STEM-Integrated Arts: A Discussion With Some "Sciencey" People

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Karen Knecht
SENIOR DIRECTOR OF EDUCATION
Da Vinci Science Center
Allentown, PA

Ann Bebout
PROFESSIONAL DEVELOPMENT PROGRAM MANAGER
Da Vinci Science Center
Allentown, PA
What makes someone a “sciencey” person?

PICK TWO:

- Being naturally good at science
- Creativity
- Knowing the right vocabulary words
- Curiosity
- Discussing science ideas with others
- Getting the right answer
1,309 Allentown SD 4th & 5th grade students were asked...

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Science Capital is like a “holdall” containing all the science-related knowledge, attitudes, experiences and resources that you acquire through life.

Archer et al. (2015)
US Dept of Education grant
Professional Development for Arts Educators

Prepare students for the expanding design economy by...

• Developing art teachers’ skills, knowledge, and comfort with artistic applications of digital design, coding, and fabrication tools

• Integrating principles from STEM Inquiry, Maker Education, and Design Thinking into K-12 visual arts classes
US Dept of Education grant
Professional Development for Arts Educators

• Summer intensive
• School year workshops
• Online professional learning
• Classroom programs

• Equipment lending library
  3D printers
  laser cutter/engravers
  microcontrollers
  robotics kits
Simple circuits with LEDs
Scribbling Machines
Coded Designs

When run:
- Jump to 238 over 230 down
- Set width to 7
- Repeat 10 times
  - Do
    - Repeat 17 times
      - Do
        - Move forward by 50 pixels
        - Turn right by 80 degrees
        - Move forward by 8 pixels
        - Move forward by 150 pixels
        - Jump forward by 30 pixels
      - Jump to the top left position
3D Printing
Laser cutter/engraver

1/8" plywood with kerf hinge

6"x6" cardboard, 3 layers glued
Laser-engraved cardboard totems – art lesson on symmetry
Mallory Zondag and Panther Valley Jr/Sr HS students
Moving Masterpieces
Electronic Musical Instruments
Arts Integration is an **APPROACH** to **TEACHING** in which students construct and demonstrate **UNDERSTANDING** through an **ART FORM**.

Students engage in a **CREATIVE PROCESS** which **CONNECTS** an art form and another subject area and meets **EVOLVING OBJECTIVES** in both.
**STEM or STEAM?**

An integrated, interdisciplinary, and student-centered approach to learning that encourages curiosity, creativity, artistic expression, collaboration, ... communication, problem solving, critical thinking, and design thinking.
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Pennsylvania Department of Education
STEM or STEAM?

An approach to education that promotes student-led explorations driven by curiosity and the application of competencies and practices across disciplines that can effectively and equitably prepare them for success in education and the 21st century workforce.
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The Innovation Collaborative
 STEAM is...

**CREATIVE**
Students leverage content from S, T, E, and M to create meaningful artwork that focuses on outcomes with a personal or aesthetic meaning.

**EXPERIENTIAL**
Students conduct open exploration in the context of both science and art, communicating about the processes and outcomes.

**INQUIRY-BASED**
Using scientific and creative processes, students ask questions, design and experiment with intention, improvise and solve real-world problems.

**INTERDISCIPLINARY**
Student learning occurs at the intersection of S, T, E, Arts, and M – incorporating standards in all subjects.
What we have heard
STEM Professionals say:

• Leave the A out – Arts aren’t rigorous enough.

• Put the A in – It helps the medicine go down.
What we have heard
Arts Professionals say:

• STEAM is…
  the same as Design Thinking
  the same as Project Based Learning
  a mindset
  anything requiring creativity

• STEM is
  missing creativity and innovation
Breakout Room Questions

• What are the benefits and risks if school systems distinguish between STEM and STEAM approaches?

• What needs to be done to ensure that the important characteristics of STEAM have a place in school systems long term?

PARTING THOUGHTS

STEAM programs offer an opportunity to build arts identities and increase community involvement in the arts.

STEM and Arts professionals should collaborate to design and study the effectiveness of STEAM education programs.

Empowering art teachers as STEAM experts in their buildings/districts is a good way to ensure that Art remains a central part of STEAM curricula.

The Exploratorium is an inspiring STEAM example, founded to be “a museum of human awareness” that combines art and science while encouraging play, experimentation, and a sense of joy and wonder.
THANK YOU!

Contact:
Karen Knecht
Senior Director of Education
karen@davincisciencecenter.org

Contact:
Ann Bebout
Professional Development Program Manager
ann@davincisciencecenter.org
@bebout_ann