

## ***Exploration into the STEM Pipeline: To Understand and Move to Expand***

---

Andy Cavagnetto  
*Binghamton University –SUNY*

### **VEXATION**

After beginning my career working in the area of teaching strategies that promote science literacy, I have migrated toward studying argument in science education. I have most recently reviewed literature on the use of argument in science classrooms. While I have enjoyed this recent project, it has left me somewhat disenchanted. This work has allowed me to realize that argument is an area of study that is not of direct importance to most educators and the general public. It is an excellent example of an area of study that has unnecessarily developed its own specialized language to focus on minutia. Perhaps more disturbing is that we are moving toward minutia without sitting on mountains of empirical evidence suggesting that argument in science classrooms positively impacts student learning. Seeing myself as a pragmatic individual, I have decided to move back to reality by refocusing my scholarship.

In an effort to successfully make this shift in scholarship, I have decided to pursue studies associated with the diminishing STEM pipeline in the United States. These issues are becoming increasingly relevant as the significant U.S. advantage over other countries in quality of the STEM workforce is rapidly disappearing (National Academies of Science, 2007; National Center for Education and the Economy, 2008). Thus, it is clear that we are in a race with other countries to produce the most highly qualified, creative, and skilled scientists, mathematicians, and engineers who can lead the world in the development of new technologies and into new fields of study. From an education standpoint, the status of the STEM pipeline in the U.S. could be a potential game changer for the educational system. That is, if current trends and associated predictions continue and subsequently come to bear, the economic conditions of the U.S. could shift to the point that the federal government takes on a bigger role in education. While big government is not something that many Americans would sign up for, reduction in standard of living (if dramatic) could likely lead to new perspectives. There are already hints of this as the National Academy of Science has included the development of a voluntary K-12 science curriculum in its recommendations for improving K-12 science education. Most enticing to me personally, STEM is an area of scholarship at the intersection of a number of other big-picture issues. As an individual who loves to learn new things, this area of study will facilitate my learning of issues and disciplines in which I am generally naïve. Specifically, this line of scholarship would enable me to gain a richer understanding of major influences on people's everyday lives, both in the U.S. and abroad. Further, as a new father, it will allow me to keep foremost in my mind the world that my son will grow up in, contribute to, and hopefully without extraordinary hardship live in.

### **VENTURE**

The past two years I have worked with colleagues in the natural sciences and engineering to develop and implement a summer science institute (Go Green) for high achieving eighth graders. The purpose of the summer institute is to generate excitement about scientific and engineering courses of study and careers. This work started out as a state funded project serving 48 students and we are in the process of scaling it up to serve a larger number and more diverse population of students. In addition to high achieving students, this scaled up version of the institute will include students who are capable, but traditionally have not done well in school science. The inclusion of the new cohort will present challenges that this venture will seek to inform. Specifically, the new institute will require that we:

- a. reconceptualize our institute to provide an experience that is not characteristic of school science. Some aspects of our current model have a school science feel. While this has been accepted positively by our current high achieving cohort, it will likely not be well received by the additional population.
- b. maintain a connection with our students during the academic year (the new cohort will be with us for two consecutive summers). This will require creating established partnerships with local teachers.
- c. create an environment where traditional roles of gifted and intelligent slacker do not play out. In our new model, each student will have a shared history with at least one other student as they will be from the same school. As such, it will be easy to fall back into the roles that play out in school science. Therefore, in order for this model to succeed we will need to create an environment where all feel empowered to effectively contribute.

To address the first issue, I plan to identify organizations or individuals who have experience running summer music or athletic camps. In my experience, these day camps are very popular and have played an important role in growing their respective fields (e.g., basketball) Such networks may also have ideas about making science more accessible outside of school or formal settings. Accessibility would aid in maintaining a connection and creating empowered students. Secondly, I will seek guidance from computer science faculty regarding creating a platform or space to maintain a link with our students. This platform could potentially serve as a space to organize and partner with local teachers and school districts as well. I currently am a bit stymied on how to best attack the third challenge. What areas of study would be able to contribute ideas toward this problem?

In addition to this building of social capital, I plan to explore some diverse models of education by using the 2007 TIMSS data to gain a broader perspective on the nature of the problem. The 2007 TIMSS data appears to be a rich resource to provide information on a number of factors that could contribute to STEM participation such as educational models, instructional patterns, student attitudes and demographics, time in science class, and other student information. Are any of the factors that influence student STEM success transferrable to different contexts? In other words, can these factors be manipulated and subsequently implemented in U.S. schools? Are there cultural factors that influence student success (e.g., value in education)? Can such factors be fostered in new models to use in our schools and summer science institute? Although these are general questions, I view these as starting points that will lead to more defined and continual exploration.

This venture is my *current* conception I am hopeful that the conversation with other Crossroaders will move me beyond these initial ideas toward areas of exploration that will enhance my understanding of the STEM pipeline issue and our summer institute model.