Visual Design and Communication Strategies for STEM Community Engagement

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Purpose

The purpose of this poster presentation is to explore creative ways to apply visual design and communication strategies to make STEM community engagement appealing to FAU student volunteers and inspiring to K-12 students.

Background

STEM community engagement is a goal of the STEM Education Laboratory (STEM Lab) in the College of Education at Florida Atlantic University. STEM education is a matter of national importance. According to the Executive Office of the President (2018), "Individual success in the 21st century economy is also increasingly dependent on STEM literacy; simply to function as an informed consumer and citizen in a world of increasingly sophisticated technology requires the ability to use digital devices and STEM skills such as evidence-based reasoning." The character of STEM education itself has been evolving from a set of overlapping disciplines into a more integrated and interdisciplinary approach to learning and skill development. This new approach includes the teaching of academic concepts through real-world applications and combines formal and informal learning in schools, the community, and the workplace. It "seeks to impart skills such as critical thinking and problem solving along with soft skills such as cooperation and adaptability" (Committee on STEM Education of the National Science and Technology Council, 2018). STEM education involves the teaching and learning of concepts found in science, technology, engineering, and mathematics, from K through postgraduate levels. The STEM Education Lab recognizes that STEM overlaps with the arts, reading, social studies, architecture, nursing, medicine, etc. Recently, the STEM Edu Lab received a grant from The Scott Family Fund to support its mission. To make STEM community engagement more appealing to FAU student volunteers, the visual design and communication strategies proposed by Vassilissa Semouchkina (2021) are applied in this presentation.

STEM Community Engagement by the STEM Education Laboratory

The STEM Education Lab supports the "Community Engagement and Economic Development" platform in the "Strategic Plan for the Race to Excellence 2015-2025" of Florida Atlantic University.

FAU Student Volunteers

Undergraduate Preservice Teacher Education Majors = **49**

Graduate Preservice Teacher Education Majors = **3**

Education Community Engagement Sites

Schools in **Dade County**

- All Angels Academy
- St. Patrick's Elementary

Schools in **Palm Beach County**

- A. D. Henderson University School
- Hidden Oaks K-8 School
- Morikami Park Elementary

Schools in **Broward County**

- Apple Tree Montessori School
- Baldwin Academy
- Bennett Elementary
- Boulevard Heights Elementary
- Challenger Elementary
- Coconut Creek Elementary
- Coconut Palm Elementary
- Cooper City Elementary
- Coral Park Elementary
- Country Hills Elementary
- Cross Creek Elementary
- Eagle Point Elementary
- Flamingo Elementary
- Fox Trail Elementary
- Franklin Academy
- Hollywood Hills Elementary
- Meadowbrook Elementary
- Norcrest Elementary
- North Broward Preparatory School
- Nova Blanch Forman Elementary
- Oakland Park Elementary
- Parkway Christian School
- Pines Lakes Elementary
- Renaissance Charter School
- Riverside Elementary
- St. Patrick's School
- Village Elementary
- Welleby Elementary

Non-formal Education Community Engagement Sites

- Fort Lauderdale Museum of Discovery and Science (MODS)

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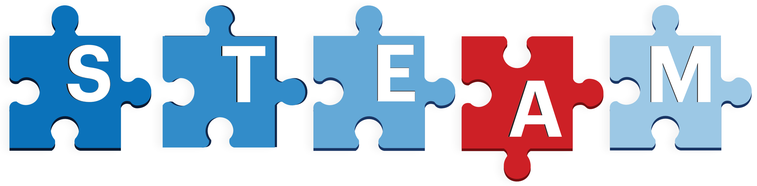

Sample STEM Community Engagement Topics Chosen by Volunteers

MODS EXHIBIT RELATED TOPICS

- Airplane Wing Lift (e.g., Bernoulli's Principle), Weather, Clouds, Water Cycle, Coral and Coral Bleaching, Sharks, Mangroves, the Everglades)

OTHER NON-MODS RELATED TOPICS

- Simple Pendulums, Electrical Circuit, Water Pollution, Floating and Sinking, Magnetism, Light

Formal Education Community Engagement Sites

BENEFITS TO STUDENT VOLUNTEERS (Kumar and Moffitt, 2000)

