into your classroom. Schools are responsible for providing some of the lab supplies as well as transportation of the modules, call for more details. Please contact Barb Rozik at 724-771-4148 for more information.

Presented By: Dr. Mandy Raab, PhD, MSIS
Credit Hours: 6 Hour(s)
Grade Level(s): 9,10
Location: Saint Vincent College
Fee: none - refundable deposit upon completion of works
Provider Organization: Saint Vincent College School of Natural Sciences

**PASCC Meetings**

The Pennsylvania Science Curriculum Council (PASCC) is an organization comprised of over 120 members that includes Science Teachers, Science Department Chairs, Principals, and Curriculum Directors from over 54 school districts in southwestern PA. Our purpose is to promote collaboration amongst science educators and science education administrators in order to share effective methods of both science instruction and assessment. Topics of discussion and focus have been on the SAS (Standards Aligned System), the CDT (Classroom Diagnostic Tools), PLC (Professional Learning Communities), assessment portfolios, and assessment sharing based on all 8 areas of Biology Keystone Eligible Content. You can access more information about PASCC through the website http://www.edmodo.com/. Once you create an account, you will click on “join” and enter the code cqtl95. Please contact Kristy Scalise at kscalise@wiu.k12.pa.us if you would like to become a member of PASCC and attend this meeting.

DATES and LOCATIONS: Elizabeth Forward HS - November 16, 2012 and Mt Pleasant HS - March 22, 2013
Presented By: PASCC Members
Time Frame: 11/16/2012 9:00AM - 2:00PM and 03/22/2013 9:00AM - 2:00PM
Credit Hours: 5 Hour(s)
Grade Level(s): 9,10,11,12
Location: See description
Fee: $0
Provider Organization: Pennsylvania Science Curriculum Council (PASCC)

### EARTH SCIENCES

**Environmental Resource Guide (ERG) Teacher Workshops**

Learn about air and water pollution from environmental professionals during Air & Waste Management Association’s (A&WMA) teacher-training workshops, featuring Environmental Resource Guide’s (Air Quality and Nonpoint Source Pollution Prevention) hands-on activities, written by teachers and reviewed by A&WMA members.

Presented By: A&WMA Members
Credit Hours: Varies Hour(s)
Grade Level(s): K,1,2,3,4,5,6,7,8,9,10,11,12
Fee: Usually free

Provider Organization: Air & Waste Management Association

**Exploring Your City**

For more information on course content call the AIU or Karen Cahall at 412-471-5808, ext. 537; or email karen@phlf.org

Presented By: The Pittsburgh History & Landmarks Foundation
Credit Hours: 16 Hour(s)
Grade Level(s): K,1,2,3,4,5,6,7,8,9,10,11,12
Location: Station Square
Fee: Call AIU
Provider Organization: Pittsburgh History & Landmarks Foundation

**Free Professional Development for Teachers**

The Challenger Learning Center at WJU provides free Teacher Training sessions for any mission on www.e-missions.net. The teachers will get an overview of the program and we will demonstrate the program in a very hands-on way so that they teachers can participate fully in the mission.

Presented By: CLC Staff Flight Director
Credit Hours: N/A
Grade Level(s): 3,4,5,6,7,8,9,10,11,12
Location: scheduled via video conference to your location
Fee: FREE; no fees
Provider Organization: Challenger Learning Center

**Green Building as a Teaching Tool**

Building as a teaching tool is a hands on interactive program using the Children’s Museum of Pittsburgh and CCI Center on

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For additional resource listings, visit the Resources for Educators web site at www.pa-edresources.net
the Southside, both LEED certified green buildings as a teaching tools for Green Building education. In this two day workshop participants will be introduced to basic green building concepts and the environmental impact the built environment has on students. Teachers will have enough understanding to introduce these concepts to their students. Teachers will create a green building scavenger hunt, green building school audit and green building unit for their specific grade level. Time will be devoted to giving an overview of the PA Academic Standards in Environment and Ecology and how to apply these standards in developing green building lessons. Indigo Raffel, artist and environmental artist, is the instructor.

