STEM to STEAM:

The importance of formal arts education in public schools

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Introduction

America is experiencing crises in two crucial and interrelated areas- the economy and education. Since 2002, the US has lost close to 5.5 million manufacturing jobs making the US unemployment rate is 9.2% (14.1 million). The second crisis is that the rate of high school graduates has been hovering at about 68%, (although it can be as low as 30% in minority communities). These trends do not bode well for the future of our country.

Although there is not just one cause for these alarming statistics, we do know that one of the primary reasons for this is the ongoing transformation of the US economy from one based on industry to one based on information management. Again (and unfortunately) there are no easy, instant solutions to these trends. Yet, educators, corporate executives, journalists bi-partisan government leaders all agree that three important steps necessary to build for the future are: innovation in all fields and professions, creative problem solving, and collaboration. The challenge then is to establish ways to teach long with advocating for a framework that promotes practical applications to these three critical 21st century tools. One key element containing all three tools is found in formal arts education. Eminent arts educator Elliot Eisner eloquently states,

> "To conceive of students as artists who do their art in science, in
> the arts, or the humanities, is, after all, both a daunting and a profound
> aspiration. It may be that by shifting the paradigm of education reform
> and teaching from one modeled after the clocklike character of the
> assembly line into one that is closer to the studio or innovative science

laboratory might provide us with a vision that better suits the capacities

and the futures of the students we teach." (Eisner, 2004).

We understand by this observation that arts education is only one component of 21st century skillsets- the other part is found in the sciences. Together, arts and sciences provide a solid foundation of 21st knowledge, skillsets and employment.

Yet, since 1994 (and probably much earlier) the US government has primarily promoted STEM educational initiatives (Science, Technology, Engineering, Math), omitting the arts- STEM rather than STEAM.

Adapting STEAM educational initiatives will help the US to better compete in the current and future global economy. American businesses need 21st century employees with 21st century skills for innovation, creative problem and collaboration to address current and future challenges. To accomplish this, it is essential to shift the focus from STEM to STEAM.

Area of Concern

The purpose of this policy is make formal arts education (in all of the arts) required subjects the American public school curriculum. This means that the various arts need to be offered as discreet subjects taught by discipline specialists rather as one-time projects for specific learning modules. For example, art will be taught by art teachers, music by music teachers, and drama by drama teachers.

STEAM Thesis

Simply put, The US Department of Education needs to adapt a policy in which arts education allocated the an equal amount of resources that are provided to science, technology, engineering and math based curriculum. A national education policy for arts

education will insure that arts education is a required subject and not simply an elective. Additionally, it will insure that all students in all public schools will have the opportunity to study arts, and not just those in arts discipline-based schools (for example, schools for the performing arts). In order to accomplish this, two frameworks need to be developed: the allocation of resources, and the development of standards.

Because of competing demands on resources, time allocation can be considered the most critical issue. One successful model to be evaluated for implementation here is found in China, where all primary and secondary schools there are required to provide a minimum of two hours of classroom arts education (painting, drawing, singing, instruments, theater and dance) per week. The individual classes are semester-based insuring that there will be a sense of continuity in each discipline taught.

The ongoing debate regarding the adaption of standards has not bypassed arts education- it is in fact one of the most critical and controversial issues currently facing arts education in schools. The argument focuses on whether or not it is possible to evaluate and assess the arts in an objective and authentic manner. Standards for teaching arts have been identified and published in the many professional journals and publication, such as the U.S. Department of Education, TAB (Teaching for Artistic Behavior), Arts Education Collaborative, and the National Arts Education Association. While many science-based disciplines, focus on end-results, the arts focus on the process. Because of this, it is often difficult to fully assess and evaluate arts education because the skills, knowledge and learning outcomes not always apparent in short-term assessment. These acquires skills can only be probably reviewed over time as the students begin to integrate

these arts skills (for example creativity, collaboration and innovation) into other educational disciplines.

This policy requires that the evaluation of arts education be focused on the process itself. Teachers will not be evaluated on whether their students can paint like Picasso or play guitar like Les Paul and students will not be evaluated on the quality of their work in the arts, but rather on their ability to learn the processes involve and how they integrate these processes into other educational disciplines (such as the sciences). The different arts instructors in conjunction with professional arts education organizations and the US Dept. of Education will define these processes.

Framework for STEAM

STEAM and formal arts education use an instruction-based framework. Arts teachers will be required to form lessons that:

- Create a set of basic qualifications for arts instructors that allow them to freely integrate their skills and knowledge in the classroom to advance student learning.