- Experience in designing and developing engaging STEM lessons mentored by university faculty and MODS staff
- Opportunity to deliver engaging STEM lessons to K-12 school students and/or MODS visitors
- FAU Academic Service Learning Credit (since Fall 2017)
- FAU designated Noble Hour Credit (prior to Fall 2017)
- Development of Teacher Leadership among Preservice Teachers in the following areas (*)

DEVELOPMENT OF SELF-CONFIDENCE

- *"This experience allows me to be more confident when teaching."*
- *"Presentation and demonstration allowed me to build confidence in explaining [the lesson]."*

DEPTH OF UNDERSTANDING OF THE [STEM] CONCEPT

- *"Everything I learned [about my topic] will stick with me forever."*
- *"I have learned a lot about the different components of [the topic]."*

AUDIENCE STEM LEARNING

- *"Because of the level of confidence I had in my project, this caused the audience to gain more knowledge about..."*

SENSE OF SELF-RESPONSIBILITY

- *"It is important to me that students understand the effects humans have on the Everglades."*

(*) Based on FAU IRB approved analysis of reflective survey responses of selected FAU student volunteers who engaged in STEM community engagement at the MODS (Kumar and Moffitt, 2000).

References

- Committee on STEM Education of the National Science and Technology Council. (2018). *Charting a course for success; America's Strategy for STEM education*. NSTC.
- Kumar, D. D. and Moffitt, S. (2000). STEM teacher development through community engagement. *Science Education and Civic Engagement: An International Journal, 12* (1), 5-11
- Semouchkina, V. (2021). *Advancing visual design culture in STEM Lab groups* (Master's thesis, University of Washington).

The Role of Art in STEM Education

Integrating art and design in STEM education encourages creativity, communication, and creative problem-solving. Through clear and engaging visuals, design principles help bridge the gap between science and public understanding. This strategy is supported by research by Semouchkina (2021), which demonstrates that creating a "visual design culture" in STEM groups improves cooperation and clarity by reinforcing the exchange and comprehension of ideas. Emphasizing creativity within STEM boosts visual literacy and curiosity, helping learners engage more deeply with science and technology.

WHAT ARE SOME EXAMPLES OF HOW ART INTERACTS WITH STEM?

- **S** **SCIENTIFIC ILLUSTRATION AND VISUALIZATION** Artists create visuals that illustrate biological processes, medical anatomy, and ecological systems.
- **T** **UX/UI DESIGN FOR SCIENCE APPLICATIONS** Designers work with developers to create user-friendly interfaces for educational and research software.
- **E** **PRODUCT AND INDUSTRIAL DESIGN** Engineers and artists collaborate to create functional, yet visually appealing prototypes.
- **A** **SPACE VISUALIZATION** Visualizers utilize artistic techniques to translate raw astronomical data into visual representations of space.
- **M** **DATA VISUALIZATION** Designers turn numbers into color-coded graphs and infographics that display patterns and trends.

Adding More STEAM to Boost STEM

1. **DESIGN IMPROVES COMMUNICATION**
   Visual storytelling makes STEM concepts clearer and more engaging for learners.
2. **DESIGN BUILDS VISIBILITY**
   Art and design increase awareness of STEM initiatives and opportunities.
3. **CREATIVITY FACILITATES INNOVATION**
   Integrating art into STEM encourages new ways of thinking and problem-solving in student volunteers.
4. **STEAM CONNECTS COMMUNITIES**
   Combining creativity with science fosters collaboration and curiosity among students, educators, and the public.

Marketing Outreach Strategy

1. **VISUAL TOOLKIT**
   Develop a reusable set of accessible outreach materials that can be used to promote lab events and initiatives consistently.
2. **DIGITAL MARKETING**
   Promote STEM Teacher Leadership Development on digital display screens across FAU's campuses using graphics, photos, and QR codes linking to the program's website.
3. **MAKING STEAM**
   Create a workshop series that invites students from both STEM and non-traditional STEM disciplines to work together on creative problem-solving tasks.
4. **COMMUNITY BUILDING**
   Collaborate with local museums, schools, and libraries to host hands-on STEAM outreach activities that extend the FAU STEM Lab's impact beyond campus, strengthening community connections and raising awareness of the STEM Teacher Leadership Development program.