

ARTSMARTS and CRAFTSMARTS

AMONG INNOVATORS
IN SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS
(STEM)



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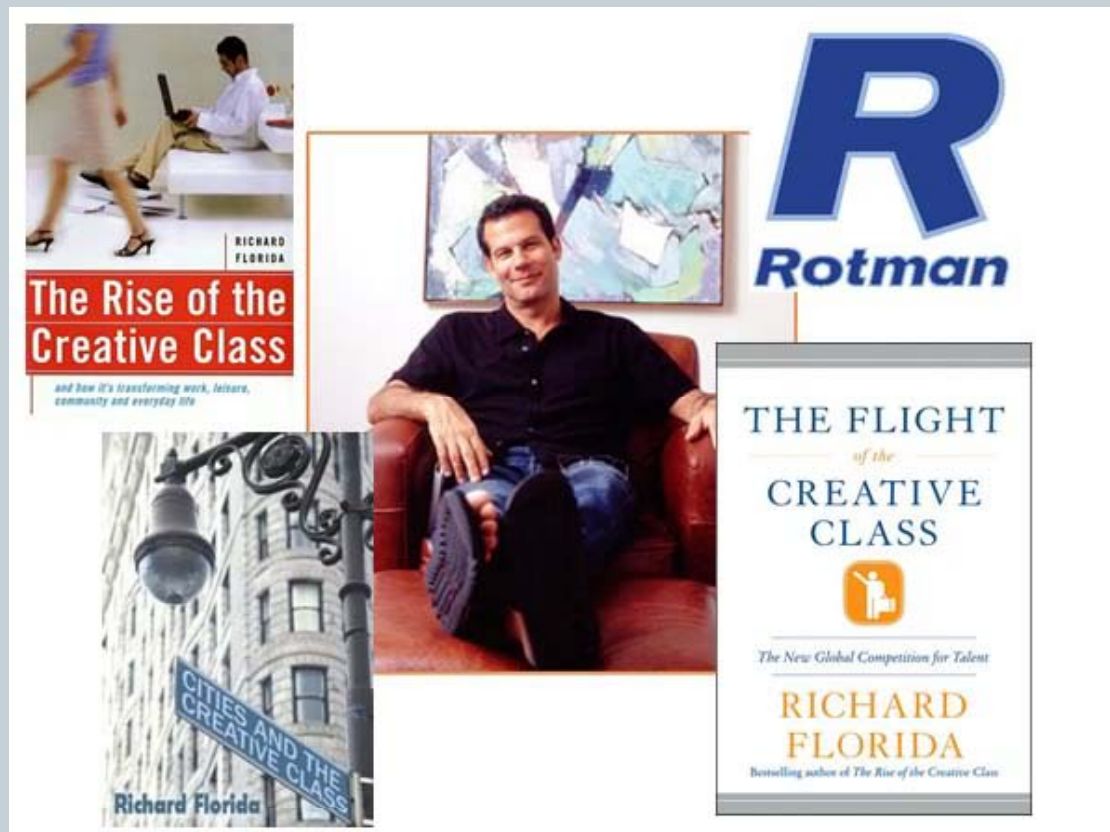