- Advance teachers' professional development to increase their competencies and pedagogical practices in the classroom.

- Provide standards that introduce students to understanding the processes used in specific arts forms.

- Insure that students and teachers develop understandings of the definitions of art terms.

- Foster environments that support and promote experiential learning, collaboration and creative problem solving.

Basis for STEAM

Formal arts-based and STEAM education and economics- long term investment

on the future by providing students with 21st century skillsets- innovation, creative

problem solving, collaboration. Writing in the Wall Street Journal, Carl Bialik cites a US

Bureau of Labor Statistics report that states that the average amount of careers that a

college graduate today will have is seven, although he also says that 10 is more realistic.

If this is truly the case, then flexibility is another skill necessary to be taught and one in

which the arts can play an important role (use of multiple media in art, playing multiple

role is theater, multiple instruments in music). It is good economic policy to prepare

students to be able to move into the workforce in a manner that will allow them to keep

off of unemployment by being able to adjust to the changing needs and requirements of

future employers. This increases the tax base making it possible to continue to provide

services and entitlements promised to the American public.

Background and Related Literature about STEAM

Formal arts education is not a new idea. In the past, an understanding of all of the

arts was considered a relevant and important component of a well-rounded education in

order to prepare students to be valuable contributors to society. Among other educational

benefits, arts education will "Foster interdisciplinary learning; Build self-esteem; and

Facilitate student success despite differences in languages or learning styles" (Nelson,

2009).

Yet, the arts are usually the first casualty of budget cuts in school systems and

often are not included in the core curriculum of colleges and universities.

The arts are a growth industry- the NEA projects an 11% growth rate for arts-related jobs through the year 2018. It is essential to understand that there is more to formal arts education then simply design, illustration, film and television, theater, writing and music. Arts education promotes imagination, creativity, communication and other relevant 21st century skill sets necessary for solving 21st century problems. Dr. Joseph Piro, Associate Professor Curriculum & Instruction Long Island University writes, "If creativity, communication and critical thinking- all touted as the hallmark kills of the 21st century success- are to be cultivated, we need to insure that STEM subjects are drawn closer to the arts".

The arts and sciences are not mutually exclusive. Indeed, many great scientists were also musicians, writers, poets or painters. Einstein was a life-long student of violin, Samuel Morse painted portraits, Galileo was a poet and literary critic, Richard Feynman was an enthusiastic fan of Tuvan throat singing, and of course there was Da Vinci. It is also noteworthy to recognize that there are also many artists and musicians who are scientists. For example Brian May, the guitarist who founded the rock group Queen, has PhD in astrophysics from Imperial College, action-star Dolph Lundgren- has a master's degree in chemical engineering from the University of Sydney and was awarded a Fulbright Scholarship, and Israeli artist Yaakov Agam has extensively researched light waves and color theory.

In actuality, formal arts education is not a revolutionary idea. On the website The Well-Trained Mind, author and educator Susan Wise Bauer writes, "To the classical mind, all knowledge is interrelated". This astute comment infers that no subject can be taught in a vacuum- innovations in science relate directly to the economy, culture and

society of the time. For example, a full study about the Black Death requires students to look at the geo-political historical events of the time, the geography of the path of the disease, the biological and physiological concerns of the disease, religious and social responses as well as the arts that were generated during that time. Any and all subjects than become fulcrums for more complete knowledge. This understanding will help produce the 21st skillsets of innovation, creative problem solving and collaboration that needed for addressing and solving the myriad of complex and interconnected problems facing the globe.

Before addressing the idea and importance of innovation, it would be valuable to revisit several important ideas and thinkers that provide educated inspirations for building a foundation for innovation.

Collaboration is actually a basic component of human society although people are not always aware of its function, especially when not done in a mindful manner. Everything that affects humans is done collaboratively. For example, purchasing a loaf of bread in a store is the result of collaboration between the wheat farmer, the trucker, the baker, the distributer, the marketer and the store in which it is purchased. These particular activities are done as a matter of fact- it is highly unlikely that any of the links of this bread-chain would view their role as that in a much larger collaboration. Collaboration is not an instinctual process- it is a skill that is developed and refined. The more those individuals are aware of the process, the more that they can accomplish. One interesting example the field of arts education was the Bauhaus art school in that operated in Germany between 1919 and 1933. Founder Walter Gropius introduced a curriculum in which all artists and craftsmen came together to create aesthetically pleasing, functional

art and designs that could be mass-produced for the public. The clean designs of objects,

many of which are still in production today (such as the ubiquitous Barcelona Chair)

were created and built by designers who were also educated in production and fabrication

in tandem with craftsmen who understood principals of design and art. Although the

Nazis closed the school in 1933, many of the artists and craftspeople continued to work in

the process what they learned there.