Presented By: Indigo Raffel

Time Frame: 10/13/2012 8:30AM - 4:30PM and 10/20/2012 8:30AM - 4:30AM

Credit Hours: 1 Credit(s)

Grade Level(s): K,1,2,3,4,5,6,7,8,9,10,11,12

Location: Children’s Museum of Pittsburgh

Fee: free

Provider Organization: Children's Museum of Pittsburgh

Sustainable Energy Education Project: Teacher Training FREE Workshop IU3

Teachers will gain the knowledge and hands-on teaching tools to introduce Solar Energy, Wind Energy, and Energy Efficiency technologies to the classroom. The teacher training workshop is geared towards 6th 12th grade educators responsible for energy-related curricula. The workshop is FREE and participants receive six Act 48 credit hours, lunch, and over $170 of teaching resources including: a functioning model wind turbine, a solar energy kit, a multi-meter, books, DVDs, a resource binder and flashdrive. The one-day teacher training workshop is geared towards 6th 12th grade educators responsible for energy-related curricula (science and tech-ed). This workshop is presented by CITIZEN POWER, a Pittsburgh-based, nonprofit, energy advocacy organization and a Pennsylvania Department of Education approved provider. Registration is full at this time.

Time Frame: 09/27/2012 8:30AM - 4:30PM

Credit Hours: 6 Hour(s)

Grade Level(s): K,1,2,3,4,5,6,7,8,9,10,11,12

Location: Children’s Museum

Fee: free

Provider Organization: Children's Museum of Pittsburgh

Sustainable Energy Workshop I: Energy Smart Schools, Wind Power & Solar Photovoltaics - Phipps Garden Center November 14, 2012

Teachers will gain knowledge and hands-on experience with renewable energy and energy efficiency technologies to introduce Energy Smart Schools, Solar Energy, and Wind Energy to the classroom. The workshop is FREE and participants receive six Act 48 credit hours, lunch, and over $170 of teaching resources including: a functional model wind turbine, a solar energy kit, a multi-meter, books, DVDs, a resource binder and flashdrive. The one-day teacher training workshop is geared towards 6th 12th grade educators responsible for energy-related curricula (science and tech-ed). This workshop is presented by CITIZEN POWER, a Pittsburgh-based, nonprofit, energy advocacy organization and a Pennsylvania Department of Education approved provider. Registration is full at this time. Teachers will have enough understanding to introduce these concepts to their students. Teachers will create a green building scavenger hunt, green building school audit and green building unit for their specific grade level. Time will be devoted to giving an overview of the PA Academic Standards in Environment and Ecology and how to apply these standards in developing green building lessons. Indigo Raffel, artist and environmental artist, is the instructor.

Presented By: Indigo Raffel

Time Frame: 10/13/2012 8:30AM - 4:30PM and 10/20/2012 8:30AM - 4:30AM

Credit Hours: 1 Credit(s)

Grade Level(s): K,1,2,3,4,5,6,7,8,9,10,11,12

Location: Children’s Museum of Pittsburgh

Fee: free

Provider Organization: Children's Museum of Pittsburgh

Sustainable Energy Education Project: Teacher Training FREE Workshop IU3

Teachers will gain the knowledge and hands-on teaching tools to introduce Solar Energy, Wind Energy, and Energy Efficiency technologies to the classroom. The teacher training workshop is geared towards 6th 12th grade educators responsible for energy-related curricula. The workshop is FREE and participants receive six Act 48 credit hours, lunch, and over $170 of teaching resources including: a functioning model wind turbine, a solar energy kit, book, DVD, a resource binder and flashdrive. Citizen Power is a Pittsburgh-based, nonprofit, energy advocacy organization and a PA Department of Education approved provider. Registration is full at this time.

