

November 15, 2011

Regards: STEM Summary

Purpose: Clarify "STEM" education in less than two pages

### What ? Project Based Learning

The acronym STEM stands for Science, Technology, Engineering, and Mathematics. The narrow use of the term is to "revolutionize" the teaching of subject areas such as mathematics and science by incorporating technology and engineering into regular curriculum by creating a "meta-discipline". The four parts of STEM have been taught separately and most of the time independent from each other for years. By adopting the STEM philosophy Science, Technology, Engineering, and Mathematics all play an integral part in the teaching of the whole. The science, engineering, and mathematics fields are made complete by the technology component that provides a creative and innovative way to problem solve and apply what has been learned. The broader use of the term includes the missing letters L and A and possibly even PE. Language, Arts and physical education play an essential part in the "Project Based" approach to learning that STEM embodies.

### STEM Goals

The STEM goal is to provide Interdisciplinary "STEM-learning" communities to build social networking skills, knowledge, and partnerships. Stem Facilities encourage learn-by-doing. Students engaged in a STEM education will quickly access world-wide knowledge bases, communicate and collaborate in multiple ways, tackle real-world problems and design real-world experiments, collect data, analyze data, and formulate and communicate conclusions.

### Why STEM? Our Future

There is growing concern that there is not a sufficient number of students, teachers, and practitioners in the areas of science, technology, engineering, and mathematics. A large majority of secondary school students fail to reach proficiency in math and science. Many are taught by teachers lacking adequate subject matter and knowledge. In a nation considered the world leader in scientific innovation the rate of STEM degree attainment appear in adequate to meet the demands on a changing and competitive global economy.

As the 21<sup>st</sup> century global marketplace changes, students must excel in science, math, technology and engineering to become a contributor to the marketplace. As students must excel in the STEM, we should not forget our need to think, analyze and communicate (remember our L and A). In fact, high tech companies have jobs that they cannot fill today due to a lack of qualified candidates. As the demand for scientists and mathematicians is projected to grow dramatically with the importance of alternative energy and global warming, the number of students going into these fields is not growing at a comparable rate.

### Activities that promote STEM:

Initiatives that can raise awareness and capacity of all students to pursue career possibilities in the areas of science, technology, engineering, and mathematics which include:

- Advocate Interdisciplinary STEM-learning communities that will build social networking skills, knowledge, and partnerships essential to success in a STEM-based society.
- Promote facilities that will become learn-by-doing. Students will quickly access world-wide knowledge bases, communicate and collaborate in multiple ways, tackle real-world problems and design real-world experiments, collect data, analyze data, and formulate and communicate conclusions.
- Development and application of 21<sup>st</sup> Century skills for all students in all disciplines through the use of project/problem based learning.
- Introduction of STEM units in elementary grades.
- Hands-on robotics study and competition at the middle school level within technology education classes
- Integrated Art and STEM projects.
- A project/problem based "Introduction to Engineering" course at the high school level which will prepare students for successful participation in college level engineering disciplines.
- Development of individual learning plans in grades 6-12 to explore opportunities and select appropriate educational pathways for STEM careers.
- Local business and industry partnerships for hands on applications and mentorship.
- Local public discovery centers/libraries/museums that can assist local business, interest children and serve as a resource:
- Promote science/technology teaching, learning, research that improves conceptual understanding, processing skills, and problem-solving skills.



- Provide science/technology educational programs for K-12 students based on national and state teaching/learning standards that will enhance learning and test scores.
- Strive for multicultural and gender-equitable-science/technology education.

**Architecture for STEM Education:**

When a school district or campus advocates a project based learning approach, how does it affect design of the space(s) or classrooms? The response to this question can vary widely based on the specific needs and goals for the district, site and facility improvements. On one end of the spectrum the changes are in instruction and no change in facilities is needed. At the other end of the spectrum is the adapted reuse or new facilities that can receive the educational approach with specifically and uniquely designed spaces. The answer, no doubt lies between. Several factors to consider are:

- Clarify the goals of a project and its relationship to its site, campus and community.
- Operational understanding on staffing and using the facility.
- Faculty understanding of the implications of shared and flexible use of spaces.
- Educational group sizes (class sizes).
- The physical needs of complimentary and variety of learning environments
- Clarity of curriculum requirements and a level of specificity on lesson plans.
- Flexible and multipurpose to support individual and collaborative needs.
- Use of technology based communication systems that connect students both locally and globally.
- The building structure can be a model for learning
- Be practical on building budgets, in the end the attitude and vision will be its success.
- The building is one tool to assist in serving the educational goals.

Resources used in preparation:

- <http://stemeducation.com/about/>
- <http://www.institutefordiscovery.org/STEMfuture.html>
- Science, Technology, Engineering, and Mathematics (SEM) Education: Background, Federal Policy, and Legislative Action-CRS Report for Congress
- <http://drpfconsult.com/understanding-the-basics-of-stem-education/>
- [http://www.marylandpublicschools.org/MSDE/programs/stem/stem\\_links](http://www.marylandpublicschools.org/MSDE/programs/stem/stem_links)
- Central Coast STEM Collaborative

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Less than two pages...



It will be in their hands...will they be prepared?

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