A current 21st century example may be found in the collaborative environments

found on the web. Since the early days of its' development, the Web has attracted a wide

range of talents and skills- scientists, computer engineers, typographers, graphic

designers, and artists are just some of the types of knowledge that has been used to

develop Web tools. "As knowledge has become more detailed in response to an

increasingly complex world, the ideals of a unified science— the synthesis and

integration of knowledge...Issues are now arising that are either of greater complexity and

breadth than can be comprehended by one discipline alone, or of interest to more than

one discipline" (Collin, 2009. p. 102). Additionally, "Gronski and Pigg (2000) define

collaboration as "an interactive process among individuals and organizations with diverse

expertise and resources, joining together to devise and execute plans for common goals as

well as to generate solutions for complex problems" Therefore, truly collaborative

relationships between universities and communities are both mutually dependent on and

beneficial to one another" (Miller & Hafner, 2007. p 67).

Wikis are one tool in particular that has captured the imagination of many of the

professionals previously mentioned. Wikis are good examples of distributive and

collaborative ways of working. By now, most people with access to a computer are

acquainted with Wikipedia. But experiments and examples of the type of collaborative,

multi-person activities are also found in education, arts and literature and science. In his

book Wikinomics, author Don Tapscott illustrates how the wiki model is currently being

used in commerce. In one example, he describes how Goldcorp Inc., a mining entity in

Canada uses a wiki model to successfully expand their R & D division to both identify

potential gold-laden tracts of land the company owned, as well as develop ways in which

the gold could be extracted in an economical and efficient manner. The result was a

person (not employed by the company) submitted a proposal that increased the

company's earning from $100 million to $9 billion (the individual was awarded $575,000

in prize money for his proposal. Goldcorp Inc. used the wiki model to make information

and data available to ideas that their own people may not have considered. This

collaborative model also is an example of innovation.

Tapscott also describes how companies such a Proctor and Gamble and DuPont

are using this same model to gather new ideas for products (and profits). He describes

this wiki-based collaborative business process "…the traditional notion of property rights

is inverted. Traditional forms of intellectual property confer the right to exclude others

from using or distributing a creative work. Peer production is more or less the opposite.

Communities of producers typically use "general public licenses" to guarantee users the

right to share and modify creative works provided that any modifications are shared by

the community. By opening up the right to modify and distribute, these open sources

licenses allow larger numbers of contributors to interact freely with larger amounts of

information in a search for new projects and opportunities of collaboration" (Tapscott,

2008. p. 69). We can see that Tapscott is describing an innovative model for collaboration.

This model can be applied to schools by creating muti-dicsipinary projects, such as the Black Death example described above. Students will not only learn about the Black Death (or any other topic), they will be exposed to a way of working that is crucial for becoming productive members of society.

Creativity and creative problem solving directly relate to collaboration. Humanity faces an array of complex problems that stretch across all aspects of society in ways that never existed before. Sir Kenneth Robinson describes the issue as "The world economies are caught up in a genuine paradigm change. The new technologies do not mean simply that we have new ways of doing things we did before: businesses, organizations and individuals everywhere are faced with entirely new forms of work, leisure and ways of being. We are trying to meet this new social and economic paradigm using assumptions and preoccupations o the old intellectual paradigm of education. There are profound consequences for the development of creative abilities…" (Robinson, 2001. p. 92).

Creative problem solving involves many different disciplines. Pre-eminent arts educator Elliot Eisner states that arts in education is critical to developing the thinking skills needed for a better understanding of the world. He writes:

>   "Artistry, therefore, can serve as a regulative ideal for
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>   education, a vision that adumbrates what really matters in schools. To
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>   conceive of students as artists who do their art in science, in the arts, or
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>   the humanities, is, after all, both a daunting and a profound aspiration.
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>   It may be that by shifting the paradigm of education reform and

teaching from one modeled after the clocklike character of the

assembly line into one that is closer to the studio or innovative science

laboratory might provide us with a vision that better suits the capacities

and the futures of the students we teach. It is in this sense, I believe,

that the field of education has much to learn from the arts about the

practice of education. It is time to embrace a new model for improving

our schools. (Eisner 2004).

