

Art + Science:

Utilizing STEAM Education to Promote Empathetic Scientific Literacy for Global Citizenship

Ali Orsi-Davis

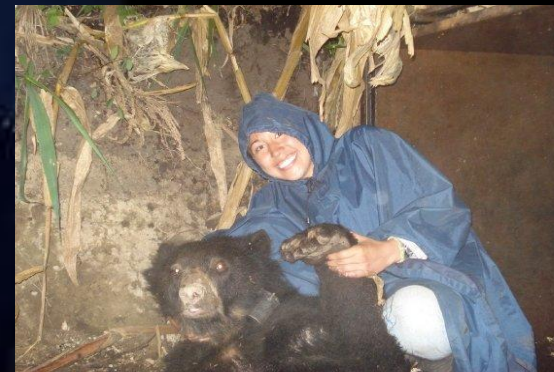
Masters Synthesis Presentation

May 4, 2020

University of Massachusetts, Boston
Critical and Creative Thinking Program
Science in a Changing World Program







Sex differences in improved efficacy of doxorubicin chemotherapy in *Cbr1*^{+/-} mice

Megan M. Freeland^a, Jackeline Angulo^a, Alison L. Davis^a, Adam M. Flook^a,
Brittany L. Garcia^a, Nathan A. King^a, Samuelle K. Mangibin^a, Kristin M. Paul^a,
Megan E. Prosser^a, Nicole Sata^a, Jim L. Bentley^b and Lisa E. Olson^a











“We are in humanity’s moment of greatest peril.”

Iran to confirm next steps in withdrawal from nuclear deal



Australia’s Fire Season Ends, and Researchers Look to the Next One

Assessing Russian Activities and Intentions in Recent US Elections

We have 12 years to limit climate change catastrophe, warns UN

Coronavirus: Trump's WHO de-funding 'as dangerous as it sounds'

Should the Renewable Fuel Standard (RFS) be Eliminated?

In Forecasting Hurricane Dorian, Models Fell Short

April 30, 2020 · 7:00 AM ET

Doomsday Clock Moves to 100 Seconds Before Midnight Due to Threats of Nuclear War and Climate Change

