Strengthen Your STEM (Science, Technology, Engineering, and Mathematics) Thinking

MEC 2010 – ASU – Tempe, AZ

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What is STEM?

- STEM is an acronym – Science, Technology, Engineering, and Mathematics. What it can teach is far greater than the sum of its parts.
- STEM is a current movement in the United States to address scientific and technological education considered essential to our economic growth, national security, and a productive future.
- Our nation's prosperity depends on how well we educate our children in science, technology, engineering, and mathematics for an innovative thinking future.
- STEM is directed towards satisfying the need for skilled, knowledgeable, and ethical citizens ready to succeed in life.

Why STEM?

- All indicators show that American schools have lost their lead in providing high quality science, mathematics and technology education.
- *(2008 Report – 25th in math, 21st in science out of 30 industrialized nations)*
- To excel in most contemporary endeavors, young Americans will need at least a basic understanding of science, technology, engineering and mathematics (STEM) concepts.

What are selected goals of a STEM education?

- Provide a rigorous and diverse curriculum with an emphasis on science, technology, engineering and mathematics.
- Create STEM learning experiences that start in early grades and continue through higher education.
- Develop career awareness and a passion to excel.
- Increase the number of graduates who have an interest and expertise in STEM subjects.

Additional attributes of a STEM education

- Any learning environment can create STEM experiences.
- Critical thinking learned through STEM education can be applied across all disciplines - from humanities to everyday problem solving; and higher-level math, science, and engineering.
- Draws students from all economic levels, diversity levels, and various types of schools.

Where and when did STEM originate?

- Colonial Era – Benjamin Franklin (1749). "Proposals Relating to the Education of Youth in Pennsylvania."
- Rensselaer Polytechnic Institute (1824). First University in the English speaking world to teach practical arts to tenant children.
- Land Grant Act (1862). Agricultural and Mechanical Institutions were created.
- Vocational Education Act (1917). Federal Government supported career and technical education.
- National Science Foundation (started 1950). With Sputnik came physics, chemistry, biology, and mathematics.
- The overlooked STEM imperatives – Background and history of the STEM movement by Salinger and Zuga. (2009)

What do STEM activities look like?

- Emphasize mathematics, physics, and engineering by building a LEGO robot and presenting designs.
- Focus on rocket design, physics, fluid dynamics, engineering, and aerodynamics. Students “Build a Rocket” unit.
- Projects about the evolution of new farming equipment, safer drinking water and food, electric vehicles, faster micro chips.

Where are the resources?

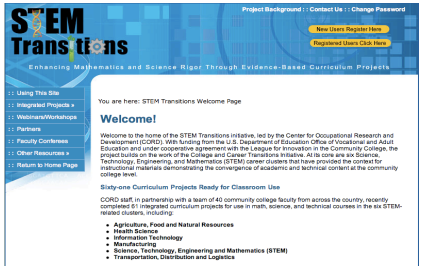
- Developing the STEM Education Pipeline: ACT
- Innovate America, National Innovation Initiative Summit and Report: Council on Competitiveness
- One Giant Step for STEM Education: NASA and the National Science Foundation form an agreement to work together to expand STEM opportunities.
- The Looming Workforce Crisis: Preparing American Workers for 21st Century Competition: National Association of Manufacturers
- The Science and Engineering Workforce: Realizing America’s Potential
- National Science Board

Where are the resources?

- www.stemequitypipeline.org

STEM Transitions Project

www.stemtransitions.org



NSDL

THE NATIONAL SCIENCE DIGITAL LIBRARY

http://nsdl.org

What organizations are working on STEM issues?

- International Technology Education Association (ITEA), National Science Teachers Association (NSTA), National Council of Teachers of Mathematics (NCTM)
- National Governors Association (NGA)
- Triangle Coalition
- STEM Education Coalition
- National Science Digital Library (NSDL)
- National Science Foundation (NSF), National Aeronautics and Space Administration (NASA)
- International Society for Technology in Education (ISTE)

Funding STEM Programs

Arizona State University has invested more than $100 million in research university-wide and has funded more than 72 official STEM outreach programs that extend to students in the K-12 system as well as its own college students.

Arizona's Goals include:

- improving K-12 math and science education;
- strengthening the skills and aptitude of teachers through more specialized training;
- and building a pipeline of students prepared to enter the university and graduate with STEM degrees.

What legislative or agency action has taken place?

- America Competes Act
- Higher Education Act
- National Assessment Governing Board – Probe on Technological Literacy
- Department of Education/National Science Foundation
- Triangle Coalition

How will success be measured?

- Number of graduates in STEM fields.
- Number of people who choose a STEM career.
- Reduction of achievement gaps and enhanced student learning in higher-level thinking.
- Engaging formal and informal educational assets.
- Better curriculum, assessment, teacher quality, leadership, and community engagement.

What Students Need to Know: 21st Century Skills and ICT Literacy

The future will demand people who can express themselves effectively with images, animation, sound, and video; solve real world problems that require processing and analysis of thousands of numbers; evaluate information for accuracy, reliability, and validity; and organize information into valuable knowledge. Yet, students are not learning these skills in school.

What Students Need to Know: 21st Century Skills and ICT Literacy

- The nature of mathematical and scientific thinking
- The importance of math, science and technology in society
- Strategies needed for rigorous inquiry and problem solving
- Strategies for representing data visually
- Strategies for clearly communicating scientific/ mathematical discoveries
- Pedagogies for enhancing mathematical/scientific thinking in elementary and secondary students

Our call to action is educating various publics

- Talk to parents, administrators, and curriculum developers.
- Provide examples and models of excellence.
- Articulate our role in STEM education.
- Contact legislators and corporate leaders - advocacy. www.edtechactionnetwork.org/

Education over the Internet

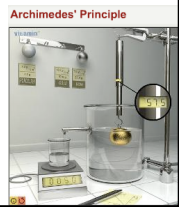
"Education over the Internet is going to be so big it is going to make email look like a rounding error."

- John Chambers, Cisco CEO

An Online Solution
www.adaptivecurriculum.com

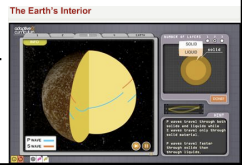
Adaptive Curriculum -

an online system designed to enhance teaching and learning in math and science for teachers and students in the middle grades

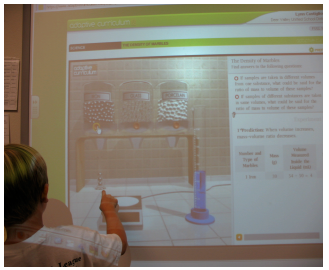


Math and Science *Activity Objects*

Adaptive Curriculum has more than 230 Math and Science *Activity Objects* in its expanding standards-based lessons.



Science – Mass and Volume



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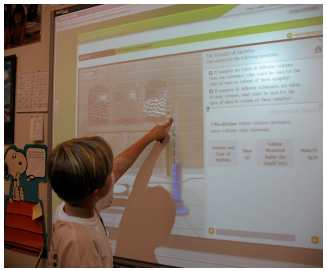
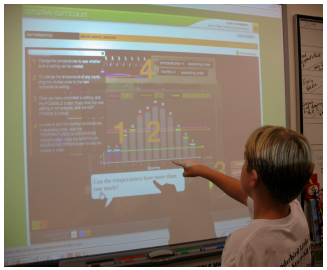


Math– Mean, Median & Mode



QUESTIONS ???

THANK YOU!