Time Frame: 09/27/2012 8:30AM - 4:30PM

Credit Hours: 6 Hour(s)

Grade Level(s): 6,7,8,9,10,11,12

Location: Phipps Garden Center, 1059 Shady Avenue, Pittsburgh, PA

Fee: FREE

Provider Organization: Citizen Power, Inc.

INQUIRY AND DESIGN

Allegheny Intermediate Unit Continuing Professional Education

Many AIU courses are science related and have instructors from organizations such as the Pittsburgh Zoo, the Carnegie Science Center, Beechwood Farms and the Carnegie Museum of Natural History. Courses are offered throughout the year and during the summer. Participants in courses earn inservice credits which can be applied to Level II and Act 48 requirements. Some of the continuing professional education courses are offered in a traditional, face-to-face setting, but there are also a series of courses available to educators online. The courses are related to standards and focus on content in language arts, mathematics, and science. The courses were developed by classroom teachers, and have classroom teachers as the instructors.

Credit Hours: N/A

Grade Level(s): Preschool, K,1,2,3,4,5,6,7,8,9,10,11,12

Location: varies

Fee: Contact AIU Continuing Professional Education

Provider Organization: Intermediate Unit 3

Amazing Kids - Building Inclusive Classrooms

It's natural that the Children’s Museum of Pittsburgh sponsors this class for educators as they prepare for today's classes filled with children of a wide range of abil-
ities all amazing! The interdisciplinary and interactive setting of the Children’s Museum is the perfect inspiration for Amazing Kids where participants will gain valuable insights into some of the health challenges that are now more commonly found in today’s classrooms: cerebral palsy, spina bifida, brain injuries, intellectual and learning disabilities, hearing and sight impairment, asthma, autism, and seizure disorders. Participants will also learn how to implement that knowledge in order to help students accept and appreciate each other, regardless of differences. Bruce Adamson and Judy Parker are both experienced instructors at the Children’s Institute.

Presented By: Bruce Adamson, Judy Parker

Time Frame: 09/29/2012 8:30AM - 4:30PM and 10/06/2012 8:30AM - 4:30PM

Credit Hours: 1 Credit(s)

Grade Level(s): Preschool, K, 1, 2, 3, 4, 5

Location: Bayer Professional Development Academy at ASSET

Fee: Call for pricing

Provider Organization: ASSET STEM Education

Early Childhood Initiative


Presented By: ASSET Resource Teachers

Credit Hours: N/A

Grade Level(s): Preschool, K

Location: Bayer Professional Development Academy at ASSET

Fee: Call for pricing

Provider Organization: ASSET STEM Education

Engineering is Elementary (EiE)

EiE has created a research-based, standards-driven and classroom tested curriculum that integrates engineering and technology concepts and skills with elementary science topics. EiE lessons not only promote K-12 STEM learning, but also connect with literacy and social studies.

Presented By: ASSET Resource Teachers

Credit Hours: N/A

Grade Level(s): 1, 2, 3, 4, 5

Location: Bayer Professional Development Academy at ASSET

Fee: Call for pricing

Provider Organization: ASSET STEM Education

Free Teacher Training Missions

The Challenger Learning Center at WJU provides free professional development sessions via video conference for any of our distance learning programs on www.e-missions.net. Teachers will take on the roles of specialists in a simulated mission and use their math skills and science knowledge to solve problems using team approach. This is a great way to show how engaging and exciting video conferencing can be and makes for a fun teacher in-service or professional development day session.

Presented By: Flight Director at CLC via vc

Credit Hours: N/A

Grade Level(s): 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Location: held at your location

Fee: FREE; no fees associated with this service

Provider Organization: Challenger Learning Center

Inquiry in Elementary Science

The Education and International Activities Division’s K-8 Science Office will provide professional development workshops for teachers of students in grades 3-8. These workshops focus on the inquiry and chemistry-related content standards in the National Science Education Standards. The goal of these workshops is to equip elementary teachers with the skills and knowledge required to use a more inquiry-based approach in their teaching of chemistry concepts. Teachers will conduct hands-on chemistry investigations that integrate the attributes of inquiry-based teaching and learning with age-appropriate chemistry content knowledge.

