**THE PRIMARY QUESTION: HOW CAN I INCORPORATE STEAM INTO A UDL-BASED CLASSROOM ENVIRONMENT?**

My inquiry is based on my own teenage middle and high school student experiences. I struggled with how to incorporate my passions for singing and stage production along with the joy of learning about geology that included my field-based experiences at a young age. Therefore, there is another thought:

**How can I add music and art into a secondary science class increase student understanding and retention?**

This simple, additional thought to my inquiry relates to creativity, concept construction, and the ways to display my knowledge based on these preferences. I have learned that it is a personal connection and curiosity that creates a foundation that students enjoy showing.

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**STEAM COMPONENTS AND INFORMATION...**

Often in STEAM units, teachers incorporate design principles of art such as planning and designing model for artistic expression. (Stanford University, provided by the University of Florida Arts Education Dept).

- 93% Americans believe arts are vital and well rounded.
- 83% of Americans agree arts education and assists in improvements of a child's attitude towards school.
- 4 years of arts and music show 80 pts better on SATS vs. 15 yrs or less. Students are more likely to be recognized for academic achievement.
- Knock your individual subjects! Work towards implementing a STEAM process into your lesson plans and designs. Present an interactive classroom and learning environment for your students.
- Implement STEAM and technology into your classroom! Opportunities for augmented and virtual reality tech along with 3D printing devices and excellent tools.

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**WHAT WE HAVE LEARNED ABOUT STEAM:**

STEAM offers a transdisciplinary approach introducing students to multiple ways of thinking about and demonstrating knowledge, attracting students from under served groups and increasing the number of individuals participating in a STEM teaching environment (Savage et al, 2007).

**Why teach STEAM:** Critical inquiry, divergent thinking, and creativity – these are driving our future. The persistent call for 21st century skill development includes learning and innovation skills derived from critical and creative thinking, which will help student's fill jobs of the future (Trilling et al, 2009).

STEAM stimulates children's curiosity and motivation – higher order thinking, problem solving, collaboration, independent and project-based learning and focusing on things that happen in life. There is a formal operational stage that adolescent students go through on their way to adulthood, and it incorporates the logical use of understanding and abstract concept. This may occur in symbols and formal thinking. This involves a development of cognitive ability (Muntomihalai et al, 2020).

In my mind, I see this as an artistic influenced adaptation! As a part of this, researchers have found that “...art activities involve thinking and the making of meaning, art activities are raised to the level of important and complex cognitive tasks.” (Langer, 1967). What a powerful thought!

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**EXAMPLES OF UDL-STEAM BASED PRACTICUM...**

**Allegory-Analogy-Metaphor, AAM, as a lesson framework that may be used for artistic-based memory assistance and application**

Using an artistic perspective to use the students' thoughts on how their artistic desires can be heightened or how they can be encouraged to use their preferences in artistic influenced memories.

- Students’ personal experiences have strong and important meaning to them and how they use these experiences with encouragement can be a powerful tool.
- An excellent start is to “explicitly show” how they work!
- Provide a STEAM learning environment incorporating an understanding of the subject using a visual and audial aspect to ensure the student understands the intention, especially with their connection.

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**A Class Performance-based Final Project through artistry – a cast and crew...**

- An artistic, presentation-on-stage summative assessment.
- Pick a subject provided that includes items required for the final presentation.
- The students may pick singing, dancing, painting/drawing, sculpting, poetry display, visual/audio stage items etc., an artistic display that they desire.
- An opportunity for students to present a required final project as they see fit within a framework that may include the entire class from the cast to the crew.

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**REFERENCES:**

- **2019). Integrating Project Based Learning through the Undergraduate Research Experience, Journal of Education for Business, January/February, 2019.**

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**UNIVERSAL BY DESIGN LEARNING (UDL) PRINCIPLES:**

1. Provide multiple means of representation.
2. Provide multiple means of action and expression.

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**TPEP CRITERIA APPLICATION.**

I believe that a STEAM-UDL learning environment is an excellent opportunity to provide an open and safe place while applying criteria 4, 5, and 6. Using content area knowledge, appropriate pedagogy and available resources is part of a solid curriculum foundation plan (#4).

This can further be enhanced by fostering a safe and inclusive classroom environment (#5) using the UDL platform for student well being, assessment, curiosity, and substantial growth (#6) via STEAM based opportunities to be presented while learning.

Mutually-reinforcing Arts with STEM objectives deepens student learning. We can get everyone on-board and this includes students, staff and fellow teachers!

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**ARTISTIC ADAPTATION OF MAIN STEAM-BASED UDL PRACTICES:**

- Using artistic techniques for display of scientific data patterns based on the model design and purpose.
- “Moving STEM to STEAM by adding the arts...can produce powerful authentic learning opportunities” (Jolly, 2014).
- Student statements including a description of what the art piece means, i.e., its rational, how it was made, and its meaning.
- Science and Art activities combined that involve thinking and the making of meaning...they are raised to the level of important and complex cognitive tasks. UDL provides the banquet.

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**ARTISTIC SIDE OF BRAIN FOCUS**

**CRITICAL THINKING AND PROBLEM SOLVING**

**FLEXIBILITY AND ADAPTABILITY**

**COMMUNICATION AND COLLABORATION**

**ARTISTIC SIDE OF BRAIN FOCUS**

**CREATIVITY AND INNOVATION**

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**INCORPORATING STEAM INTO A UNIVERSAL BY DESIGN LEARNING (UDL) ENVIRONMENT: AN ARTISTIC ADAPTATION**

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