Since innovation is the common element that defines collaboration and creative

problem solving. But innovation does not necessarily imply to invent something. Indeed,

Dictionary.com defines invent as "to originate or create as a product of one's own

ingenuity, experimentation, or contrivance" while to innovate is "to introduce something

new; make changes in anything established." The critical point here is innovation utilizes

existing situations, practices objects, or ideas and then recombines different elements to

refine, improve and make something new. The result of this is something that is familiar,

yet different. In some ways it is similar to remodeling an existing structure by updating

and strengthening it. Jeff Hawkins states this clearly when he describes his experience

developing the PalmPilot, "When you look at the PalmPilot, there was nothing new in it.

Everything had existed in a prior product. The trick was to know what to include, what to

exclude, and what we were trying to accomplish with it." (Hawkins, 2007)

The importance for teaching innovation cannot be underestimated. Journalists,

authors, educators and government leaders have all stressed the importance for

innovation for building for the 21st century. Thomas Friedman has mentioned in it books

and newspaper columns. For example in the world is flat, he writes that we need "…the

right education programs and knowledge skills to empower more people to innovate and do value-added work." (Friedman, 2006. p. 329). He also quotes Joel Cawley, the head of IBM's strategic planning unit, "What we are seeing in so many different fields is that the next layers of innovation involve the intersection of very advanced specialties…"(Friedman, 2006. p. 439). Friedman wrote in the January 10, 2010 New York Times that "Obama should launch his own moon shot. What the country needs most now is not more government stimulus, but more stimulation. We need to get millions of American kids, not just the geniuses, excited about innovation and entrepreneurship again. We need to make 2010 what Obama should have made 2009: the year of innovation, the year of making our pie bigger, the year of 'Start-Up America'".

Innovation should not be recognized as a one-shot deal. It requires tenacity, hard work and commitment to success. Malcolm Gladwell quotes psychologist Dean Simonton that "Quality is a probabilistic function of quantity" (Gladwell, 2011). Gladwell continues by stating that Simonton is saying "…there is nothing neat and efficient about creativity. The more successes there are, the more failures there are as well, meaning that the person who had far more ideas than the rest of us will have far more bad ideas then the rest of us too" (Gladwell, 2011).

The skillsets of innovation, creative problem solving and collaboration, as well as associated skillsets can be taught by arts education. Elliot Eisner the arts educator illustrates this when he describes the summarizes lists skillsets a student will acquire through arts education:

- Make good judgments about qualitative relationships.

- Problems can have more than one solution.

- Celebrate multiple perspectives.

- In complex forms of problem solving, purposes are seldom fixed, but change with circumstance and opportunity.

- Make vivid the fact that neither words in their literal form nor number exhaust what we can know.

- Small differences can have large effects.

- Think through and within a material.

- Learn how to say what cannot be said.

- Have experience that can be had from no other source.

Economic Analysis

More education professionals understand it across the spectrum that arts education provide students with fundamental 21st century skill sets. The primary question that is asked now is: where does the funding come from? In an era of massive unemployment and reductions in public services, nothing seems to be spared and that includes all educational initiatives. Teachers are receiving pink slips, class size is increasing and there is a raucous debate about teacher's salaries taking place in schools and government agencies. It is difficult then to identify the funding necessary for arts education: art supplies, instruments and trained teachers. Part of the debate centers on which subjects are truly necessary- sciences, language, history or art. Each in its own way is important or the intellectual, psychological and emotional development of a child. If we look to Howard Gardner's theories regarding multiple intelligences, then it becomes very difficult to make the choices between one subject and another. Different people have

different natural intelligences and abilities- if we exclude one subject, we then risk the

exclusion of a group of learners who fall out of the realm of accepted curriculum.

The question needs to be asked then is: if there is no money for ongoing

educational programs, where does the money for formal arts education come from. It

comes down to the issue of "robbing Peter to pay Paul". Unfortunately, there is no easy

solution, especially in the current situation where both federal and states governments are

debating and wrestling with the issues of deficits, tax increases and budget cuts. Leaders

from across the spectrum all agree on the importance of education for future citizens and

leaders, yet no person has been able to find a solution to identifying a funding source for

education.

It would be presumptuous for me to say that I have a solution to this complex

problem. If we consider the basic nature of investments, then we know that putting

money into an account now may reduce one's standard of living now, but will increase it

in the future. Perhaps this is a model that need can be modified and applied to education.

