

# Talent Development in STEM Disciplines: Developing Talent That Leads to Innovation

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*Editor's Note: Talent Development in STEM Disciplines explores issues related to specialized school students in each Journal issue. Dr. Roberts invites reactions, questions, and suggestions at [julia.roberts@wku.edu](mailto:julia.roberts@wku.edu).*

*Innovation* is a term being used frequently in economic and political discussions and also . Innovation has been the focus of several national reports. One such report, entitled *Innovation America* (2007), was issued by the National Governors Association. President Obama used the term in his January, 2011's State of the Union Address stating that "the first step in winning the future is encouraging American innovation.... We need to out-innovate, out-educate, and out-build the rest of the world." Others refer to this second decade of the 21st century as the Innovation Age, having moved beyond the Information Age.

Innovation fuels the economy by creating jobs rather than just filling them. So what does this term *innovation* connote? Merriam Webster's Collegiate Dictionary (2009) says that innovation is (1) "the introduction of something new" and (2) "a new idea, method, or device." *Preparing the Next Generation of STEM Innovators: Identifying and Developing Our Nation's Human Capital* (2010) describes STEM innovators as:

those individuals who have developed the expertise to become leading STEM professionals and perhaps the creators of significant breakthroughs or advances in scientific and technological understanding. A key component of innovation is the development of new products, services and processes essential to the Nation's international leadership. (p. 1).

What skills does a potential innovator need to develop? What characteristics must be encouraged among young scholars so that they learn to think like innovators? Here's what Intel says:

"Intel salutes today's innovators and believes a solid math and science foundation coupled with skills such as critical thinking, collaboration, and digital literacy are crucial to the success of tomorrow's innovators." ([http://bigthink.com/series/36#!selected\\_item=4529](http://bigthink.com/series/36#!selected_item=4529))

All of those skills as well as the math and science preparation are These should be fundamental components of the a student's experience in a specialized STEM secondary school with a focus on math and science.

The question then related to specialized secondary schools is how can students be prepared to be innovators? That question has several answers. Our schools prepare young people through learning experiences that promotes the following:

- (1) A strong background in math, science, and technology,;
- (2) An integrative approach to processing content, including background in the arts and humanities (Adding Art to STEM creates STEAM.);,
- (3) Investigative, probing thinking that leads to creative ways of seeing problems and/or addressing issues,;
- (4) The ability to work collaboratively while solving problems and/or conducting research; , and
- (5) The ability to persevere in spite of frustration and to learn from failure.

A heuristic model with innovation as the theme is shown in Figure 1 (Roberts & Boggess, p. 143).

Baxter, Bemiss, Inman, and Roberts developed this model to provide teachers and students with both



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direction into the kinds of thinking that lead to innovation and an overview to focus curricular implementation. The various verbs in the heuristic guide the thinking at various points in the investigative and problem-solving process.

Note the key words on the heuristic model – connect, inquire, create, analyze, enhance, and communicate. There is no specific starting point or ending point with the processes but rather each is important and occurs at various times within the investigative process.

Equally important are the verbs describing the six processes, such as notice, wonder, and imagine. Furthermore, innovative thinking is not limited to the study of STEM disciplines but should become a way of thinking both inside and outside of school.

Perhaps the most important point in the preparation of innovators is that while a strong background in math and science is a great start, it is not the end goal. Instead, Fallows and Wallace (2011) state:

Fostering innovation, in other words, isn't just a matter of improving the quantity or quality of math and science education. It's a matter of restructuring how we approach and teach all our subjects, from the liberal arts to math, science and engineering. And it means focusing as much on teaching how to combine those fields of knowledge and think in flexible, integrative, and creative ways, as we do on the subject matter itself.

The big problems in this world do not have right-answer solutions. Instead, solving problems related to sustainability, health, energy, natural disasters, and global climate warming change require innovative thinking. Asking the right questions is vital to solving real problems. Keeping one's mind open to possibilities is essential. Boosting and sustaining a vibrant economy depends on innovations that create new jobs; and often new jobs come as the result of innovations in science, technology, and engineering. The importance of innovation cannot be overestimated, and specialized STEM secondary schools of math,

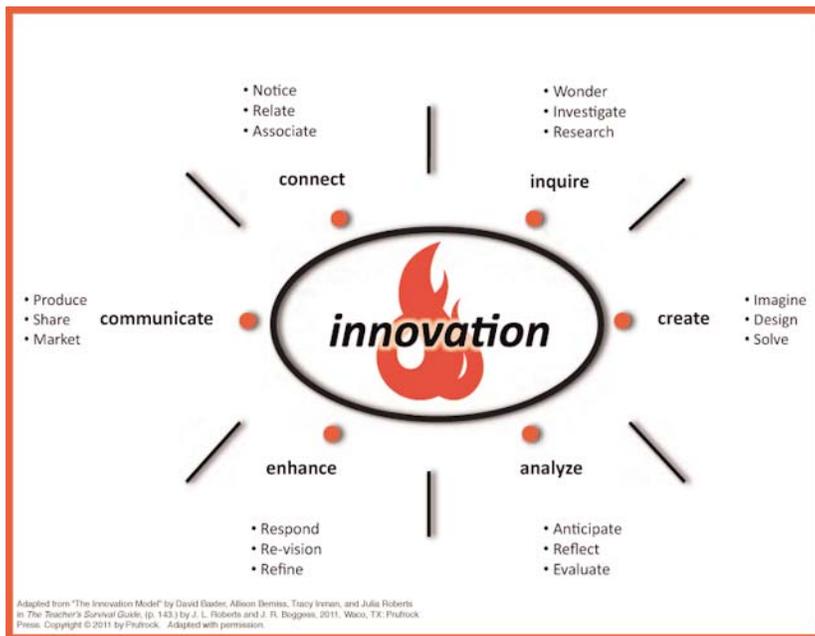


Figure 1

science, and technology can play an essential role in preparing young people to be innovators.

### Resources

- Fallows, J., & Wallace, L. (2011). Innovation isn't about math. *The Atlantic*. Retrieved from <http://www.theatlantic.com/national/print/2011/01/innovation-isnt-about-math/7042/>
- National Science Board. (May, 2010). *Preparing the next generation of STEM innovators: Identifying and developing our nation's human capital*. Arlington, VA: National Science Foundation.
- Roberts, J. L., & Boggess, J. R. (2011). *Teacher's Survival Guide: Gifted Education*. Waco, TX: Prufrock Press.