

*Published by GIFTED EDUCATION PRESS; 10201 YUMA COURT;  
P.O. BOX 1586; MANASSAS, VA 20108; 703-369-5017 [www.giftedepress.com](http://www.giftedepress.com)*

**STEM — The Perfect Transition from School to Work for Gifted Students**  
**Harry T. Roman Distinguished Technology Educator**

**What STEM is About**

- STEM is an educational paradigm that integrates the curriculum – both process and content oriented, and standards-based.
- It exemplifies open-ended problem solving in the workplace representing life-on-the-job after graduation from either high school or college through team-based, head and hands learning.
- It uses the scientific inquiry process (asking questions), the invention process (creativity), and the engineering design process (designing with constraints).
- STEM’s fundamental premise is that the world is interconnected, and solving problems is an inter-disciplinary and multi-dimensional endeavor.....involving active learning, teamwork, collaboration, and student empowerment.
- It challenges students to become comfortable with open-ended, context based problem-solving.....defining the problem first – then asking high quality questions so robust and high quality solutions can be evaluated. The questions asked determine the quality of the solution(s).
- Problem solution is necessarily an iterative process. There is no answer in the back-of-the book, or a discrete solution that is “right.” It is about asking questions and exploring the problem, and then designing a solution that answers the questions. (Non-linear, insightful thinking, lateral thinking, and experiential insights can play a powerful role here.)
- STEM shines best when students see how math can be used for practical applications, and gain an appreciation of the problem’s magnitude and significance.
- Designing with constraints often uses a matrix-style of solution identification, assessment and selection. High quality solutions blend together the technical and non-technical concerns in potential solutions.
- Teachers should conduct the classroom in a Socratic style, encouraging students to try new things, and document their work in order to learn from failure and be ready to try again. Teachers tie the students to the problem, leading them to pursue solutions through their students’ own natural exuberance and creativity.
- The arts, humanities, and language skills are very important. In its most concentrated state, STEM is a complete integration of the entire academic curriculum.
- Good written and oral communications are an absolute must for STEM students. In the workplace, great ideas poorly presented will not be implemented.

**STEM Pays**

At a time when STEM is such a big topic in the educational vista, it is good to show the raw power of a STEM-based education – to drive the point home that a science, technology, engineering, and mathematics based education has great earning power. Here below are some sample salaries for those who work in a STEM related career. Notice the high starting salaries and the median value for that job in mid-career (generally folks with 20-25 years of seniority in their field).

<b><u>Career</u></b>	<b><u>Starting Salary</u></b>	<b><u>Mid-Career</u></b>
Petroleum Engineering	\$97,900	\$155,000
Chemical Engineering	64,500	109,000
Electrical Engineering	61,300	103,000
Physics	49,800	101,000
Applied Math	52,600	98,600
Computer Science	55,600	97,900
Biomedical Engineering	53,800	97,800
Mechanical Engineering	58,400	94,500

What should be obvious here is that a good grounding in a multi-dimensional, multi-disciplinary problem solving environment is something business and industry value, and are willing to pay for in the form of high salaries. This can be interpreted as meaning that such an educational background has serious potential for improving a company’s standing and help it compete in the global economy. Salaries reflect a company’s willingness to invest in employees with great skill sets that can be applied on behalf of a company and its shareholders. STEM pays!

**Critical Employee Skills – Leveraging STEM**

The business world is a multi-dimensional environment that expects its workers to solve problems cooperatively, through inter-disciplinary, team-based project activities while assessing, evaluating, and making tradeoffs as necessary. Rigorous adherence to a STEM problem solving regimen is a superb training ground for the mastery of critical employee skills. Here are the critical skills

globally competitive employers will look for. Please notice also how all these skills depend very much on a solid bedrock foundation of good communication skills.

**1) Analyze Information.** In an information-rich company, people with good planning, organization and analysis skills will be in key positions to manage, process and interpret the huge flow of internal and external data and information. With solid logical and analytical skills, employees should be able to understand the significance of the information and recommend action.