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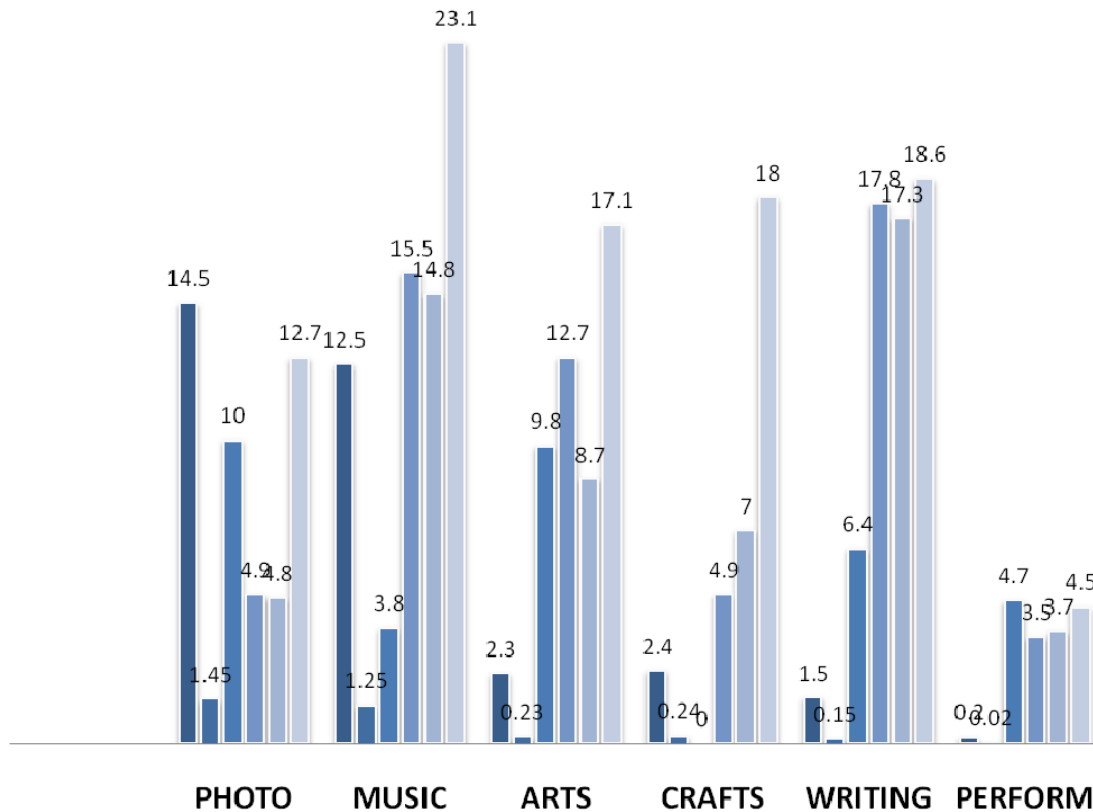
What Is the Relationship Between Innovation and the “Creative Class”?