By the Numbers: Syrian Refugees Around the World

A quick guide to the US-China trade war

🕒 16 January 2020



Please Do Not Eat Disinfectant

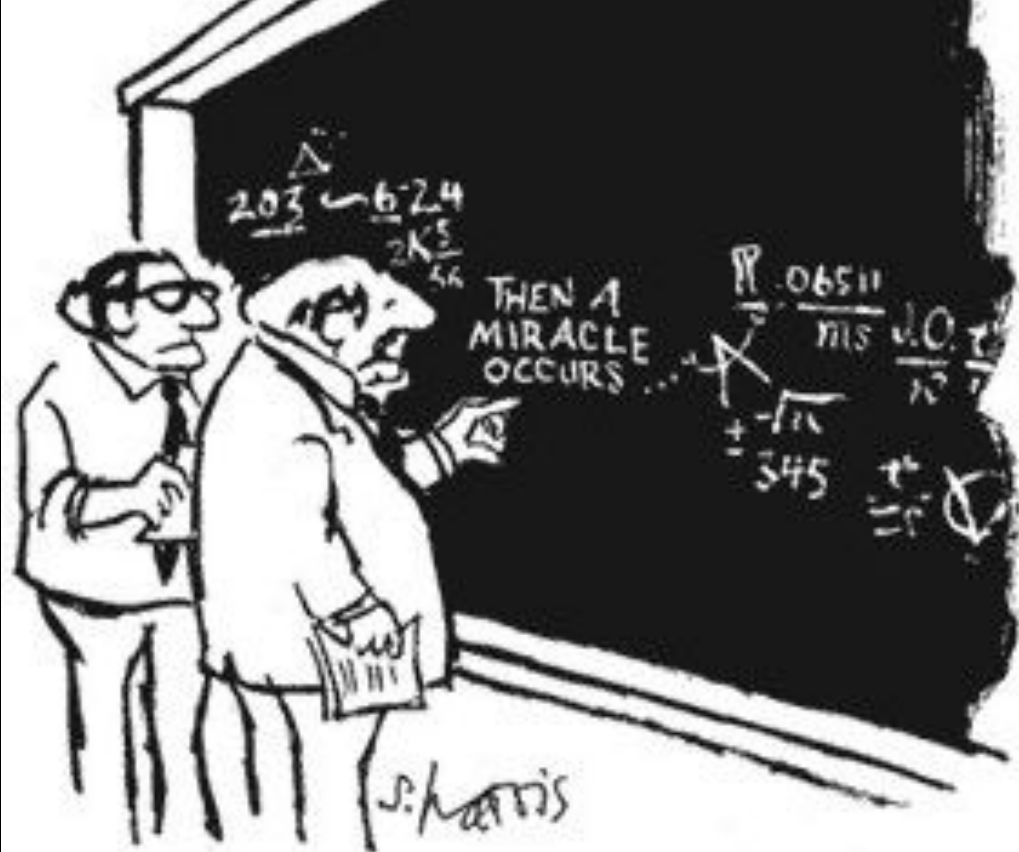
House Bill H.R. 9

Should the U.S. Stay in the Paris Agreement?



**'THE FUTURE
DOES NOT
BELONG TO
GLOBALISTS.
THE FUTURE
BELONGS
TO PATRIOTS.'**

Donald Trump
U.S. President, in a speech at the
U.N. General Assembly on Sept. 24, 2019



"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."



Science

Technology

Engineering

Mathematics



“... increase the pool of engineers and scientists, and to maintain global economic dominance”

girl scouts 



lemon-ups™ 

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WITH OTHER NATURAL FLAVORS
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with inspiring messages to
lift your spirits.

NET WT 6.2 OZ (176g) 

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Girl Scout
Mission**

Girl Scouting builds girls of courage,
confidence, and character, who
make the world a
better place.

Ready for a lifetime of leadership,
success, and adventure?
Join Girl Scouts today!
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STEM

Giving girls the know-how to
invent the future.



Outdoors

Inspiring girls to love
nature and seek adventure.



Life Skills

Setting girls up with the skills
they need to succeed in life.



Entrepreneurship

Preparing girls with business
smarts to take on the world.





Science

Technology

Engineering

Art

Mathematics



“Above all... art often constructs connections that are surprising and novel — bringing the viewer to new insights and new knowledge.”

Factors Inhibiting STEAM Development

- 1. Lack of coordination in STEAM implementation**
(differences in how and for what reason teachers include art)
- 2. Overbearing high stakes testing**
(test scores remain sole priority)
- 3. Public value and connotation about sciences**
(lower-value art has no place with quantitative science)



BUILDING STEAM

- 2013 - CONGRESSIONAL STEAM CAUCUS CREATED
- 2012 - SUNY POTSDAMN BEGINS FORMING A STEAM DEGREE PROGRAM
- 2012 - RISD PARTNERS WITH CREATIVE MORNINGS TO PUSH FOR STEAM
- 2010 - WOLF TRAP FOUNDATION FOR THE PERFORMING ARTS WAS AWARDED A FIRST OF ITS KIND \$1.15 MILLION STEAM GRANT



THE NEED FOR STEM

A STUDY BY THE PARTNERSHIP FOR A NEW AMERICAN ECONOMY, CALLED "NOT COMING TO AMERICA," DEMONSTRATES THE LACKING INTEREST IN STEM BY UNDERGRADUATES THROUGHOUT AMERICAN-BORN CITIZENS. WITH A STEM JOB MARKET INCREASING THREE TIMES FASTER THAN THE REST OF THE ECONOMY, AND ONLY 44% OF AMERICAN UNDERGRADUATES ENROLLED IN STEM PROGRAMS, THERE IS A HUGE SHORTAGE OF QUALIFIED HIGH-TECH WORKERS.