Presented By: ACS K-8 Science Team

Credit Hours: N/A

Grade Level(s): 3, 4, 5, 6, 7, 8

Location: Varies

Fee: Contact K-8 Science Office

Provider Organization: American Chemical Society

Institute for Assessment (IFA) Elementary/Middle School

With a focus on formative assessment, IFA participants will: 1. Learn the differences between summative and formative assessment with regard to purpose, form and use 2. Construct a framework of knowledge about the characteristics of formative assessment and formative assessment cycle 3. Investigate five formative assessment strategies that promote the use of evidence of student learning to inform instruction 4. Work within a learning community framework to implement an action plan that integrates formative assessment strategies into their classroom practice.

Presented By: ASSET Resource Teachers

For additional resource listings, visit the Resources for Educators web site at www.pa-edresources.net
Pre-K through 8 Module Professional Development
These one to three day courses (depending on the module) enable educators to discover the STEM concepts, skills and attitudes embedded in a FOSS, STC, SEPUP or Engineering is Elementary hands-on science module. Teachers will explore investigations, concepts and materials as both teacher and learner. Teachers will benefit from in-depth modeling of strategies within each lesson including inquiry, assessment and note-taking. Teachers will leave with a deeper understanding of the concepts introduced and strategies for improving student achievement.

Presented By: ASSET Resource Teacher
Credit Hours: N/A
Grade Level(s): K,1,2,3,4,5,6,7,8
Location: Bayer Professional Development Academy at ASSET
Fee: Call for pricing
Provider Organization: ASSET STEM Education

Research Experiences for Teachers
Teachers work in research labs with faculty and students to learn about engineering disciplines and to assist the faculty members as they design classroom lessons that can be used to help students understand how the content that they are learning is applied by people in "real-life" careers. Presented by: Carnegie Mellon researchers/scientists.

Credit Hours: 75-200 Hour(s)
Grade Level(s): 6,7,8,9,10,11,12
Location: Carnegie Mellon University
Fee: funded by National Science Foundation
Provider Organization: Carnegie Mellon Gelfand Cntr. for Service Learning

Science Matters Program at Intermediate Unit 1
A variety of courses to increase content knowledge, improve instructional strategies, implement performance assessments and prepare for the PA State Science Assessment Tests are available throughout the year. The course content is aligned to the PA Standards for Science & Technology and Environment & Ecology. A complete list of courses can be found in the IU1 course catalog at www.iu1.k12.pa.us. Act 48 and IU credit are available. The Science Matters staff can also assist school districts with science curriculum selection, standards alignment, coordinating modular trainings and modeling classroom strategies. Contact the Science Matters office to arrange a consultation.

Credit Hours: varies Hour(s)
Grade Level(s): K,1,2,3,4,5,6,7,8
Location: Children’s Museum of Pittsburgh
Fee: varies, call for a quote
Provider Organization: Science Matters

Science NetLinks
Providing a wealth of resources for K-12 science educators, Science NetLinks is your guide to meaningful standards-based Internet experiences for students. The Tools section is our latest addition to the host of Science NetLinks resources for teachers -- a myriad of web resources designed to truly enhance their science lessons. The Tool Index allows you to quickly and efficiently identify some of the best online experiences and sort them by benchmark, grade level, or title.

Credit Hours: N/A
Grade Level(s): K,1,2,3,4,5,6,7,8,9,10,11,12
Fee: free on-line
Provider Organization: American Assoc. for the Advancement of Science

For the latest information, visit the Collaborative’s web site at www.aiu3.net/msc
Teaching Resources and the Museum: A Videoconference

Teachers can experience Distance Learning firsthand by participating in a 90-minute, live, interactive videoconference with Museum staff. Videoconference formats are straightforward: participants are able to see, hear, and speak with a Museum educator in real time via a television monitor, and that presenter is able to see, hear, and speak with participants. This program is designed to review the range of Museum resources that can help teachers to better address Pennsylvania’s Academic Standards.

