

The stage for the “2011 Advancing the STEM Agenda Conference” was set with these thoughts on how educators must join together to engage the workforce of the future in this vital area.

# STEM: An Entrepreneurial Approach

Keith T. Miller

In a radio address, President Barack Obama said, “Today, more than ever before, science holds the key to our survival as a planet and our security and prosperity as a nation. It’s time we once again put science at the top of our agenda and work to restore America’s place as the world leader in science and technology.”

In many ways the president’s interest in science, technology, engineering, and mathematics (STEM) has energized the ongoing discussions among educators in K-12, higher education, and the workplace related to shaping tomorrow’s workforce. The fact that the world and its survival are becoming increasingly dependent on these interconnected fields has been recognized for quite a while, but reliable approaches for preparing students to succeed in that environment have not been adopted widely.

The challenge is to accept that there is no greater responsibility than to prepare the next generation of students to serve as the leaders of our future society. It is

up to the current generation of leaders and educators to set priorities and to establish a new precedent. As advances in STEM fields will drive our society and economy, future generations that are well versed in STEM areas will have a disproportionate effect on the direction of initiatives and developments throughout society.

Preparing for this future will take perseverance, creativity, and an entrepreneurial attitude. One STEM student will be developed at a time, and success will be built from the experience of failures. Ultimately, growth in STEM areas through improved curricula and practical applications will affect every aspect of life.

## Getting Started

Creating a strategic plan for our institutions that includes STEM topics is certainly a very important place to begin this journey. We must ask the question, “What will our society need in the future to optimize our potential as a society and as human beings?” The need for a



strategic approach becomes imperative when we begin to think about what knowledge and skills are necessary to address upcoming challenges. Furthermore, almost every unit in our organizations will need to be involved in shaping the plan, ensuring its unit goals and objectives fold into the overall scheme. Only a unified, high-level approach that ties directly to future STEM requirements can provide the platform necessary to move us to the improved performance necessary for success.

Setting the priorities is a great responsibility, and working with each other and the next generation of adults to implement plans related to these priorities is a privilege. This opportunity creates a need to think differently, which can set new precedents and affect the way we tackle the STEM agenda.

For instance, thinking differently might lead to the belief that any age can be the right time to start learning—even in the STEM fields. We shouldn't exclude or dismiss any cohort group or any generation from STEM education. We need to demonstrate that learning truly is life long and incorporate appropriate approaches for all ages into our STEM plans.

Much research indicates that students should get involved in STEM courses in elementary school—or even as early as preschool and kindergarten. I would contend that STEM education parallels the study of languages where research findings support that greater success is attained when instruction begins at a young age. These statements probably reflect the ideal. Obviously, early exposure to STEM topics is best, but it is a relatively rare occurrence; however, we do have responsibility to make the ideal scenario happen to the greatest extent that we can.

### **Fostering Interest and Learning**

It seems that a serious gap currently exists between the perceptions of Americans toward STEM topics and the need for a greater focus on them to achieve success in the future. Many students in the United States do not seem to enjoy math or science. The challenges educators will need to overcome to prepare the workforce are immense.

This underlying disconnect appears related to what motivates our willingness to tackle education. Apparently, we are more likely to spend time

studying subjects we enjoy and think are fun instead of those that will benefit society and generate high-potential career paths for us.

Some of this lack of enjoyment, no doubt, is associated with the effort required to master math and science, which generally are viewed as more difficult subjects. Children and adults often experience failure when learning and applying science and math, and they can become discouraged. They focus more attention on topics where they feel more capable and successful. The innate tendency to avoid failure creates a barrier to learning that may be difficult to overcome unless we adopt new strategies that foster continuing effort.

The key is to recognize the value of failure as a process that provides a foundation for future learning. Furthermore, successful strategies ensure that excessive failure is not acceptable; a certain amount of failure makes us better, but too much failure undermines our confidence and brings out our self-protective behaviors. No one likes hitting his/her head against the wall continually, but many people enjoy beating the odds by tackling and overcoming an obstacle. To encourage engagement in STEM education, we must find the fine line between having too much failure and just enough.

As educators, we should attempt to speed up the mistakes because mistakes are going to happen. Temporary depression will occur in conjunction with these failures; it happens to all of us. How we respond as teachers, parents, and mentors is what makes the difference and matters most. We need to remember, "success is 99% failure" and be prepared to coach students through the down times to success.

Our goal should not be to turn every student into a mathematician, scientist, or an engineer. Instead, we should focus on adding one math or science student at a time to our institutions. We can achieve this objective if we implement an innovative approach based on the entrepreneurial model.

### **Implementing the Entrepreneurial Model**

From a business perspective, much of the growth, when there is growth in the United States economy, is due to the work of entrepreneurs and small business owners. Successful entrepreneurs are able to find a niche and take advantage of it. Many entrepreneurs have failed numerous times

before achieving success. If we think differently about education, we can establish a K-16 framework based on this same model that will drive improved workforce STEM preparation. Certainly, STEM courses are very important at every level of education.

We need to create a culture that presumes young children can enjoy and succeed when learning mathematics and other STEM subjects. This culture must be built on the belief that we have the approaches in place to stimulate interest and generate capability in these areas.

One way to capture the attention of students and generate dedicated effort to pursue a degree in the STEM field is to clarify the benefits of careers in these fields. Demonstrating the relatively higher earnings potential, associated better quality of life, and increased job security can be a strong incentive. Individuals with STEM skills entering industry tend to have higher salaries than those in other disciplines. Often those with two-year STEM degrees will make more entering the workforce than those with other types of four-year degrees. Furthermore, I anticipate that STEM graduates are likely to assume greater leadership roles as organizations around the world become more flat and expect middle managers to possess more technical skill.

What can we do to make STEM courses more attractive to students? How can we increase student success in these traditionally challenging courses? At the college level, we can integrate STEM courses with case studies and experiential activities to improve their effectiveness. We also can incorporate some aspects of STEM across the curriculum in English, social studies, and geography. For example, courses might include: "Psychology of Science and Technology," "Politics of Science and Technology," "Economics

of Science and Technology," "Business of Science and Technology," and "Sociology of Science and Technology."

Our efforts to engage students need to begin long before college, however. Some wonderful initiatives are available across the United States with an influx of summer camps, school partnerships, and mentoring programs with professionals, as well as public school/private industry partnerships. There are Saturday programs, speaker series, company tours, scholarship programs, grants, and more.

## Summary

Was the success of Albert Einstein, Steve Jobs, or Bill Gates a straight line of success? Probably not, there was likely a bump or two (some failure) along the way. If we think about STEM across the curriculum as an entrepreneurial venture and revisit how to educate holistically, we can challenge ourselves to meet the STEM needs around the world by the year 2025.



*Keith T. Miller*

*Dr. Keith Terrence Miller is the 13th president of Virginia State University. He worked in corporate America including stints at Pennsylvania Power and Light, Proctor & Gamble, and the Omnistaff Corporation. His professional academic career includes various instructional and administrative roles at Fairleigh Dickinson University, Quinnipiac College, Niagara University, and the University of Wisconsin, Oshkosh. In 2004, he was named president of Lock Haven University of Pennsylvania and later was named president emeritus. He can be contacted at [ktmiller@vsu.edu](mailto:ktmiller@vsu.edu).*