THE ISSUE WITH NCLB

(NO CHILD LEFT BEHIND) STUDENTS ARE MEASURED ON MEMORIZATION RATHER THAN COMPREHENSION. IN PREPARATION FOR STANDARDIZED TESTS, A STUDENT IS TAUGHT THAT ONLY RIGHT AND WRONG ANSWERS EXIST WHILE THE ARTS ENCOURAGE STUDENTS TO SEEK OUT MULTIPLE SOLUTIONS.



A STUDY BY ROBERT ROOF-BURNSTEIN DEMONSTRATED THAT MOST ALL OF THE SCIENTIFIC NOBEL LAUREATES, OR "GENUSES," BETWEEN 1902 AND 2005 WERE PROFICIENT IN NOT JUST SCIENCE BUT ALSO THE ARTS.



LIFEJOURNEY™

AN ONLINE MENTORSHIP PROGRAM THAT ALLOWS STUDENTS TO TEST DRIVE STEAM CAREERS THROUGH PROBLEM BASED LEARNING



WHAT IS STEAM?

CROSS CURRICULAR COLLABORATION



PLEASE JOIN US!



STEAM

SCIENCE, TECHNOLOGY,
ENGINEERING, ARTS, MATHEMATICS

Hart Middle School Family STEAM Night

Experience exciting, hands-on Science, Technology, Engineering, Arts, and Math activities, demonstrations, and performances.

All families are welcome.

Activities are geared for grades 4-8.

- Project Lead the Way (PLTW)
- Hart M.S. Engineering
- Robotics Team

- AVHS PLTW Engineering
- Foothill High Engineering & Biomedical Sciences
- Foothill High Art Dept.
- FAD (Fine Arts Docents)
- Hart Jazz Band
- Hart Science Department
- Hart Culinary Demonstrations
- Leadership
- Art Dept.

- Alameda County Mosquito Abatement District
- Mad Science Workshops
- Give Us The Floor Teen Expression Workshop
- Lawrence Berkeley National Laboratory
- ThermoFisher Scientific
- Zone 7 Water District/Morrison & Associates
- J.Chidambaram Interior Design
- Hands-on Building Corner





unit?

(ves)



Stormy
 This scene captures the raw power of a storm, with dark, swirling waves crashing against a rocky shore. The sky is filled with heavy, dark clouds, and a small boat is seen struggling in the turbulent water. The overall mood is one of intense natural force and danger.



Golden Hour
 The warm, golden light of the setting or rising sun illuminates the scene, creating a dramatic contrast with the dark, churning waves. The mountain in the distance is silhouetted against the bright sky, adding to the sense of scale and grandeur.



Golden Sun
 The bright, golden sun dominates the upper half of the frame, its rays casting a warm glow over the entire scene. The waves below are rendered in shades of blue and white, contrasting with the intense yellow and orange of the sun.



Stormy
 The sky is a deep, vibrant pinkish-red, suggesting a sunset or sunrise during a storm. The waves are dark and turbulent, with white foam cresting over. The mountain in the background is partially obscured by the low-hanging clouds.

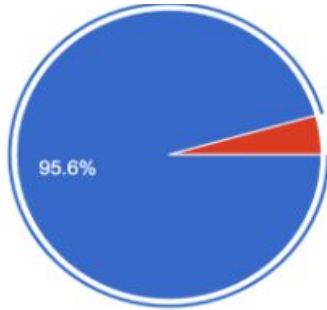


Red Sun
 A large, solid red sun is the central focus, its color suggesting a sunset or sunrise. The waves are depicted with bold, blue lines, and the mountain in the distance is a simple silhouette against the bright background.



