Science Through Art: The Impact of Art Projects on Depth of Knowledge of Science Topics

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arts
elementary school
science

Rationale

Educational communities have recognized the importance of presenting information in varying modalities to reach all types of learners. Science through Art provides an opportunity to study

the impact of using creative, hands-on process art to learn about the world. Combining the joy of creativity with curiosity inspired by science topics has resulted in high student engagement and participation. For this research study, the goal is to document how teaching science topics along with the step-by-step process of creating artwork impacts student knowledge of science topics.

Context

A.D. Henderson University School is a laboratory school situated on the campus of Florida Atlantic University in Boca Raton, Florida. There are 1,287 students across grades K-12. The students are in the top 1% of scorers, based on combined math and reading standardized test scores. The demographic makeup of the student body is 63.5% White, 15.5% Black, 11.4% Asian, 8.8% Multi-racial and 0.6% Native American or Native Alaskan. Students are admitted to the school based on a lottery system which takes into consideration student demographics. Study participants will be second grade students. Currently, the special schedule allows for each class to visit Science through Art on a week-long rotation. There are three second grade classes. All classes will be learning the same lesson and data will be collected on all three classes.

Supportive Literature

Research on the impact of art projects on the depth of knowledge of science topics is limited, but a review of recent literature builds a strong basis for understanding how to fulfill the gaps in research and evaluate the effectiveness of the

course as was outlined in its originalintention. The benefits of art in science learning have been measured by few, but findings are similar. Analysis of studies in the realm of cross curricular effectiveness have revealed the need for a uniquely diversified approach to collecting data and detailed, thoughtfully crafted lesson-planning process for teachers.

Reflecting on learning through art-based projects was one of the most valuable tools in increasing student knowledge of topics. Student learning cannot be represented by their artwork or their words alone. The effectiveness of my study hinges on strategically collecting data from a variety of measures that represents true student knowledge of science topics. I will need video evidence, photographs of artwork, student interviews and even recordings of student interactions with one another. Students must be given the opportunity to not only show, but also to talk about the science learning they represent in their artwork.

Research Methods

How does implementation of art-based projects impact depth of knowledge of science topics in a lower elementary specials setting?

This action research study focused on learning about plants found right outside of our classroom door. Students observed the parts and learned about the functions of their chosen plant. Broken up into four distinct parts, this lesson spanned the course of four days with one 45-minute lesson per day. Each day, students learned science concepts followed by an art

lesson where students were challenged to apply their newly gleaned knowledge of plants, their parts and their roots. Data wascollected daily. By the end of the week, students created a collage demonstrating understanding of soil, roots and plant parts. The modality used was process art, whereby students create different parts of the artwork using different processes and combine them to create a multimedia piece that demonstrates mastery of multiple artistic mediums. We used ink transfer, oil pastel resist with watercolor and collage. We employed many skills including but not limited to painting, drawing, cutting, pasting, layering and collage. Quantitative data was collected via pre and posttests. The pretest and post tests were the same. One was administered at the beginning of Day 1, before any new information about the topic, plant parts and plants on campus, was covered. The post test was administered at the end of day one, after a nature walk identifying plants and a lesson about four different plants we have on campus. Students were asked to list plants that are on our campus. Students were also asked to draw a picture of one of the plants listed and label its parts.

The drawing of the plant on the post- test was then compared to the final project created by the student after four days of working through the “Build-a-plant Workshop.” The posttest drawing and the final projects were graded on a scale of 1, demonstrating Level 1 Depth of Knowledge, to 4, demonstrating Level 4 Depth of Knowledge. Qualitative data was collected through student interviews. Students were asked the name of the plant they built and to identify the different parts they created. Students were asked, “What are some facts about this

plant?” and “What did you learn in Science through Art during this project?” To assess depth of knowledge based on student artwork, a rubric was used.

Results

By the end of Day 1 of our Build-a-Plant Workshop lesson, students demonstrated an increase in depth of knowledge of plants on campus. Day 1 consisted of an introduction to the plants via powerpoint on the SMARTboard followed by a nature walk to visit the plants learned about. Curiosity peaked and students began to make their own observations about the plants as they had the chance to connect the facts learned in the classroom to the observations, they were making on the nature walk. A note in my research journal indicates, “(Student) spent the majority of the time on our nature walk watching the bees visit the flowers of the Mexican petunia. At first, I considered (student) to be distracted because they weren't following me from plant to plant with the class, but then I realized that there was value in the stillness of observing.” When measured on a scale of Level 1 to Level 4, 95% of students moved up one level to level 2 at the end of Day 1. Students moved from identifying plants as grass, bush and tree to using the correct names for each plant- mexican petunia, umbrella bush, autograph tree and Sabal Palm. 88% of students (average of three classes) were able to identify the four plants after only Day

1.Another finding was that students have a deeper understanding of plant structure after building their own plant as an art project, step by step. In student interviews, students were asked to identify the different parts of their plants on their own

completed plant art project. 100% of students were able to verbally identify the four different parts of plants explicitly taught in the lesson: stem, roots, flower, leaves. The last finding was that a sense of place and relevance of material to their own lives sparked curiosity, allowed students to make meaningful connections and to better retain the information taught in class. On Day 4, even after focusing on only building one of the four plants learned about in class, 100% of students were able to identify the four plants we learned about on Day 1, 100% of students tested were able to find the four plants we learned about. Of those students, 72% were able to identify the names of all four plants. 78% were able to give at least one fact about each plant, even if they could not remember the name.

Implications

The project allowed for students to demonstrate that the joy of creating can be harnessed and funneled into scientific observation and analysis which leads to deepened knowledge of the subject of their artwork. Further study of which creative materials or artistic processes are most effective in teaching science topics would be valuable for this relatively new field of cross-curricular study. While this action research study demonstrates success in deepening knowledge for elementary science topics, it is important to consider that abstract concepts require creative lesson planning to demonstrate via artwork. Further research is needed to determine the impact of art projects on understanding more abstract topics in upper elementary, middle, and high school students.

As cross-curricular elementary school subjects emerge and develop, it will be important to continue researching how and why students are motivated to learn through the arts. Arts have played a role in formal education for hundreds of years. In the past few decades, many arts programs have been cut because of lack of funding or importance being placed on other subject areas. The value of arts in education must be proven and studied to be protected and respected. Children's intrinsic motivation to create is clear. Students' pride in their artwork and happiness during the process of art-making demonstrates the unique emotional connection students have with creating artwork. Using action research to demonstrate the power of arts as a modality of teaching science concepts could be key in influencing decision makers to keep arts in our schools.

References

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