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Reflections ~ How STEM becomes STEAM

Ruth Catchen
Jack Swigert Aerospace Academy, Colorado Springs, Colorado, USA

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Reflections ~ How STEM becomes STEAM

Abstract
Reflections from designing a STEAM class for high-risk students.

Author/Artist Bio
Ruth Catchen received her Bachelor of Music degree from American University and her Master of Music degree from The Catholic University of America, both in Vocal Performance, and a Master of Arts from the University of Colorado at Colorado Springs in curriculum and Instruction/Leadership. After an active performing career, Catchen turned her direction to education and integrated educational programs working to develop arts integrated curriculum programs for schools and school districts. Her passion is to promote excellent instruction that supports teachers and to bring education and the arts to life for children by connecting the arts to other core academics. Currently, Catchen is developing STEAM-mates, an online and iPad integrated application to develop STEM skills through the arts. Catchen is the artist-In-Residence at Jack Swigert Aerospace Academy in Colorado Springs where she develops curriculum to integrate the arts into STEM curriculum.

Keywords
STEM, STEAM, Artist-in-residence, Curriculum, Inspiration, High-risk Students

Reflections ~ How STEM becomes *STEAM*

Ruth Catchen

I have always believed that integrating the arts into core academics benefits all learners. Around two years ago, considering my passion for STEM education, I thought why not STEAM? Why not add the arts in a deliberate fashion? I know this method would be tough to connect to high stakes testing, but easy to connect to standards. I knew it would take bold administrators who dare to dream.

In my search to make this happen I heard many things; *"great ideas, but we need to focus on core curriculum and raise student achievement in writing, reading, math and science"* or *"we have a set curriculum as we have a huge pay for performance initiative and we can't change anything."* Many liked my ideas, but there were no real takers.

All of that changed last summer when Jack Swigert Aerospace Academy (JSAA), with whom I had some prior experience, said, *"Can you be our Artist-in-Residence and team teach a STEAM class?"*

Passion and hard work to better outcomes for at risk students…
paper orchestra, one of the many STEAM activities

The aerospace theme is a natural for STEAM, especially with the recent landing of The Mars Science Laboratory/Curiosity and so much attention focused in it with a variety of media. Previous nerds are social media heroes. The scientists and engineers involved in Curiosity are now real people. Kids say, *"I can do that!"*

I scrambled to fit my ideas into an existing 'build a space station' project. Kids need to know who I am and understand that my experience with STEAM is the life I lead and how everything I do I see in terms of STEAM. It is my passion through which they can learn and discover. Creativity is key and students begin to learn things about themselves they didn't know. They began to tear down the walls of the box of learning. I see their mind wheels spin, dusted off and cranking slowly, but in a positive direction.

Students discover their multiple intelligences through a survey, career discussion, and lots of questions. They design and make journals expressing those multiple intelligences in which they will record all of their thoughts and inspirations, process and labs. During that self-discovery, we do drama exercises, paper plate orchestra and other team building activities. We talk about what makes a good team, trust. "*Who do you trust? Why don't you trust? Can you regain trust?"* We talk about good designs, those who are great designers, and how form must follow function. We discuss that things must be durable and practical and yet at the same time, beautiful.

Journal sketches begin. It takes encouragement for some. I keep saying dare to dream. Dream big. I use real-life examples to show that dreams can come true. Journal designs are incredible. Me on a page. One 6th grade student makes a puzzle that is incomplete. It includes all the pieces of her life so far and room for more pieces since she has not experienced her whole

life yet. Wow!

Communication is an essential STEAM skill. You can have the greatest idea, but no one will know if you can't clearly communicate it. Writing skills are weak. I emphasize description and creative expression. Every lesson I present ends with a reflection of questions that students answer in their journals. We learn about descriptive words and tell stories to describe details they observe in the design of objects or photos of existing artwork. They can see the golden ratio in a painting of Da Vinci or understand symmetry or fractals as art. They will design a travel brochure to Mars including a study of space hazards. They will make a comic book about Mars or Moon characters. Imagination ignites.

STEAM is more than a concept or method. It surpasses words on a page. It must be visceral and physical. Its essence is experiential as those memories become burned in our minds and hearts. It is not important if you are right-brained or left brained or somewhere in between. Having learning experiences that involve a variety of the senses will be memorable. It creates the opportunity to take those experiences and learn from them and apply them to something new. That is how innovation and creativity happen. STEAM in reality is a lot of things. A protocol must be done to assure that work is replicable, and at the same time, every day, every class and every child is different. The teacher must be the facilitator of learning and offer a wide menu of options. I think in practice STEAM means different things to different people. It is part of my mission to clarify. Having the arts for the art's sake is valid, and yet the arts can teach and enlighten. Their influence can be both subtle and pervasive. STEAM is not arts and crafts, although many think STEAM means you make stuff. The substance of STEAM has more depth. It is integrated and cross-curricular. Most important is to take off the labels and educate to educate, not to do well on a test or a particular protocol, but to become a whole person.

JSAA is a struggling school. The population is highly at risk. These students need education as their inspiration to a better life. As a teacher, one must believe in their ability to learn and achieve. Naive as it is to some, I do believe all students can learn and want to learn. In some cases it takes breaking down the walls. It takes encouragement and finding the outlet that has personal meaning to each student. Find something they like and learning becomes fun. At JSAA, I am beginning to open doors through which students will realize their own creativity and at the same time, learn valuable academic skills. My goal is to be ready to open the doors to discovery but never to push anyone through them. We are at the beginning of the journey. My excitement for the endless possibilities for these students to learn and discover through STEAM grows with each day.

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