- Richard Florida has proposed that entrepreneurs are attracted to arts-rich regions'
- Why?
- Perhaps innovators are artistic themselves...

Adult Avocations Correlate with Scientific Success

■ SIGMA XI MAX n = 4406
 ■ US PUBLIC n = 4250
 ■ NAS, USA n = 1266
 ■ SIGMA XI MIN n = 42,525
 ■ ROYAL SOC n = 1634
 ■ NOBELS, TOT n = 510



Compared with typical scientist, Nobel laureates are **at least:**

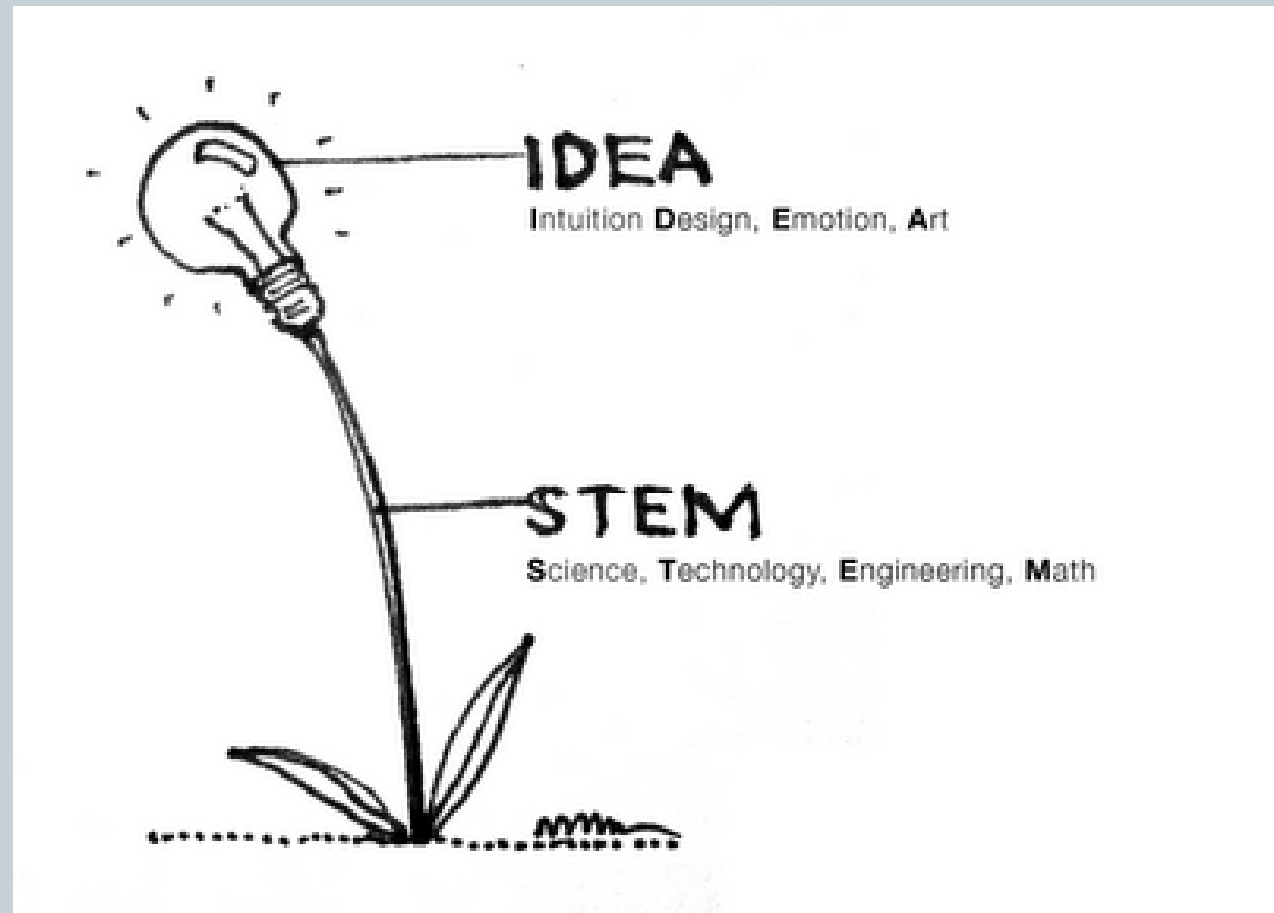
- 2X photographers
- 4X musicians
- 17X artists
- 15X craftsmen
- 25X writers
- 22X performers

Root-Bernstein, et al., 2008

Adding **ARTS** to **STEM** to Give them **STEAM**!



Harvey White,
Qualcomm
Founder



RISD President John Maeda

“At Boeing, innovation is our lifeblood. The arts inspire innovation by leading us to open our minds and think in new ways about our lives – including the work we do, the way we work, and the customers we serve.”

– W. James McNerney, Jr., Chairman, President and Chief Executive Officer, The Boeing Company

"We are a company founded on innovation and believe the arts, like science and engineering, both inspire us and challenge our notions of impossibility."

–George David, Chairman and Chief Executive Officer, United Technologies Corporation

“The arts foster creativity, and creativity is central to our business strategy. Indeed, we believe there is a strong link between the creativity nurtured by the arts and scientific creativity. If our scientists are stimulated through their involvement with the arts, then it’s ultimately good for our business -- and our community.”

- Randall L. Tobias, Chairman of the Board and CEO, Eli Lilly and Company

“A good well-rounded education must include the study of both the arts and the sciences. As a company we explore the synergies between arts and science... [Arts] teach critical thinking, creativity and curiosity – skills that make for an educated and innovative work force.”

- Helge W. Wehmeier, President and Chief Executive Officer, Bayer Corp.

Where Do ArtSmarts and CraftSmarts Begin?



