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Encouraging Teachers to W.A.I.T Before Engaging Students In Next Generation Science Standards STEAM Activities.

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Abstract

Effective art integration in K-12 curricula has clear benefits for classroom teachers (i.e. student achievement on standardized tests, student engagement, improving critical thinking). This paper proposes a framework based off of Claudia Cornett's levels of art integration. Teaching With About and In Through (WAIT) the arts can serve as a model for teachers who want to transform their science lesson to include art integration.

Keywords

Science, Art, STEAM, Integration

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Arts Integration (AI) has been a mainstay of a balanced educational experience since antiquity. Plato once wrote "The object of education is to teach us love of beauty" (Grube, 1974). In recent years the positivist influence and neofundamentalist policies of the No Child Left Behind Act (NCLB) has reduced the amount of art electives available to students. A study by the Center on Education Policy (2007) found that seventy-one percent of school districts surveyed reported that they had reduced instructional time in elementary schools for one or more subjects in order to increase time spent on reading and math. In twenty-two percent of the districts, elementary music and art instruction had been reduced. Disadvantaged districts were the most affected by the shift in instruction. Nearly all the districts serving large numbers of low-income children, ninety-seven percent, reported they mandated additional time on language arts instruction, compared to fifty-five percent of districts with few poor families (Center on Education Policy. 2007). Teachers feeling the pressures of standardized tests have, in many cases, reverted to behaviorist thinking and implore direct instruction and worksheets when teaching science (Flup, 2002).

The irony of NCLB paradigm of “rigor” and “evidence-based practice” is that when AI is implemented with fidelity scores on standardized tests typically increase. Judith Philips, director of the "Arts Integration and the Mississippi Arts Commission's Whole Schools Initiative” reported that: "Schools that effectively implement arts integration have either significantly reduced or completely eliminated the educational achievement gap for economically disadvantaged students” (Mississippi State University, 2013). In Chicago, twenty-three Chicago

Arts Partnership in Education (CAPE) schools reported test scores rising twice as fast as economically comparable schools without AI (Deasy, 2002).

There are many more examples of AI improving student achievement, so it is logical that more teachers will seek this approach in their classroom. This paper has a dual purpose; to encourage teachers to use AI when considering altering their science lessons to include AI and to consider Claudia Cornett's With About In and Through (WAIT) levels of art integration when designing these lessons.

Cornett describes the four levels of AI as:

With: "Teachers experiment by using the arts casually for enjoyment and give students chances to work creatively. Usually these are isolated arts experiences and students explore art materials or ideas with minimal teacher guidance" (Cornett, 2011 p.55). An example of a science lesson taught with the arts could include students watching videos of earthquakes and then drawing what they think is going on under the ground in an earth science unit.

About and In: "The goal is to have students do creative problem solving through the arts and develop personal artistry" (Cornett, 2011 p.55). An example of about and in AI in science could be having students learn about sound waves and vibrations by reading about famous composers and listening to their symphonies.

Through: "At this level the arts are prominent through daily arts routines, an aesthetic classroom environment. The emphasis in teaching through the arts is creating meaning using the arts" (Cornett, 2011 p.55-56). An example of teaching science through the arts would be having students pantomime the movements of a jet and then designing a paper airplane to be tossed in the air as an anticipatory set for a force and motion unit.

A key distinction between Cornett's three levels of AI is their alignment to standards and the arts impact on the academic task. *With* is not normally associated with actual standards and the academic task could be completed without the inclusion of the arts, *about and in* could be tied to a specific standard and the academic task could not fully be completed without the arts, and *through* can be aligned to standards and the academic task could not be completed without the arts. See the chart below for an example of a performance standard from the Next Generation Science Standards taught using various levels of Cornett's WAIT model.

NGSS	*With*	*About and In*	*Through*
ESS3.B: Natural Hazards • A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)	*Students read about earthquakes and engineering design for homes that could reduce the impact of an earthquake. Students draw a picture of a home they believe would be better adapted to survive an earthquake.*	*Students read about earthquakes tectonic plates. They create a world map jigsaw where they draw the fault lines and physical features around those lines (i.e. mountains and volcanoes). Students then look at artwork that has depicted the impact of a culture after a natural disaster (i.e. John Martin: The Great Day of His Wrath, 1850)*	*Students watch videos of earthquakes and think about how they would design a home that could would reduce the impact of the earthquake. Then, students build homes out of toothpicks and marshmallows based on the design they created. Finally, the design is tested on a shake table.*
Could the lesson be taught without the arts?	*Yes*	*Partially*	*No*

Figure 1 – Example of how NGSS 4-ESS3-2 could be taught with, about and in, and through the arts.

As you can see in table 1 teaching the lesson *through* the arts requires the student to create something and meets the criteria for the NGSS engineering standard (see figure 2). The lesson taught *with* the arts uses the drawing merely as an "add-on." Simply adding art to an already created artless lesson does not align to Cornett's vision of what quality AI should be in the classroom. The art in the art lesson should be the driving force for the other disciplines involved. Teaching the lesson through the arts allows the creative process of creation to assimilate or accommodate the students' pre-existing concepts to agreed upon science.

Science	*Technology*	*Engineering*	*Arts*	*Math*
NGSS ESS3.B: Natural Hazards A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)	***Common Core State Standards*** *"When making models, [students] know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data.*	**Science Engineering Practices** Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)	**Kennedy Center National Arts Standards** **Grade K-4 Visual Arts Standard 6** Students understand and use similarities and differences between characteristics of the visual arts and other arts disciplines Students identify connections between the visual arts and other disciplines in the curriculum	**DCCSS.MATH. CONTENT.4.G. A.1** Draw and identify lines and angles, and classify shapes by properties of their lines and angles. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines.

Figure 2 – The *through* lesson from figure 1 aligned to NGSS, Common Core State Standards, and The Kennedy Centers National Arts Standards.

With all the clear benefits to AI in science STEAM initiatives are likely to become more common in future curriculum development. This paper was written to identify Claudia Cornett's WAIT framework as a possible starting point when transforming a science lesson from a traditional lecture format to an AI format. Pre-service and in-service teachers should consider teaching the lesson *through* the arts the goal of their STEAM lessons.

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