

# Talent Development in STEM Disciplines: Sparking Innovators

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*Editor's note: This is the second installment by our newest columnist. Dr. Roberts invites reactions, questions, and suggestions at [julia.roberts@wku.edu](mailto:julia.roberts@wku.edu).*

What role can specialized schools with a focus on mathematics, science, and technology have in sparking innovation? Such specialized schools can be and in some cases currently are leaders in promoting high-level content knowledge, creative and critical thinking, and problem solving – the basic ingredients of innovation. However, it is not a “given” that innovative thinking will be encouraged and promoted in these or other educational settings.

In a speech at the recent NCSSTMST Conference (2010) Jeniffer Harper-Taylor, President of the Siemens Foundation, stated that specialized secondary schools are “impacting the next generation of innovators.” What a tremendous responsibility and an awesome opportunity! Let’s discuss why and how our schools can impact the next generation of innovators.

What is so important about innovation in today’s society? Simply put, innovation fuels the economy. In a time of economic downturn, it is very clear how innovation can lead to recovery in our local, state, and national economies. Innovations – new ideas – create jobs. Innovative people are needed if the United States is to continue to be competitive in the global economy. Florida (2005) writes, “...it is by no means our nation’s manifest destiny to stay on top. To remain innovative, America must continue to attract the world’s sharpest and most creative minds. And to do that, it needs to invest in the further development, from both internal and external sources, of its talent base. Because wherever talent goes, innovation, creativity, and economic growth are sure to follow.”

*Innovation America: Building a Science,*

*Technology, Engineering and Math Agenda* (2007), a report released by the National Governors Association, focuses on the importance of innovation in today’s world. “In the new global economy, states need a workforce with the knowledge and skills to compete. A new workforce of problem solvers, innovators, and inventors who are self-reliant and able to think logically is one of the critical foundations that drive innovative capacity in a state.” Please remember that leaders in your state, legislators, and your governor are very interested in economic development. Keep them apprised of your school’s role in developing innovative professionals who can shape the economic future of your state as well as the nation. This is a selling point for the work that you do in your specialized school with a focus on STEM disciplines.

Ideas are and have always been the basis of innovation, but today new ideas are creating change at a more and more rapid pace. National Public Radio announces, “all music was once new” and the same can be said about ideas. The key is to put ideas together in new ways. Surely, an individual that all of us will recognize as an innovator is Bill Gates. Gates said that “[Smart] is an elusive concept. There’s a certain sharpness, an ability to absorb new facts. To ask an insightful question. To relate to domains that may not seem connected at first. A certain creativity that allows people to be effective.” This quote highlights the value of seeing ideas in new combinations, allowing for new possibilities. Remaining open to new ideas is an essential step in the creative process. But this doesn’t just happen on its own. Specialized schools should foster such an approach by deliberately teaching and expecting the integration of critical and creative thinking into learning.



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Undoubtedly, innovators have strong knowledge bases. It is not possible to be creative in a content area in which one has a limited background. In *Outliers* (2008), Malcolm Gladwell states that 10,000 hours are required for being truly exceptional in one's field. Of course, students in specialized schools won't be able to accumulate that number of hours, but they can get a good start on developing their expertise.

It is also important that students develop a variety of perspectives and that these different perspectives come from interests and knowledge in more than one content area. One of the things that specialized secondary schools do well is provide opportunities for students to learn content at complex and advanced levels. That is certainly a key step in innovation, but a step that must be accompanied by creative thinking.

"From an economic point of view, creativity is a form of capital – call it 'creative capital' (Florida)." Creativity can be fostered in schools or it can be stifled, unintentionally but stifled nonetheless. Creative thinking doesn't develop in a vacuum but rather it must be seen as a goal within a school that fosters new ideas and welcomes insightful questions. Creativity must be made a priority within the curriculum of classes at schools specializing in STEM disciplines if creative thinking is to be a hallmark of the graduates.