1. Did you enjoy the art components of the waves unit?

(183 responses)

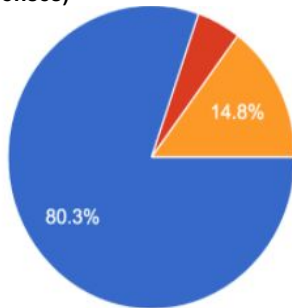


95.6%
Yes
4.4%
No

Does STEAM work?

2. Would you like to have more art opportunities incorporated into science units?

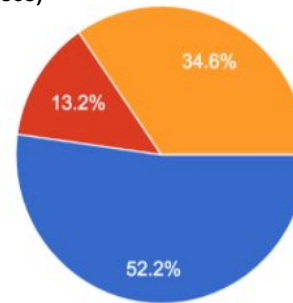
(183 responses)



80.3%
Yes
14.8%
Maybe
4.9%
No

3. Do you think you were able to communicate to others what you know about waves by using art?

(182 responses)

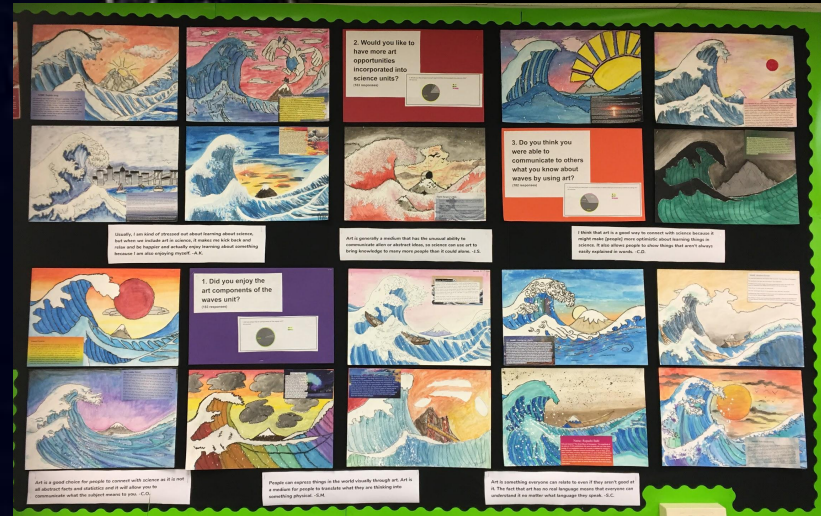


52.2%
Yes
34.6%
Maybe
13.2%
No

Does STEAM work?

There is significant evidence that non-male students chose to take their work home at a higher rate than male students (p-value = .0066)

There is some evidence that non-white students chose to take their work home at a higher rate than white students (p-value = .0851)



1. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.

2. Would you like to have more art opportunities incorporated into science units? Yes

3. Do you think you were able to communicate to others what you knew about waves by using art? Yes

4. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.

5. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.

Art is generally a medium that has the unusual ability to communicate ideas or abstract ideas, so instead of an art to bring knowledge to many more people than to learn about. C.D.

6. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.

7. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.

8. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.

9. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.

10. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.

11. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.


12. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.

13. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.

14. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.

15. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.

