

Mijajlovic, Steven  
Summer Reflection  
*New Lens, Connections, Grit, and the Process*  
6-Aug-14

As my Master's Project for Northwestern concluded a new academic journey began for me – the Michigan State STEM cohort. One of the first assignments was to watch “Why truly innovative science demands a leap into the unknown” by Uri Alon in a featured TED talk. Uri's discussion about the importance of learning over the course of one's journey, continuing to learn in the face of adversity, and focusing on the process as opposed to the end result was a description of everything I had endured over the past year with my research and what I have been trying to instill in my students for the past year.

Alon discussed how we are often given a problem A and expected to get to solution B, however real problems do not work in that manner – in fact we often take a great deal of time to get to solution B, and spend majority of our time in what he called *the cloud*. This *cloud* is the land of trial and error. A place where we focus on the process by trying to get to the solution using all sorts of different work and methods. A land of frustration. A place where character and grit is developed. An intangible place where the authentic learning takes place.

Upon hearing Alon discuss this *cloud* and the many hardships we all face while trying to solve a problem, I knew one journey was coming to an end and another was just beginning. This TED Talk was reinvigorating and reaffirmed the importance of focusing on the process. Shulman claims that new learning is enriched when people wrestle with ideas and this allows students to connect and create new understanding through their base line understandings.

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Now that the tone was set, another meandering journey was about to begin. The two week summer sessions provided me with a glimpse of what my new year-long journey would entail and some key ideas which would arise from the sessions were: looking at the world from a new lens, making authentic and relevant connections, and development of grit (I saw our cohort's development of grit through an activity appropriately named #QuickFire).

The first key idea which stood out to me from day one was looking at the world from a new lens – stop recognizing the world around us for what it is, and start to actually look at the world and question what is happening around us by asking simple questions why and how. This stood out to me a great deal because I constantly ask my students those questions about the mathematics in order to push their thinking and help them verbalize their process. But these two very simple questions should not be confined to our classroom, but should, and in fact need to, extend beyond the classroom walls to promote student thinking and student curiosity. There are two clear added benefits to developing provocative student questioning. One of those benefits is that I, the teacher, will not necessarily know the answer. This shows the students that I am not the fountain of knowledge they think I am, and it also develops a sense of community through wondering and learning. Additionally, more likely than not, science or mathematics, if not both, will be able to explain their wondering developing a natural and relevant connection – subject matter to real world content.

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This connection leads to the next idea which is making authentic and relevant connections. This idea also happens to be the basis for my *Dream It* project, making mathematics real – connecting Algebra and Physics. Howard and Gardner discuss the importance of inquiry across all disciplines and the importance of approaching a topic from multiple angles. This approach of inquiry allows the students to *play* with the topic and create their own understanding, while the approach from multiple angles allows students to *explore* the topic longer and deeper, in turn resulting in deeper understanding and deeper knowledge. Much of our own learning during the summer session stemmed from *playing* and *exploring*. If we, adult learners, got hooked through relevancy and then learned through *play* and *exploration*, we should do the same for our own students. Reemphasizing the importance of this is what Wilson and Peterson suggest, learning is a process of active construction – learning is a social phenomenon, as well as an individual experience – and at the end of the day, they all [students] learn by doing.

The last key idea that stuck with me from the summer session was the importance of developing grit in our students. At the start of summer, a few colleagues and I went to the ASCD (The Association for Supervision and Curriculum Development) Conference in Dallas and several speakers discussed the importance of grit. Grit and perseverance are virtually the same, and developing grit in students is one of the eight mathematical practices in the Common Core

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State Standards. My colleagues and I continuously finding ourselves discussing how our students lacked this grit characteristic – as soon as something got difficult, or put the students outside of their comfort zone, they would give up, make excuses, or anything to try and get out of the task. We bounced ideas off one another and discussed endlessly how we could create tasks in an attempt to develop grit.

Fast forward a couple weeks and there I am facing my first #QuickFire. The challenge is presented. The timer is counting down. A product is expected. The pressure is on. As I sat there empty minded for a couple minutes, I suddenly felt like a student again. After doing several of the #QuickFire activities over the course of the summer session, they became easier, the pressure did not block my thinking, the timer did not bother me, thinking outside of the box became easier, and the products became more refined. I thought to myself, this activity to me is a perfect and safe way to give students tasks that may be outside of their comfort zone where they don't have to worry about the grade but rather the process. Suddenly this activity becomes one to develop student character and process oriented. The students are learning through the process – the end product is simply a result of this process. Howard and Gardner suggest that students need self-centered experiences to develop understanding – and this activity is exactly that.

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As the summer comes to a close and the start of the school years comes upon us, I am starting to reflect think about how I can implement the things I have learned over the course of the school year, from the ASCD conference, and everything learned from summer sessions. My areas of focus for the upcoming school year are the same as the big ideas I walked away from the summer session, plus one more: looking at the world from a new lens, making authentic and relevant connections, development of grit (I saw our cohort's development of grit through an activity appropriately named #QuickFire), and focusing on process and flexible thinking. Although these have many overlapping areas, for each big idea I have an idea of how I plan to, or would like to, implement it in my classroom.