- Project investigates the *artsmarts* of Michigan State University Honors College graduates from the years 1990 to 1995 who majored in science, technology, engineering or mathematics (STEM)
- Analyzed formal and informal arts and crafts education and continuous arts and crafts exposure in relation to: 1) papers published; 2) patents granted; 3) companies founded; 4) combination of 1-3.
- QUESTION: is arts education associated with measures of economically valuable innovation?

ArtSmarts and CraftSmarts Findings



- **Honors College graduates majoring in STEM subjects (science, technology, engineering and math) are far more likely to have extensive arts and crafts skills than the average American**
- **Among these graduates, arts and crafts experiences are significantly correlated with producing patentable inventions and founding new companies**
- **These graduates believe that their innovative ability is stimulated by their arts and crafts knowledge**
- **When asked, many of these innovators and entrepreneurs recommended increasing the amount of exposure science and technology students get to arts and crafts**

ArtSmarts and Craftsmarts

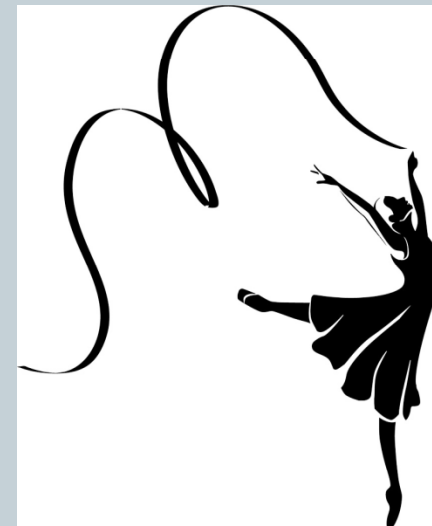
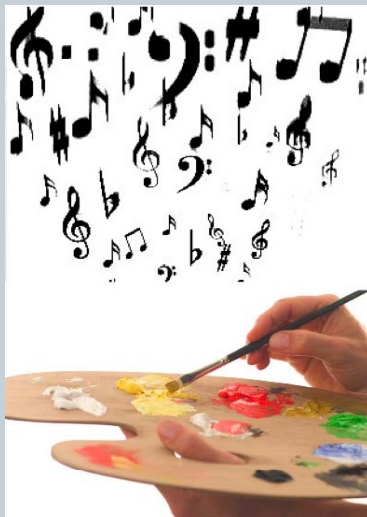


- **In sum: Michigan's economic recovery and development may depend on educational and community *ARTSMARTS and CRAFTSMARTS***

ArtSmarts and CraftSmarts



- MSU STEM Honors grads report 3 to 8 times more involvement in arts and crafts training and practice at some point in their lives than the general public



ArtSmarts and CraftSmarts!



	Percent of STEM Honors College Graduate	Percent of NEA (General Public) Participants (2008)	Ratio
Lifetime Music Lessons or Classes	93.0	34.0	2.7: 1
Lifetime Visual Arts Lessons or Classes	79.1	17.0	4.7: 1
Lifetime Acting Lessons or Classes	44.2	5.9	7.5: 1
Lifetime Dance Lessons or Classes	51.2	12.1	4.2: 1
Lifetime Creative Writing Lessons or Classes	74.4	11.3	6.6: 1

CraftSmarts!



	Percent of STEM Honors College Graduates as Mature Adults	Percent of NEA Participants (Active Participation 2008)	Ratio
Crafts	62.8	19.1	3.3:1
Non-Textile Crafts	32.6	6.0	5.4:1

	Percent of STEM Honors College Graduates as Mature Adults	Percent of Adult Participation in 2008 (Census Data)	Ratio
Photography	54.8	12.7	4.3:1
Woodwork	21.4	4.4	4.9:1

Childhood Arts and Crafts That Correlate Significantly with Economic Productivity



	Patents	Companies	Overall
Pottery/ Ceramics	+		
Photography	+		
Woodwork	+		
Metal Work	+	+	+
Mechanics	+		
Electronics	+	+	
Architecture		+	
Computer Programming	+		