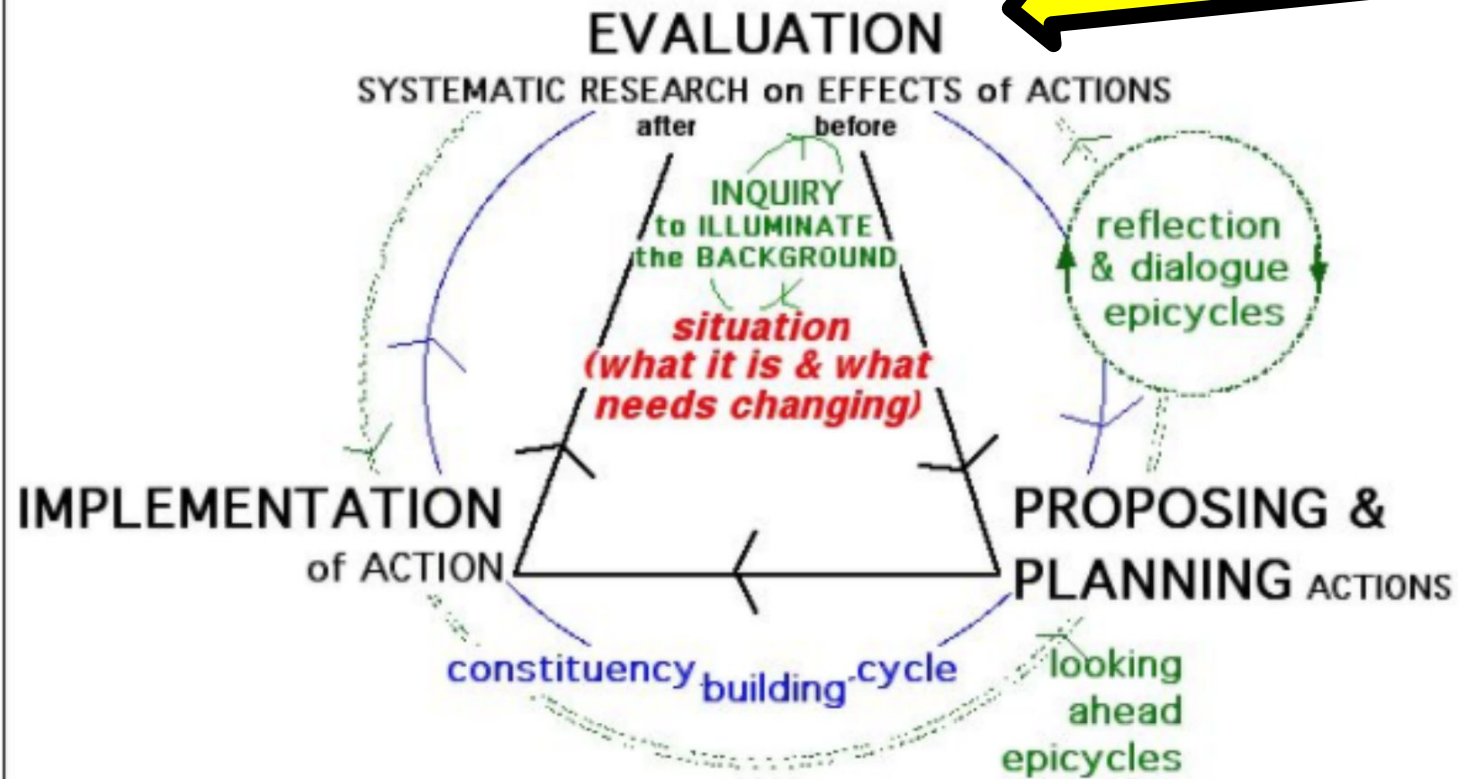
16. I think that art is a great way to connect with others because it might make people feel better about learning things in school. It also shows people how they think that isn't always really expressed in words. C.D.



“Art is generally a medium that has the unusual ability to communicate alien or abstract ideas, so science can use art to bring knowledge to many more people than it could alone.”







The Cycles and Epicycles of Action Research



Global response to the threat of climate change, sustainable development, and efforts to eradicate poverty

“[Art-science’s] meaning-creative capacity of initiatory action [instills]... boundlessness and uncertainty of outcome, where ‘boundless’ implies the creation of a ‘myriad new relationships [and] unforeseen constellations’.”





“A more robust understanding of effective STEAM application in classrooms, including carefully crafted goals and assessment tactics, can prepare humankind to confront our most pressing issues surrounding climate change, poverty, and sustainable practices, while fostering scientific literacy and empathy in global citizens.”

-Betsy DeVos (?)
US Secretary of Education
May 4, 2020



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