Entrepreneurship In Science And Engineering Correlates with Sustained Arts and Crafts Participation

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Acknowledgements:
Michigan State University’s Honors College
The MSU Institute for Public Policy and Social Research
MSU College of Arts and Letters HARP Grant
Simplified Richard Florida Model

ENTREPRENEURSHIP

ARTS

HIGH TECH
Hypothesis: Are STEM people attracted to arts-rich communities because STEM people are themselves artists?
Adult Avocations Correlate with Scientific Success

Compared with typical scientist, Nobel laureates are:

- 2X photographers
- 4X musicians
- 17X artists
- 15X craftsmen
- 25X writers
- 22X performers

(R-B, et al., 2008)
Lifetime Participation In Arts And Crafts Of MSU Honors College STEM Grads (1990-95) vs Public

http://www.ced.msu.edu/reports/ARTSMART%20Report-FINAL.pdf
Engineers Participate More in Arts and Crafts as Adults than General Public

Impact of Sustained Arts & Crafts Participation on Patent Output Among NAE Members

- **1-5 Patents**
- **> 6 Patents**

Bar chart showing the number of patents among NAE Members in different fields:
- Photography
- Fine Arts
- Music
- Performing
- Crafts
- Fabric Arts
- Elect/Comput
- Writing
Sustained Avocations Among Engineers Correlates With Entrepreneurship

MEDC (N=44)  MICH ENG (N = 45)
Intellectual Property Production Correlates with Sustained Arts & Crafts

MSU HONORS COLLEGE STEM GRADS

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<th>Field</th>
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* denotes a significant difference.
Does Your Avocation or the Skills, Knowledge, Etc. Derived From It, Play Any Role in Your Vocation?
Some Typical Responses

• “Paper-folding, wood blocks gave me early insight into 3-D geometry” (NAE)

• “I use some of my skills from drawing for creating stimuli for experiments. Experience with visual composition helps to create good diagrams and presentations.” (MSU STEM)

• “Quilting is a great way to use creativity and analytical thinking to solve problems and create something that is aesthetically appealing. It ... improves my creativity in my current vocation.” (MSU STEM)

• “I work in lasers and photonics, which has an indirect, coincidental link to photography hobby” (NAE)

• “Mechanical and material properties I learn in my hobbies can often relate to mechanical and material issues in microelectronics, especially in my specific discipline.” (NAE)
Do You Recommend Arts and Crafts Education As a Useful or Even Essential Background for a Scientific or Engineering Innovator?

- **YES**
  - NAE (N = 58)
  - MSU STEM (N = 36)
  - MICH Eng (N = 16)
  - MEDC (N = 29)

- **MAYBE**
  - NAE (N = 58)
  - MSU STEM (N = 36)
  - MICH Eng (N = 16)
  - MEDC (N = 29)

- **NO**
  - NAE (N = 58)
  - MSU STEM (N = 36)
  - MICH Eng (N = 16)
  - MEDC (N = 29)
Some Typical Responses

• “Yes, because it is relaxing and frees the mind. I think moving around -- **dancing**, playing on the playground, helps one get a **visceral feeling for physics.**” (NAE)

• “Hands on **experience with tools, materials**, etc., whether for arts and crafts or more practical pursuits (carpentry, home repair, auto mechanics, etc.), represents a very important experience for **practical problem solving.**” (NAE)

• “Yes, allows you to **explore materials in a different way**, figure out how to put things together, try to do things differently.” (MSU STEM)

• **Mechanical skills** are important for constructing experimental apparatus. **Pattern visualization** is very important, and is **developed by arts and crafts**” (NAE)

• “Yes. Ability to make simple **prototypes and models with own hands vital for creativity** in product design” (NAE)

• “**Yes- helps creativity**” (NAE)
Visual Thinking Training Improves Science and Engineering Ability


What Was the Most Important Exposure to Arts and Crafts?

• **Active arts and crafts** correlated with entrepreneurial outcomes better than passive ones (i.e., composing music rather than playing an instrument; painting or metalwork rather than photography or knitting)

• **Informal education, mentoring and self-education** were as important as **formal courses** and **private lessons**

• Participation over a **lifetime** (particularly as **adult**!) more important than any particular experience or time period
Arts and Crafts participation in Mature Adults Is a Function of Childhood Involvement

- STEM Grads that Did NOT Participate as a Child
- STEM Grads that Did Participate as a Child

Diagram showing percentages of STEM graduates who participated in various arts and crafts activities as children: Music, Visual Arts, Acting, Dancing, Creative Writing.
In Sum, Investing In Arts and Crafts Builds Innovative and Entrepreneurial Capacity Over a Lifetime

• We are NOT just talking about taking an art class or music lessons at some critical point in one’s life
• We are NOT talking about building a theater or an art museum in one’s community
• We are talking about as SYSTEM that makes available over a lifetime:
  – Formal education in arts and crafts
  – Informal education in arts and crafts
  – Personal and community access to arts and crafts materials and equipment (community centers, crafts and hobby shops, art stores, etc.)
  – Full range of community arts and crafts institutions (commercial, cultural, professional and amateur)
Arts and Entrepreneurship SYSTEM:

**Lifetime access to:**

– Formal education in arts and crafts
– Informal education in arts and crafts
– Personal and community crafts materials and equipment (community centers, crafts and hobby shops, art stores, etc.)
– Full range of community arts and crafts institutions (commercial, cultural, professional and amateur)
Take home messages

Strong formal and informal educational and cultural opportunities in arts and crafts build a creative STEM work force!

Science and technology flourish only where arts and crafts infrastructure is deep, wide, consistent and strong!

Conversely, strong STEM individuals and industries must promote arts, crafts and cultural development

Investment in arts and crafts may pay off only decades later as innovation in other professions!
We can’t ignore necessity for integration and feedback!