**2) Convert Information Into Knowledge.** All innovative companies strive to convert raw data and corporate-gathered information into saleable products and services. Executives use this knowledge to help them gain competitive and strategic advantage over other companies. Significant value is placed on individuals who can convert data and information into knowledge, and do it quickly, efficiently and consistently.

**3) Sell New Ideas to Management.** The ability to implement new ideas and concepts is the real measure of success. To bring ideas to fruition, one must be proficient in selling ideas to the executive who can grant access to the necessary corporate resources. Remember — no one will give poorly packaged and presented ideas the time of day, regardless of how promising they may appear. Employees must skillfully present: \* Market analyses for proposed ideas; \* Pricing and marketing information; and \* Timing related to return on investment.

**4) Communicate Concepts Clearly and Succinctly.** This skill is a “biggie.” Careers have been – and continue to be – severely jeopardized because of poor communication skills. In fact, without them, one’s career could be permanently stunted. Employees *must* be articulate. Today’s managers often judge employees by how well they express themselves, both orally and in writing. Managers need condensed kernels of information around which to base their decisions. They don’t have time to wade through endless pages of reports or be intrigued with dazzling, yet long-winded analyses. Succinct analysis wins the day. Employees are ambassadors of their companies, whether meeting with clients, giving a paper at a conference, or talking and interacting with members of the public or regulatory agencies. Communication skills are the absolute foundation for all the others.

**5) Plan for Timely Commercialization.** Getting new products to market is the way companies sustain their cash flow and generate new sources of it. Timely implementation begins with people who know how to plan, organize and execute the commercialization process. Knowing how to plan well allows an employee to handle a variety of different projects. It is also a skill that senior managers value. It sends a clear signal that one knows how to use precious corporate resources efficiently and effectively.

**6) Be a Team Player.** Teamwork and collaboration among corporate departments has become a mainstay of industry problem solving. Team members must possess excellent communication skills, present new ideas effectively, and resolve to act together to address corporate problems and needs. Articulate leaders connect their team members and their assigned tasks to the big corporate picture. Selecting the right mix of team members is as important as formulating the problems the team must address.

**7) Do Multi-Dimensional, Integrated Problem Solving.** Making sound business decisions require more than just the technical and economic aspects of a problem. The environmental, safety, social, political, and regulatory considerations of a new product are also important. Employees need a balanced education so they can make tough choices from a multi-dimensional selection of options. Employees who can think and reason about problems on multiple levels simultaneously are essential in today’s complex decision-making environments. Are today’s students well rounded and capable of multi-dimensional, integrated problem solving? Can they see the parts of a problem and the whole problem at the same time? Do they know how to ask the tough questions that will define and bound the problem for analysis?

**8) Seek Learning Opportunities.** Learning must be constant. Continually improving or rejuvenating one’s skills to meet new corporate challenges is absolutely essential. Employees must develop and maintain a life-long discipline of learning, honing skills, building new knowledge, and setting new goals. The global economy is a very unforgiving place.

The challenge to teachers and school systems will be to emphasize and practice these skills during the normal educational process in the classroom. How can these skills and their practice be embedded in the various subjects, classroom projects, design challenges, and team activities that gifted students normally do? Perhaps some engineers from local companies can be invited in to talk to students, and also interact with teachers to help jointly develop activities that will build such practice into the normal school day.

#### **Epilogue**

These videos referenced below from the North Carolina STEM Learning Network lend powerful credence to the discussions above. STEM is directly relevant for the 21<sup>st</sup> century workplace, and success in a globally competitive economy.

<http://www.youtube.com/watch?v=zWbD2yUFbXU>

<http://www.youtube.com/watch?v=T8kb68ZfGxg>

<http://www.youtube.com/watch?v=wS-IESwjCwE>

<http://www.youtube.com/watch?v=xT1MmTj5hPM>