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## STEAM with a Capital A: Learning Frenzy

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# STEAM with a Capital A: Learning Frenzy

## Abstract

A student dipped a brush into a bowl of viscous tempera paint and in a few quick strokes formed thick magenta letters on a large display board. Nearby a handful of students were working together to attach string to paper cups and balloons. Across the room a small group of girls were lying on the floor carefully adding multi-colored text to a poster. Two others created characters out of Popsicle sticks for a puppet show...This is how the integration of Science, Technology, Engineering, Arts, & Math (S.T.E.A.M.) happened with the fourth and fifth graders during the first few weeks of school.

## Author/Artist Bio

David Rufo is a doctoral candidate in Teaching and Curriculum in Art Education at Syracuse University. With seventeen years of experience as a general classroom fourth grade teacher, David's current research interest is the self-initiated creativity of children in a child-centered environment. In addition to being a full-time teacher, David is also a visual artist and an adjunct instructor at Syracuse University where he has created and taught a course titled, Art Educators as Contemporary Artists. His most recent article titled, Building Forts and Drawing on Walls, was published in the May 2012 issue of the peer-reviewed journal, Art Education. Previously, his article titled, Allowing Artistic Agency in the Elementary Classroom, was published in the May 2011 issue of Art Education. David also is an invited author at the online art blog, ALT/space [www.tajaltspace.com](http://www.tajaltspace.com)

## Keywords

STEM, STEAM, Science Fairs, History, Art, Creativity

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## **STEAM with a Capital A**

### **Learning Frenzy**

David Rufo

A student dipped a brush into a bowl of viscous tempera paint and in a few quick strokes formed thick magenta letters on a large display board. Nearby a handful of students were working together to attach string to paper cups and balloons. Across the room a small group of girls were lying on the floor carefully adding multi-colored text to a poster. Two others created characters out of Popsicle sticks for a puppet show.

The classroom was permeated by an energetic buzz. Those who desired silence were allowed to don noise-canceling headphones or work in an adjacent room. Outside, one boy was designing a contraption made of sticks and masking tape while others filled a large plastic bin with water to test the buoyancy of a raft made of plastic rulers. A few yards away four boys laid out a 30-foot measuring tape so they could see how far the catapult they hobbled together out of scrap materials would launch a water balloon. Students were measuring, painting, drawing, rehearsing, testing, shouting, watching, devising, critiquing, planning, inventing, constructing, creating, collaborating and debating. It could be best described as a learning frenzy. This is how the integration of Science, Technology, Engineering, Arts, & Math (S.T.E.A.M.) happened with the fourth and fifth graders during the first few weeks of school.

### **The Pilot Program**

Last year my teaching partner and I were the fourth grade general classroom teachers. In January, the fifth grade teachers asked us if we would be interested in teaching math and science for both the fourth and fifth grade while they taught Language Arts and the Humanities. I found

the idea intriguing. However, fifth grade was the first year that students participated in our school's science fair. I felt science fairs required students to take part in a highly stylized and predetermined mode of learning that contradicted our child-centered and democratically based classroom which necessitated an open-ended, fluid curriculum. Our classroom allowed for playful investigations and serendipitous discoveries; this, in a sense, ran counter to how I believed science fairs had evolved. Since their inception in the 1950s, science fairs have become *"an educational rite of spring"* (Craven & Hogan, 2008. p.679). Research on the effectiveness of science fairs, however, shows that participation does not produce a *"significant effect of students' understanding of the scientific method and attitudes toward science"* (Yasar & Baker, 2003. p.9).

### **A New Paradigm**

I attempted to do away with mandatory science fair participation for fifth graders to no avail. Because of this, my teaching partner and I decided we would have to reinvent what it meant to participate in a science fair by creating a new science learning



**Playful investigations**

paradigm through STEAM education with a capital A. My current research interest in the self-

initiated creativity of children brought me to the understanding that “*children are drawn to an arts-based approach of inquiry*” (Rufo, 2012, p. 41). Research studies have also shown connections between creative learning and academic achievement (Mason, Steedly, & Thormann, 2008). Having the arts as an integral part of the STEAM educational approach made sense.

### **Weekly STEAM Fairs**

A few years ago the decision was made to have students in grades 5 – 8 do all of their science fair work in the classroom in order to minimize the influence of parents on projects. In order to complete the projects in the allotted classroom time period, the fifth grade classroom had to begin preparing for the science fair months in advance. But I did not want the science fair to become an all-encompassing production; instead, I devised an approach where students would become familiar with, and eventually internalize, the scientific process through hands-on activities. On Mondays and Tuesdays students are guided through a science experiment and lab note write up that includes a purpose, hypothesis, data chart, results, and conclusion. On Wednesdays and Thursdays students design and conduct their own experiments loosely based on a theme, concept, or element from the guided experiment. On Fridays, students present their learning to the class using an arts-based method of their choosing. Students may share what they have learned by creating a song, painting, skit, dance, poem, story, sculpture, or demonstration. Students are also welcome to present their learning using more traditional approaches such as a tri-fold display board or lecture.

### **Stupendous Results**

The word *fair* denotes a gathering place to exchange ideas and present a variety of innovations in an engrossing way. The 900 year-old origin of the word is linked to festivals,

holidays, and feasts. County fairs, state fairs, and world fairs have historically been places of excitement, ingenuity, and entertainment. Yet in many respects school science fairs have become predictable and formulaic - rows upon rows of students stand before tri fold boards reciting their purpose, hypothesis, results, and conclusion repeatedly as visitors pass by. President Grover Cleveland remarked at the opening ceremonies of the 1893 Chicago World's Fair that they were "*surrounded by the stupendous results of American enterprise and activity*" (Walworth, 1893, p.81). Cleveland was inspired by the sense of wonder and possibility.

### **The Arts: A Key Aspect of STEAM**

In a 21<sup>st</sup> century global economy the artistic practices found in arts-based learning such as "*creative thinking, self-discipline, collaboration and innovation — are skills that are in great demand*" (Lynch, 2008, p. 26). Bauman (2009) described the postmodern world as one of '*instant and erratic change*' (p. 160). Arts-based learning prepares students for this new reality by encouraging risk taking, experimentation, and divergent thinking (Cornett, 2007). An arts-based focus leads to learning environments that "*become places of discovery*" (Fiske, 1999, p. ix) and progressive classroom approaches encourage active engagement within integrated curriculums. During our STEAM labs the classroom transforms into an organic and evolving site for inquiry and reflection. Our students become deeply engaged in relevant and meaningful learning activities with an option to work in groups, pairs, or individually.

I believe approaching science fair through the practice of STEAM with a capital A will help usher in a new type of science fair where the participants and viewers walk away feeling informed, amazed, and entertained. Allowing kids to reinvent science fairs as STEAM fairs by emphasizing creative elements will infuse the event with possibility and wonder.

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