Presented By: Patrick McShea, Susan McJunkin, and Docent staff

Credit Hours: 1.5 Hour(s)

Grade Level(s): Preschool, K,1,2,3,4,5,6,7,8,9,10,11,12

Location: Carnegie Museum of Natural History

Fee: $90 per group

Provider Organization: Carnegie Museum of Natural History

What is Research?

Participants will interact with faculty, graduate and undergraduate students to develop a broader understanding of what it means to conduct research and how research is integrated into the work of a scientist or engineer. We will also look at opportunities for middle and high school students to become engaged in research activities and how they can share their work through competitions and other programs that are conducted regionally. This workshop is funded by the Siemens Foundation.

Presented By: Faculty, staff and students from Carnegie Mellon

Credit Hours: 17 Hour(s)

Grade Level(s): 6,7,8,9,10,11

Location: Carnegie Mellon

Fee: funded by the Siemens Foundation

PHYSICAL SCIENCES/ CHEMISTRY AND PHYSICS

Journal of Chemical Education High School Chemed Learning Information Center (CLIC)

The Journal of Chemical Education has many resources designed to meet the needs of high school teachers. The JCE High School CLIC collects these resources to save you time. CLIC gathers and categorizes items relevant to high school teachers from issues dating back to September 1996 through the current issue. Diana Mason, JCE’s High School Chemistry editor, and Erica Jacobsen, the associate editor, write a column for high school teachers. It offers highlights of the latest published developments in the Journal that would be especially suitable for the high school classroom or laboratory. Announcements of meetings, workshops, and funding opportunities are also included to help high school teachers continue their professional development. The High School Office welcomes any suggestions from teachers who may know of important resources and events. Those who are looking for advice on how to publish their ideas and have them immediately brought to the attention of our high school readership through the Especially for High School Teachers column are encouraged to contact Diana at dmason@unt.edu or Erica at jacobsen@chem.wisc.edu.

Credit Hours: N/A

PHYSICAL SCIENCES/ CHEMISTRY AND PHYSICS

Provider Organization: Carnegie Mellon Gelfand Cntr. for Service Learning

Grade Level(s): 9,10,11,12

Fee: American Chemical Society fee structure

Provider Organization: American Chemical Society

Modeling Instruction for Middle and High School Science Teachers

We plan to carry out professional development (PD) activities for high school and middle school physics and physical science teachers using the Modeling Instruction. Modeling Instruction is a research-based approach for teaching science that was designated one of the seven best K-12 educational technology programs out of 134 programs in 2000 by the US Department of Education. Moreover, Modeling Instruction in Physics was designated in 2001 by the US Department of Education as one of two exemplary programs in K-12 Science Education out of 27 programs evaluated. The Modeling approach employs a research-based pedagogy in which students learn both science and scientific method simultaneously and are constantly engaged in the learning process. In this approach, hands-on and minds-on investigations are combined with appropriate use of technology and mathematical modeling to enhance student learning. Students work with their peers and the instructor acts as their guide to ensure that students build on their prior knowledge and get an opportunity to construct a robust knowledge structure.

Presented By: Drs. Kathy Malone, Kalyani Raghavan, C. Singh

Credit Hours: 40 Hour(s)

Grade Level(s): 6,7,8,9,10,11,12

Location: University of Pittsburgh

Fee: None

Provider Organization: University of Pittsburgh Science of Learning Center (PSLC)

For the latest information, visit the Collaborative’s web site at www.aiu3.net/msc
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<thead>
<tr>
<th>School District</th>
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<th>Phone Number</th>
<th>Email Address</th>
</tr>
</thead>
<tbody>
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Teachers Building Capacity

Teachers and administrators representing Math Science Partnership school districts participated in the SW PA Math Science Partnership in 2011-2012. They have built capacity that can be shared with other educators. Listed below by district, the following key indicates the nature of their experiences. Math concepts.