Mature Adult Arts and Crafts That Correlate with Economic Productivity



	Patents	Companies	Overall
Photography		+	
Print Making	+		+
Composing Music	+		+
Magic	+		
Metal Work	+		
Mechanics	+		
Electronics	+		
Architecture	+		

ArtSmarts Have Economic Impact



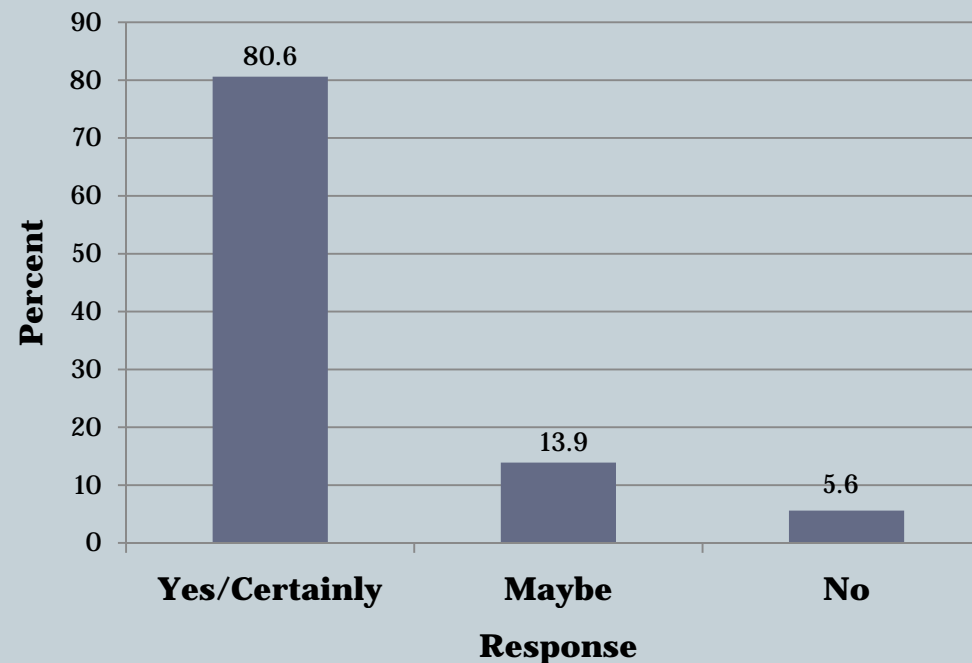
- Among MSU STEM grads early and ongoing participation in many crafts and some arts correlates with making patentable inventions and founding companies in adulthood.



ArtSmarts and CraftSmarts



- Would you recommend arts and crafts education as a useful or even essential background for a scientific or engineering innovator?