### **In what ways might specialized schools plan and implement opportunities to encourage creativity and innovation?**

(1) RESEARCH. Opportunities for research are abundant in our schools. Encouraging more and more students to avail themselves of research opportunities is a starting point. Having a staff member responsible for coordinating research opportunities is necessary in order to maximize the pairing of students with mentors and locating opportunities within and outside of the school. Research engaged in throughout the academic year can be enriched by summer research opportunities that extend learning and open the possibility of focusing full time on the research – something not possible during the academic year. Research requires thinking about a topic in new ways and being open to unintended discoveries. Research can

be individual or conducted with a mentor, a partner, or a team. It can also lead to national and international competitions that bring recognition to the individuals and to the school. Other opportunities for students come from presenting research at conferences and publishing the results.

(2) CREATIVITY. Making known to the teachers/professors that creativity is an important goal in STEM talent development. Unless the staff and faculty are working together to encourage creative thinking, creativity may get lost in the everyday routine of school. It is quite possible that the focus is strictly on facts; and, although a knowledge base is essential, it is also important that students are expected to apply their creative and critical thinking skills to that knowledge rather than strictly be able to provide the facts. Innovation is far too important to our future to allow that to happen. Perhaps professional development on strategies to promote creative thinking would be a valuable next step in making creativity a visible part of the curriculum. Each teacher must have a plan to embed creativity into his/her existing classes. Our schools also can provide seminars on creativity and bring entrepreneurs to share their experiences and to highlight the role of innovation in their work.

(3) EXTRACURRICULARS. Offering extracurricular opportunities with a focus on creative thinking can be key to sparking interest in innovation. Some examples of those extracurricular activities are Odyssey of the Mind and Destination Imagination as well as competitions in engineering, mathematics, and science. Staff and volunteers can sponsor and guide various extracurricular opportunities. For example, Amanda Beers, a student at Western Kentucky University, has been the sponsor for the Odyssey of the Mind (OoTM) teams at the Carol Martin Gatton Academy of Mathematics and Science in Kentucky. Amanda describes why this experience is a perfect match for Academy students: "Odyssey of the Mind is a great compliment to the curriculum offered at STEM-based schools, because it allows students to explore and develop a variety of aspects of their potential. Students discover that instead of having to abandon their creativity, it can become their greatest asset in establishing a successful

career in the sciences. OoTM allows students to work on testing and implementing their own designs, instead of being restricted to meeting the criteria set forth to earn a grade on a class project. Most importantly OoTM instills the essential importance of teamwork and collaboration on the regional, national, and international level that will prove vital for success in any career." Whether it is OoTM or the Society for Automotive Engineers' Collegiate Design Competition, activities that promote creativity and ignite innovation are critical in specialized schools.

Success in STEM fields of study in postsecondary education and the launching of STEM careers depend upon early and continuous development of talent in science, technology, engineering, and mathematics. Part of that development is the ability to think creatively and critically. This is too important to be left to chance. We must purposefully incorporate learning about creativity and innovation into the student experience. Moreover, we must afford students ongoing opportunities to practice and hone these skills. Too much of their futures as well as the future of our states and nation depend on doing so.

Take the example of Brian Bell and Nathan Knutson, University of Minnesota engineering students who are a part of Engineers Without Borders (2010). This humanitarian organization is currently focusing on Haiti, specifically the huge amounts of garbage covering the island after the earthquake. They have developed a portable solar cooker able to melt plastic garbage, and then that liquid is molded into useful products such as sports gear and sandals – a highly innovative solution to a massive problem. This example demonstrates what can happen when a rich knowledge base and problem-solving skills are coupled with creative and critical thinking. Innovation!

One closing point to remember is that our specialized schools can make a tremendous economic impact in our states and the nation. That is a selling point for specialized schools – legislators are always interested in the future and seeing specialized schools as economic assets (which they are) is vital to building support for new schools and for continuing our schools. It is

your responsibility to make the connections for decision-makers in your state between talent development in the STEM disciplines, innovation, and economic development. Don't assume that someone else will do that for you.

### Resources

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