A Three days of professional learning for Administrators in supporting effective instruction in 2011
CoP Ten days of Communities of Practice within their districts during the 2011-2012 school year with 4 days follow-up in 2012-2013. See the article on page 21 for full description of this experience.
M-A-11 Ten-day Math Institutes in Summer 2011 focused on the big ideas of Algebra
M-F-12 Ten-day Math Institutes in Summer 2012 with 4 days follow-up in 2012-2013 focusing on Fractions
M-L-12 Ten-day Math Institutes in Summer 2012 with 4 days follow-up in 2012-2013 focusing on Linear Functions and Proportional Reasoning
M-P-12 Ten-day Math Institutes in Summer 2012 with 4 days follow-up in 2012-2013 focusing on Patterns, Functions and Change
M-I-12 Twelve days of the Intel Math Program focused on deepened understanding of K-8 math concepts
S-B-11 Ten-day Science Institutes in Summer 2011 focused on the big ideas of Biology
S-P-11 Ten-day Science Institutes in Summer 2011 focused on the big ideas of Physical Sciences
S-E-12 Ten-day Science Institutes in Summer 2012 with 4 days follow-up in 2012-2013 focusing on Ecology
S-G-12 Ten-day Science Institutes in Summer 2012 with 4 days follow-up in 2012-2013 focusing on Genetics
STEM Ten days of STEM professional learning communities during the 2011-2012 school year with 4 days follow-up in 2012-2013.

Adelphoi Education: Mary Pat Lawson S-B-11
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Cornell School District: Jaclyn Apple garth M-I-12, Megan Carpenter M-I-12, Robin Freiss M-I-12, Colleen Peters M-I-12, Julie Roncone M-I-12
Connellsville Area School District: Robert Shaner S-B-11
Diocese of Pittsburgh: Elizabeth Bell M-A-11, Tanya Evans S-P-11, Susan Shick M-I-12
Dr. Robert Ketterer Charter School: Sara Belt M-A-11
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Fox Chapel School District: Debbie Fetterman M-F-12, Sallie Kaan M-F-12, Greg Schubert S-B-11


Hempfield Area School District:  Julie Novak S-G-12

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PA Virtual Charter School:  Amy Airgood M-L-12

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This *Math & Science Collaborative Journal* is dedicated to The memory of Dr. Z (Ted Zaleskiewicz)

1938-2012

It is with gratitude and sadness that the Math & Science Collaborative dedicates this issue to Thad P. Zaleskiewicz, Professor Emeritus at the University of Pittsburgh-Greenburg, who passed away on April 23, 2012. Ted, also known as Dr. Z, was a dedicated scientist and educator and long-term colleague and friend of the Math & Science Collaborative. Ted was a long-time member of the MSC Steering Council. When the Math & Science Collaborative brought together educators from SW Pennsylvania to write a Science Curriculum Framework, Ted was ready to lend his extensive physics expertise to the project. Fondly referred to as the “physics cop”, he kindly and enthusiastically worked with the teachers to ensure that the “physics” was not compromised in the final document. His humor, kindness, and deep insight were appreciated by everyone. In the years to follow, Ted worked with the MSC science coordinators to plan and co-facilitate Teacher Leadership Academies and consulted on many other MSC projects. While many days were spent in intensive planning, Ted never tired of arguing fine points of activities to ensure that they would not convey misconceptions.

During his tenure as a physics professor at Pitt Greensburg, Ted, with the help of his colleagues created a natural science course for non-science majors, which immediately became a very popular offering. Ted also was one of the founding contributors, and later president of the Contemporary Physics Education Program (CPEP), a non-profit organization that develops teacher materials suitable for introductory science classes. Last year, Ted was honored with the Carnegie Science Center award for University/Post-Secondary Educator Award. He is survived by his four children, their spouses, and five grandchildren. Ted will be missed and fondly remembered by everyone who knew him.