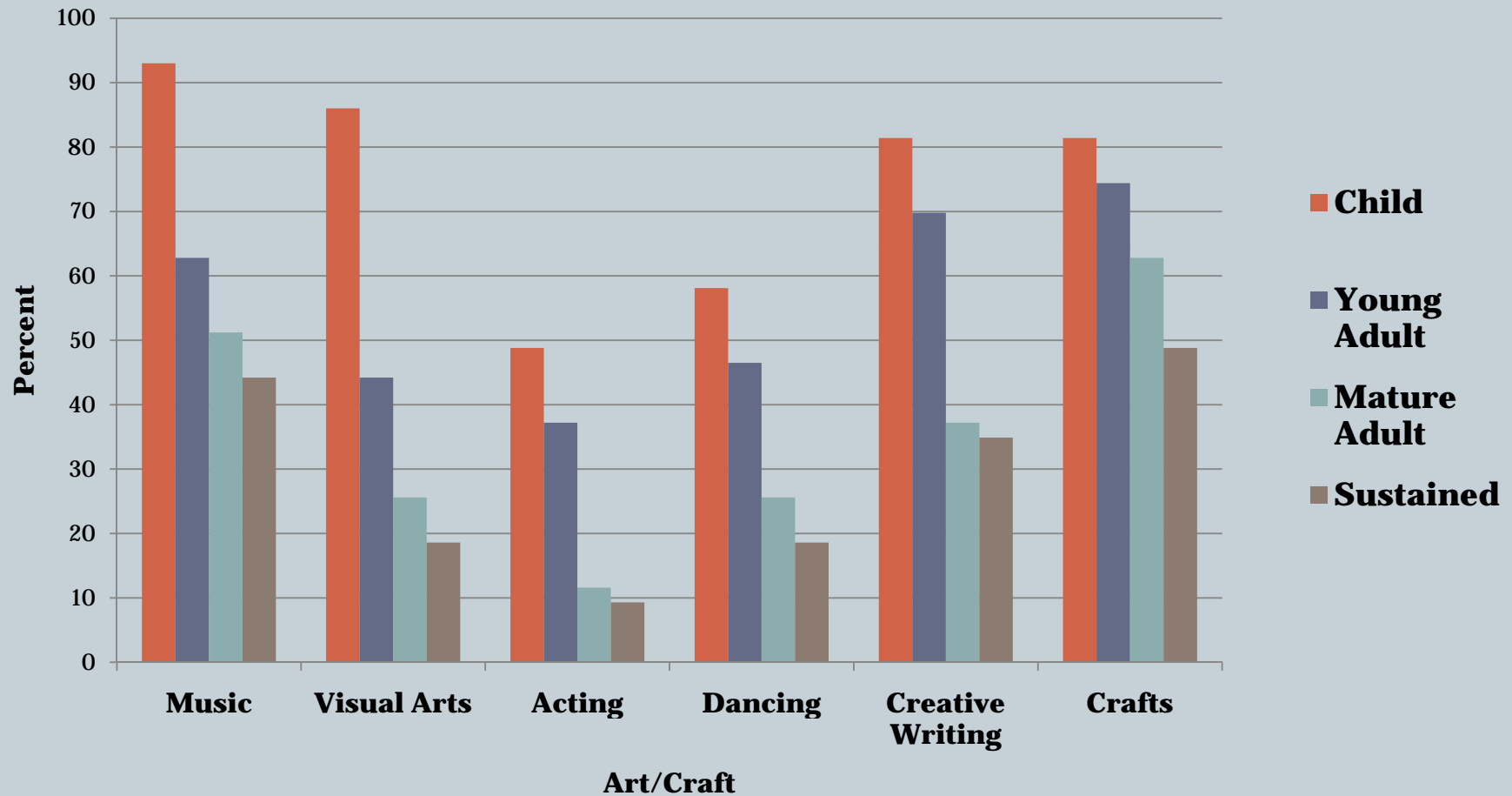
Examples



- *Yes, expands horizons and helps to think outside the box.*
- *Yes, allows you to explore materials in a different way, figure out how to put things together, try to do things differently.*
- *Yes.... After these many years in the classroom, I see those that have music and arts background seem to do very well in physics and often times head to engineering careers.*
- *I find that most scientifically minded people I know well have an interest in art or craft as well. I do think that it is an opportunity to perceive the world in a different way and engage a different portion of the brain.*
- *Diversity of experience helps you look at a problem in a different way than it has been looked at before.*

WHEN You Are Introduced to Arts and Crafts Matters!