Starting with the last one, focusing on process and flexible thinking, this is a continuation of my Northwestern research of using *Math Talks* (my term for a mental math multiplication number talk) to promote student discourse and flexible thinking through a focus on the process. At Disney II Magnet High School we are on block schedules – I see my students for 100 minutes twice per week. Some may quickly ask why spend ten minutes of your time doing a mental math multiplication activity that is deemed below the 9<sup>th</sup> grade Algebra standards? It is self-differentiated, accessible for all students, promotes flexible thinking, higher students need to push themselves to develop and experiment with new methods, and

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most importantly, every aspect of the activity is an authentic skill we use in our everyday lives: mental math, multiplication, experimentation, proving, questioning, and discussion.

This activity is one that I am familiar with and very passionate about. Every day I have taught during my career as an educator, I have heard at least one student answer a question of mine with the following response, “Because you have to do it that way.” Students are simply following steps that someone showed them without actually knowing or understanding what they are doing. My ultimate goal for my students is to understand and recognize that there are multiple ways to get to an answer, and really push the students to understand each other’s methods and be open to new methods of execution. In my classes Number Talks, renamed daily *Math Talks*, I present a single multiplication problem horizontally, written both ways (*ie*:  $24 \times 36$ ,  $36 \times 24$ ) which reinforces the importance of multiple perspectives. Students see the problem multiple ways to encourage multiple methods of solving. It does not stop with the daily *Math Talks* routine; any time an opportunity for mental math comes up in class, I remind the students to “use a *Math Talk* method” to solve mentally first, then use pencil and paper to confirm. Any time a student provides a solution in class or asks if they are correct, I reply with the simple statement, “Prove it.” Students have come to understand that if they ask me that question, they must defend their answer, reemphasizing the importance of the process.

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The focus of looking at the world from a new lens and making connections for the students both tie into my overall *Dream It* project theme: Making mathematics real – connecting Algebra and Physics. By the end of the year, I want my students to see the connection and relationship between mathematics and sciences, more specifically behind Algebra and Physics. I want my students to be able to use common vocabulary and common problem solving strategies and methods for both classes. I want my students to be able to develop an arsenal of thinking weapons to be able to attack both content areas creatively yet deliberately. Some ideas of collaboration and overlap I have from the beginning of the school year the following topics: dimensional analysis, linear functions and motion, non-linear function and motion. The 9<sup>th</sup> grade physics teacher and I plan to map out the year together aligning major topics in an effort to integrate the two content areas, and then we intend on further aligning the sub-topics as we cover them in detail throughout the school year. For example, when students are doing dimensional analysis in physics, they may be presented with some would you rather scenario problems (could be a #QuickFire challenge such as *Would you rather earn a quarter for every inch in one mile OR earn a dime for every hour you've been alive? How old do you have to be before it is more beneficial to take the money based on hours alive?*) where dimensional analysis is useful, or when cover linear functions and graphing in algebra, the students are experimenting with linear motion of cars and creating time vs. position graphs

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and linear equations. This collaboration and integration helps the students make their own connections between content areas and makes the subject matter more real, resulting in more authentic learning.

Moving into the development of student grit, I want my students to answer this with a particular answer – Who is the best student in the room? Majority of the time students will point or name the student they perceive as the “smartest” student in the room. My goal is for my students to point to the student who is trying the hardest – this student may fail the most, may succeed the most, might have a C, or might have an A – but this student has a gritty attitude, is comfortable with being uncomfortable, hangs in there, and does not give up. Now, the question is, how will I do this. Developing this characteristic among my students has not been a focus until this year. I have always discussed with my students the eight secrets to success: passion, work, focus, push, ideas, improve, serve, and persist – and there is a great TED Talk by Richard St. John to go along with this – however, I have never intentionally set up a goal for myself and my students about developing grittiness. I plan to use the #QuickFire activities in my classroom as a way to try and develop gritty attitudes among my students – activities that are challenging, limited amount of time, and require flexible, critical, and creative thinking, but most importantly are safe for students to fail and learn from.

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The idea of grit and perseverance is a critical component of learning – a lesson that is often neglected to be discussed in our everyday classrooms. We often come to a problem A and quickly expect to come to a solution B; but authentic problems and authentic learning do not work that way. The real learning occurs through the experimentation and failures which are not often enough acknowledged and appreciated. The struggle to wrap one's ideas around the problem and potential solutions is where the authentic learning takes place. This struggle is what I want all my students to understand – that real learning occurs through attempting, failing, and trying again. That real learning occurs through the process. That real learning occurs through experimentation. That real learning occurs when you put yourself out there and become comfortable with being uncomfortable. That real learning does not come easy.