Snapdragons and Math: Using Creativity to Inspire, Motivate, and Engage

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When asking preservice teachers, "What is your favorite memory from elementary school?," I have received answers such as "When I dressed as my favorite storybook character for a book report," "When I designed my dream bedroom," and "When I constructed a car of the future with Legos." Not once did anyone say, "When I had to memorize the times tables" or "When I sat in class listening to the teacher talk about science." What made the difference? It was the addition of the arts and creativity to the lessons.

The recollections of these students highlight the important role creativity and the arts play in our classrooms. Though creativity is considered a key component of 21st century teaching and learning, the United States' current educational system is leaving American students performing more and more poorly in creative ability compared to their international peers (Darling-Hammond 2010; Bronson & Merryman 2010). A void in creativity in US schools may be detrimental to children's learning when they are young; however, shortfalls in creativity may be even more problematic as children grow up and are unprepared for an environment in which employers are increasingly looking for innovators. In schools, the possibility exists for the arts to open space to be creative and innovative, engage the imagination, and to teach lessons about complex topics (Falk-Ross 2015). They provide significant opportunities for students to become confident during the learning process, fostering a desire to learn.

There is no question that all subjects are vital to learning, but teaching important subjects separately is not enough (Eisner 2002). What is missing in the current national discourse on the effectiveness of education is creativity pedagogies. Often marginalized in education, creativity and the creative arts can bolster the competitive edge of American students through arts infusion. Creativity is a 21st century skill that gives value and meaning to learning and develops a motivational mindset that is empowering. A creative mindset embodies enjoyment, autonomy, and purpose, exposing children to boundless possibilities (Keale 2011). By including arts infusion in the national dialogue about education reform, we can harness the power of the arts to teach creativity as a complement to traditional nonarts subjects. Arts infusion is a creative pedagogy that utilizes the 21st century skill of creativity to inspire and motivate children and engage them in the learning process.

Teaching is a rapidly changing, continuously evolving profession. According to a 2010 National Council for Accreditation of Teacher Educators (NCATE 2010) blue ribbon panel report, the increasingly diverse backgrounds of students have altered what teachers need to be able to do in their classrooms as compared to teacher practices 50 years earlier. Social and emotional development used to be the primary function of kindergarten, and now teachers must differentiate lessons for students who are gifted, are English language learners, have special needs, and have learning disabilities. Additionally, now there are the added pressures of standardized tests, high stakes teacher evaluations, and scripted curriculum.

In many schools where I have observed, each subject is allotted a set amount of time and a single, focused curriculum (Sabol 2010). Math is taught during math time and science during science time, and visual arts may be taught in an entirely different room altogether, with little or no crossover—subjects are being taught in silos. Sir Ken Robinson (2008), an international expert on educational creativity, states that children today are living in the most intensely stimulating time in history due to technological devices such as iPhones, video games, and computers as well as the amount of advertising directed toward them. There is extensive visual activity and interaction that engage students outside the classroom; yet, in the classroom traditional pedagogical methods, such as lecture and rote memorization, are still prevalent (Robinson 2008).

Rote memory lessons will not suffice for the students of today, and teachers need to be prepared to adapt to students' educational needs, such as critical thinking and problem solving. Nearly 10 years ago, the publication of "Framework for 21st Century Learning" (P21 2007) served as a catalyst for the body of research that eventually led to the Four Cs—critical thinking, communication, collaboration, and creativity—the most important skills for K–12 students (NEA 2012). The problem that emerged was how to incorporate the Four Cs into the curriculum.

Harvard's Studio Thinking Project studied visual arts teachers and discovered eight methods for promoting successful learning found in art rooms (Hetland et al. 2007). These methods are express, develop craft, envision, understand community, stretch and explore, observe, engage and persist, and reflect. The researchers contend that these essential learning methods from the arts can be used to make learning connections in other content areas. All disciplines are important to a child's education, but teaching each subject alone in a silo is not conducive to deeper cross- curriculum understanding. By making a purposeful connection between the arts and other subjects, skills in all areas are strengthened, and students gain a richer learning experience (Riley 2012). Infusing the visual and performing arts into traditional lessons can give students the opportunity to explore, create, and become innovators while building 21st century skills and can inspire students to actively take responsibility for their education. In this article, I give an example of an arts infusion lesson that embraced creativity, describing the process of implementing the lesson and the resulting understanding demonstrated by the students.

What is arts infusion?