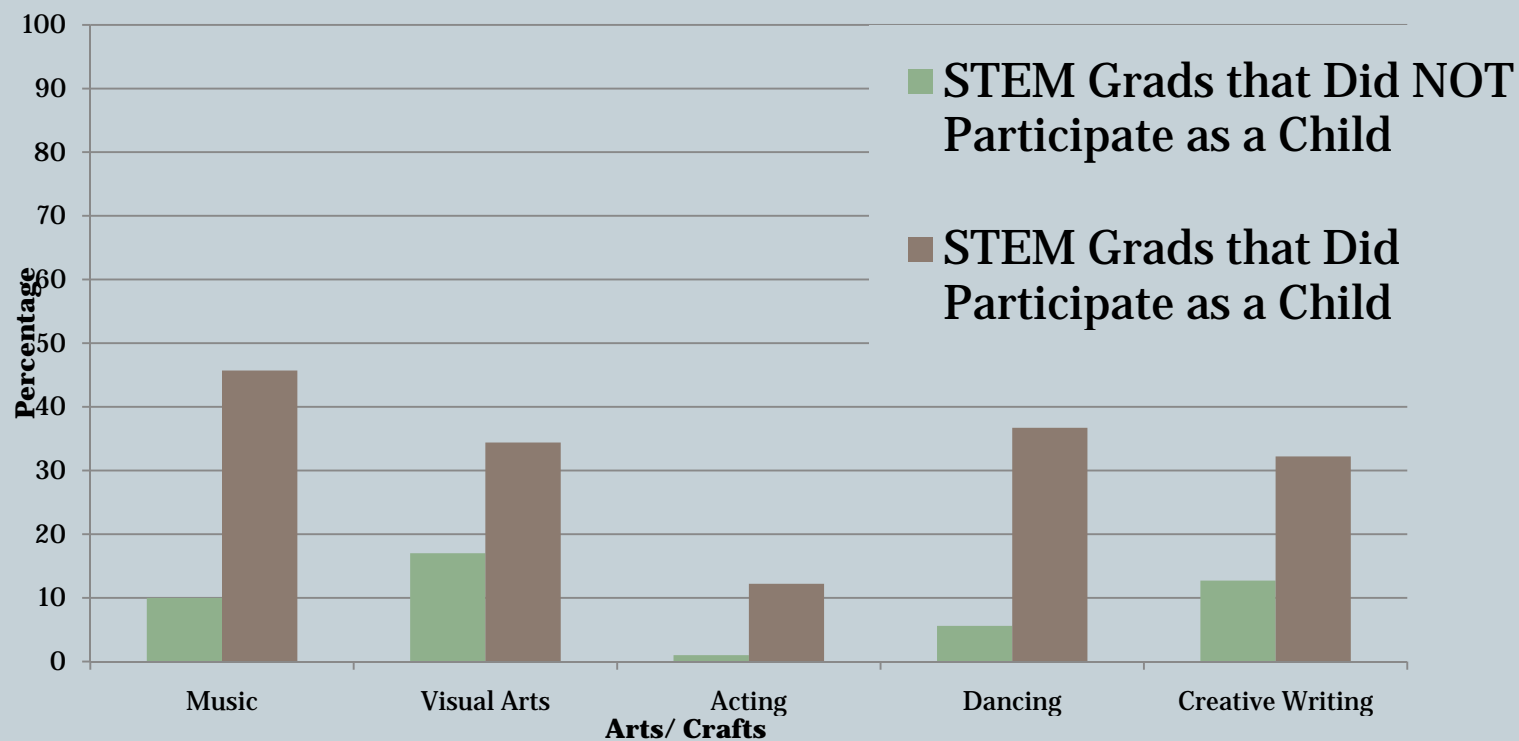
Involvement in Arts & Crafts at Different Life Phases



Sustained practice depends on degree of early exposure



Arts and Crafts participation in Mature Adults as a Function of Childhood Involvement

