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Musings From a Year of STE[a]M...How It Looks Walking Down the Path

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Abstract

This is a follow up article to one in the inaugural issue which describes the beginnings of implementing a STE[a]M curriculum in a school with a high at-risk student population. This article discusses the outcomes and the future after a year of STE[a]M.

Keywords

STE[a]M, arts integrated curriculum, creativity, education, cross-curricular education

Musings from a year of STE[a]M

Ruth Catchen

When one embarks on a journey, often the path is unclear. You just know you have to go there. The more I walked down the STE[a]M path, the more I knew it was not only the one for me, but also the best one for all students to learn. I knew this because *I saw the light in their eyes.*

In my initial meetings with teachers and administrators, they are often uncomfortable, skeptical. Since skepticism is the root of scientific inquiry, I use their questions to show the added value to what the arts can offer to STEM education. As we grew together and students craved more of what I had to offer, they began to loosen up. There was buy-in. It came from both students and teachers.

It was not all of them, mind you. Some teachers are unmovable and not willing collaborators. So what kept me going, driving to make dreams come true, my dreams, and their dreams? As most educators know, it's about the students. Even on a bad day, there was always someone who smiled or went out of his or her way to say hello and ask, "Will I see you today?" And yes, it is the few willing collaborators who believe even as teachers, they don't know everything and are somehow intrigued by this somewhat out of the box idea to integrate the arts into curriculum. By the end of the year, some of the teachers and I were so excited by our creative brainstorming, the possibilities, and how much there is to learn, we could barely control our imagination.

We embarked on a long unit of plants used for space travel. We grew hydroponic herbs, which we would eventually use to cook. We planned meals and menus that were realistic for a space crew and also designed a fantasy menu for a space themed restaurant. Students named their dishes *Star-Struck Shrimp* or *Snacks from the Milky Way*. Their menus had to have excellent composition and design as well as suit nutritional needs. The experience of doing the research, asking questions, making a hypothesis and then testing that theory led to valuable knowledge. Students learned through doing and seeing, and the results are powerful. Including fact based learning targets with imagination opened the doors for students to want to dig and discover.

Before we started learning about nutrition, body mass index and calories, students designed their own idea of what a space flower, plant or garden would look like. We wrote Haikus about our plants and moved scarves to music to imitate how a plant might move in space. You may think this was not for Middle School--in my mind, I just tried it to see what would happen. Suffice it to say, there were still comments in the end of the year survey asking for more of those scarves and music. It was a wild day, but one of my favorites.

Lessons took a diverse variety. We studied great architecture, made observations, and then designed both real and fantasy buildings. We built; we revised and built some more. Students used the principles of good design, ratio and proportion with imagination and creativity engaged while making their designs functional.

Photo credit: Students at Jack Swigert Aerospace Academy, School District 11, Colorado Springs, CO.

Students collaborated in groups to story-tell. They were given an object and had to create an illustrated story about it in both oral and written versions. Presentation skills learned through drama activities improved as students became aware of how to project their voices, describe and demonstrate. Communication through a variety of media is

paramount. No more poster boards to demonstrate knowledge. There are projects designed and built, drawings, videos and plays or musicals showing new discoveries.

Dance illustrated patterns for math and helped to understand sequence. Music teaches fractions and demonstrates a type of design and structure different from visual art. Different learning styles have the opportunity to shine and weaker skills become strong. The world is alive with music, literature and art. In this safe environment, students were able to try things that may or may not work, evaluate and re-design. They learned that the foundation of the arts is grounded in substance, not chance, and that the creative process has value. Student engagement happens.

Students (Middle school students!) would happily come into class and ask what we are doing today, anticipating a fun activity. They got used to my endless questioning to make them think, reflect, and apply what they learn. They began to do this without so much prompting, and yes, some of them were asking their own thoughtful, introspective questions. Learning through the experience of the arts engaged all students. Learning took a new direction.

Collaboration was hard for some, but essential to a STE[a]M protocol. Everyone wanted their way, or to be "right." At the end of the school year, we had a therapy-like discussion about what students learned collaborating in groups and how they would handle these situations in the future. It was a learning experience for all. Kids worked it out. We modeled as adults, resisted the need to control, and they responded. And the best part is that they get it, they learned about collaborating, creativity, communicating and how the arts contribute to their learning experiences.

I explored using peer review for presentations. At first, all of the students had their back up at being, what was to them, criticized. Soon, after teachers and I modeled and were constructive about our feedback, they were asking for more. Students transitioned to being their own teachers and let us facilitate what they need to learn. We became advisors, not authoritarian know-it-alls. The door of learning opens with the walls that break down from arts experiences. This type of learning is multi-dimensional leaving an opportunity to connect for all learners.

Students willingly participated in my end of the year survey giving not just yes or no answers, but also written feedback. The comments were almost all positive, although very similar. Ninety percent of students want to do a course like this again, love the activities, find the activities and projects challenging, believe what they learned helped them in other classes, and that they have become more independent learners. The responses are what I expected from my observations.

STE[a]M gives students the opportunity to explore core concepts through activities that might not be understood otherwise. It is a way for all learners to inquire and explore that meets the needs of all learners at any level. Creativity and imagination lead to innovation and discovery, the root of scientific and engineering advancement. Blurring the lines and merging the arts and STEM offers unlimited opportunities for growth. Students are in charge of their own learning and are free to explore and discover. Concepts not easily understood in abstract become understandable and workable through arts activities. Resilience and resourcefulness become valuable learning outcomes as students can persist through trial and error in a safe nurturing environment. Fact-based knowledge is applied and explored not just memorized. Knowledge is used and applied for the future making students resourceful to use good judgment in decision-making.

Research is out there to support the ideas a STE[a]M pedagogy demonstrates. Needed are brave teachers and administrators to step out of the high stakes testing box. STE[a]M by its essence is not a direct instructional method. It is inquiry-based and experiential, one in which students guide their own learning through the leadership of a good teacher willing to take on a diverse variety of learning experiences. Students receive the benefit of lessons meeting the learning objectives in both STEM and the Arts. It may be difficult to see direct test results, those which drive everything these days. It will take passion and belief that this is in the long run a better way to learn. It creates self-reliant, independent, engaged learners, and for our increasingly innovative world, we need these fearless students.

So, be brave. Teach hope over fear. A child will thank you.