Arts infusion, according to South Carolina's Arts in Basic Curriculum Project (2005) is defined as knowledge constructed through integrated study of arts (visual arts, dance, theater, music) and nonarts (English, mathematics, science, social studies), addressing standards in all relevant disciplines and challenging students to think reflectively and use problem-solving skills. During a well-executed, arts- infused lesson, students do not distinguish between disciplines. When infusing the arts into a lesson, a classroom teacher must assess whether the relevant standards in the arts are addressed as well as the

standards in academic subject areas. Likewise, when creative arts teachers present a lesson, it must address the nonarts standards as well as the arts standards, and all standards must be assessed equally.

Arts infusion in a classroom results in two complementary effects: it provides opportunities for students to practice creativity and problem solving, and keeps them active and engaged in more traditional subjects, such as science, English, and mathematics. It is arguable that teaching all subjects alone is not enough and that the emphasis on creativity—which the arts provide—is the key component of an educational program that is ready to meet the challenges of the 21st century.

Observing in an arts-infused school

While embedded in an arts-infused elementary school in the South, studying educators' pedagogy for over 18 months, I observed Mrs. Smith, a generalist kindergarten teacher. On a weekly basis she and her fellow teachers planned integrated lessons with visual and performing arts educators to deeply embed the arts in the curriculum. This partnership between the arts educators and the classroom teachers was impressive. Together, collaborating equally on arts- infusion lessons, these teachers created a framework to ensure that the lessons addressed both academic state standards and visual and performing arts state standards. Throughout the elementary school, the hall displays of student projects demonstrate the active and engaged learning that takes place in every classroom, such as a dance lesson that helped students understand the concepts of force and motion.

Arts-infused math lessons

Kindergarten teacher Mrs. Smith was planning a math lesson comparing numbers. Mrs. Lynn, the art teacher, offered an art activity that tied in with Mrs. Smith's imaginative mathematics lesson.

The academic domain: Mathematics

Mrs. Smith explained to me that in her class, most of the 5-year-olds find the symbols for *more than* and *less than* abstract and confusing. To assist them in learning to use the symbols, Mrs. Smith said that each year she engages her students by reading a story about a very hungry alligator. She tells her kindergarten class that the arrow-like symbols representing *less than*and *more than* are hungry alligators with their mouths open wide, ready to eat. These particular alligators like to munch up numbers. In fact, because they are so hungry, they always eat the larger number; thus, an alligator's mouth is always open toward the bigger number. Mrs. Smith added that she has her class visualize alligators' mouths opening toward the larger number. Then, with a chomp, the alligators eat that number. After listening to this explanation, the children use their outstretched arms to represent alligators' mouths, and with a clap of their hands— CHOMP!—the alligators eat the larger number.

Mrs. Smith takes advantage of kindergartners' energy and channels it into drama and role play to engage the children. The use of the performing arts to assist the students in learning identifies this as an arts-infused lesson—a lesson in which the creativity and dynamism of the arts complement the traditional learning of a mathematics concept.

The arts: Japanese culture

Taking a cue from this lesson, Mrs. Lynn, a visual arts educator, suggests a way to infuse visual arts and Japanese culture into another math lesson. Mrs. Lynn emphasizes the arts by having the children make an alligator-like creature called a snapdragon. The snapdragon is an origami form created by folding a piece of paper into a dragon shape. The mouth of the snapdragon opens and closes like a puppet's mouth, and it "eats" numbers. Because the snapdragon resembles an alligator, it could be used as an additional tool for learning about more than and less than.

The art component is not merely a prop. As children learn about the Japanese art of paper folding, they also refresh their knowledge of geometric shapes. Mrs. Lynn takes a math lesson from the curriculum and expands it into a multifaceted lesson using art making based

in Japanese culture as an avenue for discovery and understanding. This cultural component adds the creativity factor needed for 21st century learning.

The process: Activating prior knowledge

To hold the attention of the children, Mrs. Smith and Mrs. Lynn cotaught a lesson in the kindergarten classroom. First, Mrs. Lynn talked about the Japanese tradition of origami, activating children's prior mathematics knowledge of shapes and angles while creating an origami snapdragon. Mrs. Smith then explained the mathematical concepts of less than and more than.

During the art portion, Mrs. Lynn discussed the elements of art, such as shape and form; showed the children Japan's location on a world map; and talked about Japanese culture and the ancient art of origami. Then she led the children in folding paper to make their own snapdragons. In following the instructions for creating the origami figures, the children practiced fine motor skills while also using the skill of attentive listening. They discussed what they knew about Japanese culture and compared and contrasted it with their own culture.