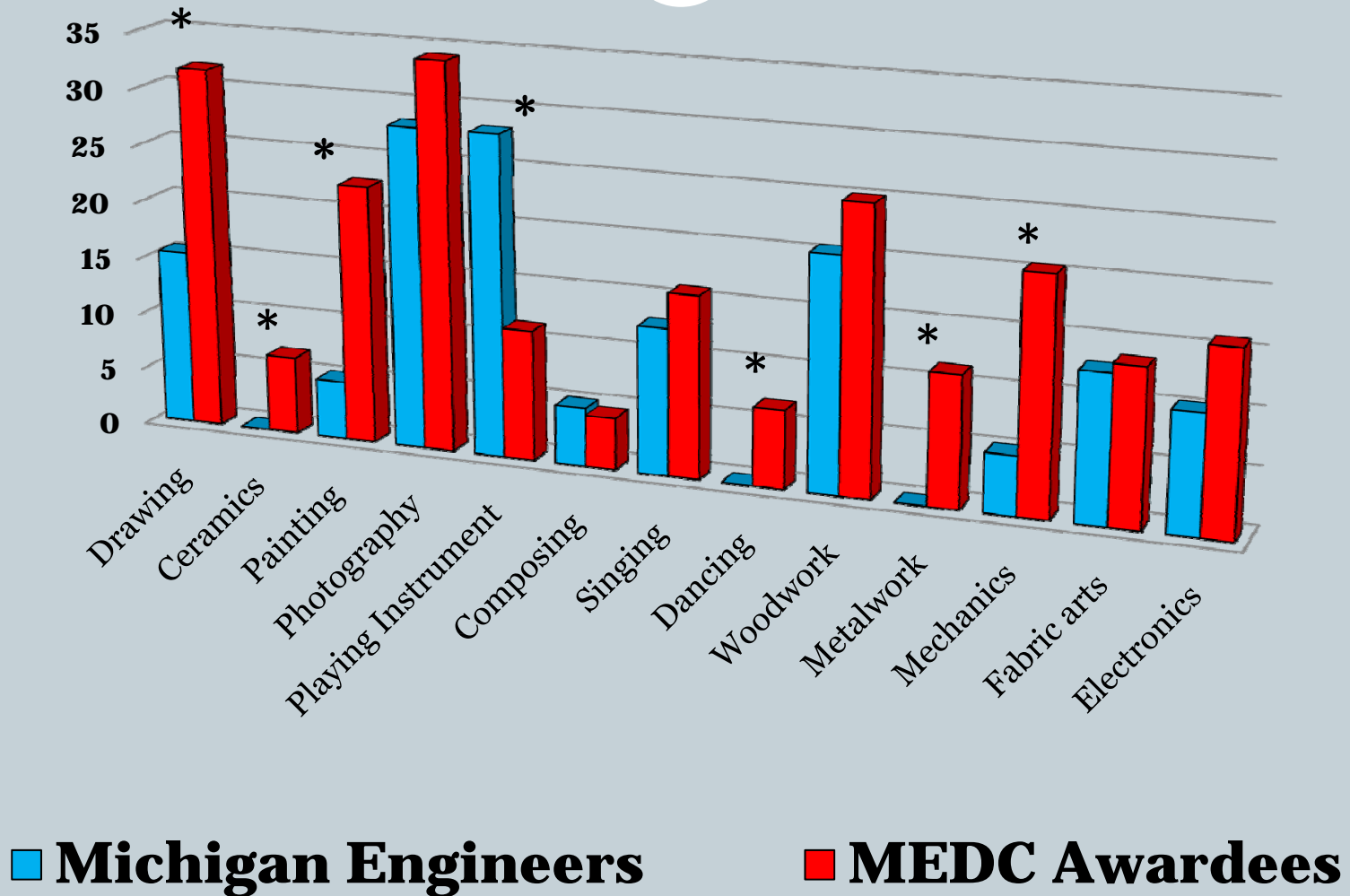


Take Home Message!



- **Arts training and participation peaks in childhood, consistently subsiding thereafter**
- **Lifetime and sustained practice depend on degree of early exposure.**
- **Sustained arts and crafts practice is the best correlate of economically valuable innovation**
- **SO, early arts exposure followed by sustained opportunities for participation are essential to building creative capital!**

Sustained Arts and Crafts Correlate with Innovation for MEDC as Well!



SUMMARY: ArtSmarts and CraftSmarts

- 80% of successful STEM professionals reported that arts and crafts were important for developing their innovative thinking
- Continuous participation highly correlated with measures of creative capital for both MSU Honors STEM professionals and MEDC funded innovators



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Policy Recommendations:



- Recognize utility of arts and crafts as incubators for developing innovative thinking skills in STEM
- Make funding of arts and crafts a priority for Michigan's economic recovery within both school and public resources budgets
- Remember: best predictor of economically valuable innovation is continuous participation in arts and crafts!