Including arts education will place a financial requirement of hiring three specialized

teachers for each school- one for arts, one for music and dance and one for drama. Each

teacher will provide 30 hours of class time per week. According to the employment

website Indeed.com the average current salary for arts instructors is about $45,000/year

(not very much for living in any major metropolitan area). This means that hiring three

art teachers for one school will require about $135,000 per year, certainly not an

exorbitant amount for a city where the average cost of a house is $300,000. Yet it is.

The question then is one of prioritization. Do we fix potholes, pay for police or

firemen, salaries of civic leaders or education? If we are true to our publicly pronounced

values, then educating our children is the answer. Yet, if there is still a money shortage

for education, how do we do it?

Perhaps a hint for the solution is found in one of the crucial 21st century skillsets

identified by educators, corporate executives and government leaders: collaboration. If

one entity or organization cannot completely fund the type of education that is almost

universally promoted then it may be time to create a new model based upon resource

sharing and economic collaboration. Looking locally, we can identify several possible

educational partners. For example we can see two important elements needed for arts

education:

- many schools now look to local businesses for support and funding.
- community colleges and local universities have arts, music, theater and education
  programs.

By utilizing these entities, costs for arts program can be spread over several institutions

and businesses (along with some funds provided by local school districts). For example,

arts students in higher education who receive financial assistance could be required to act

as arts teachers for one day a week during the school year. This would mean that 15

students (3 per day per subject) would act as arts teachers during one year. This would

provide at least four direct benefits:

1. Schools and students would receive the necessary arts classes.

2. Teachers would receive valuable on-the-job training that will be beneficial for job
   experience.

3. It would help strengthen communities by creating collaborative learning
   environments.

4. All people involved would benefit by receiving practical experiences in

collaboration.

In some ways this funding suggestion is related to the WPA, or Job Corps. The primary

difference is that funding and support would be local and the courses would be

specialized. This is also an illustration of an innovative, creative solution to a dire

problem currently facing the United States.

Conclusion

It is said that as educators, we need to prepare students for jobs that have not been

invented, using tools that have not been developed. Formal arts education provides the

framework for accomplishing this. Elliot Eisner elegantly describes the possibility when

he wrote:

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conceive of students as artists who do their art in science, in the arts, or

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Resources

Art Education in China, STEAM not STEM. Retrieved from http://steam-
notstem.com/articles/art-education-china/

Bauer, S. W. What is classical education? The Well-trained mind. Retrieved 7/5/2011
from http://www.welltrainedmind.com/classical-education/

Bialik, C. Seven Careers in a Lifetime? Think Twice, Researchers Say. (9/4/2010). *Wall
Street Journal Online*. Retrieved from
http://online.wsj.com/article/SB10001424052748704206804575468162805877990.ht
ml

Collin, A. (2009). Multidisciplinary, interdisciplinary, and transdisciplinary
collaboration: Implications for vocational psychology. *International Journal for
Educational and Vocational Guidance*. 9(2), 101-110.

Dewey, J. (1934). Art as experience. Perigee, New York

Eisner, E. (2002). The arts and the creation of the mind. Yale University Press, New
Haven.

Eisner, Elliot W. (2002) 'What can education learn from the arts about the practice of
education?', the encyclopedia of informal education. Retrieved from
www.infed.org/biblio/eisner_arts_and_the_practice_or_education.htm

Friedman, T. (2006). The world is flat. Farrar, Straus and Giroux. New York

Forgács, É. (1991). The Bauhaus idea and Bauhaus politics. Central European University
Press. Budapest.

Gardner, H. (1999). Intelligence reframed. Basic Books, New York.

Hawkins, J. (2004). On intelligence. Holt, New York

Hawkins, J. (2007) Master Mindshifter - Palm, TREO. Mindshift innovation. Retrieved

from http://mindshiftinnovation.blogspot.com/2007/01/jeff-hawkins-master-

mindshifter-palm.html

Los Angeles housing market trends. (July, 2011). Retrieved from

http://www.trulia.com/real_estate/Los_Angeles-California/market-trends/

Miller, P. M., & Hafner, M. M. (2008). Moving toward dialogical collaboration: A

critical examination of a university-school-community partnership. *Educational

Administration Quarterly*. 44(1), 66-110.

Robinson, K. (2001). Out of our minds. Capstone, West Sussex, U.K.

Wilson, B. (1997). The Quiet Revolution. Getty Institute for the Arts, Los Angeles