The students were very excited about creating snapdragons and instantly became engaged in the learning process. Mrs. Lynn explained that folding paper is a precise and difficult skill, but reassured them that if they tried to make the triangles, trapezoids, and angles as she demonstrated, they would indeed succeed. Both teachers and a teacher assistant enthusiastically helped the children with the intricate paper folding. Some had difficulty at first; however, others mastered each step and assisted their struggling peers, creating a community of learners who helped each other.

After constructing the snapdragons, each child was encouraged to add a special detail, such as a tongue, teeth, or long eyelashes, to make their figure unique. In 20 minutes, a class of twenty-two 5- and 6-year-olds were proudly playing with their very own snapdragons and were eager and ready for the mathematics part of the lesson.

Mrs. Smith established some rules about the snapdragons, such as not snapping at another person's face, and gave the children some exploration time before she began her portion of the lesson. Then, with snapdragons held at eye level, the children watched as Mrs. Smith held up two numerical playing cards. She instructed the children to face their snapdragons toward the larger number and chomp. After they mastered this activity in a large group, they took turns in small groups passing out playing cards and using their snapdragons to devour the cards with the greater number.

This integration of the arts and math provides an excellent example of the effectiveness of the arts- infused model of teaching. Regarding the efficacy of this lesson, Mrs. Smith remarked that "the visual of the open mouths and the dragon wanting to eat more helped the students decide what side to put their two numbers—which number was greater and which number was less." Mrs. Smith was amazed by the level of engagement in and excitement about a lesson that tends to frustrate young students. "They were able to manipulate as well as move around," she said. She concluded by pointing to another benefit of the integration of the arts with STEM subjects: "This helped my visual and kinesthetic learners as well as my spatial learners." Thus, another feature of arts infusion in learning and the 21st century skill of creativity is the ability of a multifaceted approach to accommodate a greater variety of learning styles.

The result: Student learning outcomes

This lesson was fun and creative yet rigorous. When asked if the snapdragons were a distraction, Mrs. Smith said, "I really don't feel the snapdragons caused any distractions from the lesson. In fact, I feel [the students] were more engaged." This lesson addressed a state standard for mathematics while infusing an art activity that addressed standards for the visual arts and engaged the students in a creative process. Bringing creativity to a lesson motivates children to learn in the globally connected world of the 21st century (NEA 2012). Regarding the visual arts standards, the children were able to identify elements of art and world culture and make connections between the visual arts and content areas across the curriculum.

The kindergarten teachers designed an authentic assessment to gauge the students' understanding of the standards. The assessment scale had three levels: *mastery*, *satisfactory*, and *needs improvement*. Assessment results showed that 95 percent of the students in Mrs. Smith's class understood the math concept at the mastery level the first time she taught it, with 5 percent scoring satisfactory and 0 percent needing improvement. In comparison, Mrs. Smith's class had 12 percent more students achieving mastery than a control group. The control group was another kindergarten class in the same school, who were taught the same lesson in a traditional lecture style and by using worksheets. Furthermore, 16 percent of the control group performed at the *needs improvement* level and had no recorded knowledge of Japanese culture or origami.

With the addition of the visual arts, the students completed a math lesson with excitement and a sense of pride in learning, and they continued playing with the snapdragons during their free time. At the end of the day, Mrs. Smith's students took their snapdragons home to show their parents and to devour playing cards, thus continuing the learning process independently beyond the classroom. The learning results are quantifiable and demonstrate the value of this particular arts-infused lesson. Perhaps equally important are the intangible effects of the arts-infused approach: establishing a higher level of engagement and excitement in the classroom and fostering a love of learning. This is critical for education, career, and global settings in the 21st century, in which the students will participate throughout their lives.

Conclusion

Combining two disciplines—the arts and academics— in a lesson not only engaged the students but also connected student learning to creativity, one of the 21st century's Four Cs skills. This lesson gave the children new knowledge in mathematics, art, and culture that provided intrinsic motivation because it created genuine interest in the learning process. In the other kindergarten class, teaching the math concept unrelated to culture and art did not have the same result. The two seemingly unrelated components—mathematics and the arts —combined not only to teach a vital math concept but also to teach kindergartners about Japanese culture and origami and to offer them an opportunity to practice fine motor skills and to listen closely. It also benefited more than one learning style.

Infusing multiple disciplines may be messy, take time, and involve a great deal of planning, but it is worthwhile because it gets the curriculum out of silos and encourages children to create, engage, and learn. When students experience learning through creativity, they will be better prepared for meeting the challenges of society and participating in the workforce (NEA 2012). Embracing creativity as a 21st century skill by addressing academic and arts standards in one lesson can inspire, motivate, and engage children in the learning process and move them forward in their learning and in their future careers.

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