Math in Motion:
How Integrating Dance and into a Math Classroom Affects a Student’s Ability to Learn

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Abstract

This research explores how placing dance and whole body movements into the math classroom at an elementary level help children better understand and develop a greater appreciation of basic mathematical concepts. More specifically, it looks at what effect the muscle memory that is developed while moving has on retaining information in a scholastic setting. Due to decreased funding in schools, programs in the arts are disappearing. I look at the positive effects of the arts in schools and how the integration and implementation of them with a core subject can be essential to a child’s learning experience. With the help of research from Karl Schaffer and Erik Stern, specialists in the field of math and dance for over thirty years, connections are made between the studies of mathematics and dance. Lesson plans focus on dance concepts with pattern recognition, symmetry, and basic geometry at an elementary level to improve mathematical thinking in children through the methods of the Multiple Intelligences Theory and Arts Integration.
Recognizing Every Learner

Think about a significant experience you had in school growing up. What about this experience made it so exceptional? Perhaps it was a favorite teacher, or a favorite subject… No matter what the moment was, chances are it was special because it allowed you to learn in a way that was most comfortable to you. Everyone is “able to know the world through language, logical-mathematical analysis, spatial representation, musical thinking, the use of the body to solve problems or to make things, an understanding of other individuals, and an understanding of ourselves. Where individuals differ is in the strength of these intelligences” (tecweb). These intelligences were identified in 1983 by Dr. Howard Gardner to establish his Multiple Intelligences Theory (Armstrong).

This theory confronts an educational system that expects everyone to learn the same material in the same way. It is very common to have a linguistic- and mathematical-based assessment in nearly every subject area; however, not all students are able to learn the same way. Through his theory, Howard Gardner expresses the idea that if subjects could be taught in a number of ways with a variety of testing methods, then every learner would be better off (tecweb). We should be acknowledging “the artists, architects, musicians, naturalists, designers, dancers, therapists, entrepreneurs, and others who enrich the world in which we live” equally as much as we recognize the logical and articulate thinkers of the world (Armstrong). Sadly, schools do not always notice the more artistically inclined students. Instead, they may in fact be labeled as “learning disabled” or as underachievers when their unique way of thinking is neglected in the typical classroom (Armstrong). The theory of Multiple Intelligences seeks to change this by encouraging teachers to work on presenting their lessons in numerous ways that may include using music, cooperative learning, art, role-play, field trips, and so much more.
In order to create a teaching philosophy based around these ideas, we need to understand what exactly the eight intelligences proposed by Gardner are. The logical-mathematical thinkers, or people who are “math smart,” have a conceptual approach to learning. They tend to do well with patterns, puzzles, and reasoning, and they enjoy organization. Teachers may use logic and number games and activities to educate these students. The “art smart” students focus on a visual-spatial intelligence. They often find the most success using colors, pictures, charts, and videos to learn. The bodily-kinesthetic intelligence is pretty self-explanatory. These learners are considered “body smart,” so whenever they have the chance to move – either by dances, sports, theatrical performances, or just the use of manipulatives – they will find the most enjoyment out of learning. If a student prefers to embrace the musical-rhythmic intelligence, they might enjoy making or performing a piece of music, creating rhythmic patterns, or using song titles and vocabulary to explain content. The naturalist loves everything about the outdoors. They are very good at identifying plant and animal species and making celestial observations. Interpersonal, or “people smart” learners prefer to interact with their teachers and peers. They like working in groups and giving feedback to classmates. On the other hand, intrapersonal learners are “self smart.” They might prefer to work alone and tend to describe their personal strengths well. They look for real-life applications of lessons and might sometimes require personal reflection time. Finally, the verbal-linguistic intelligence includes those that are “word smart.” They are good at leading discussions and speaking in front of others. They also enjoy writing letters, poems, and stories. Each of these intelligences has its own specific characteristics, but it is very likely that a student will possess a combination of the eight.

I have used my research to develop a third grade math lesson explaining multiplication and division using the eight intelligences individually (Appendix A). In reality, schools do not have time to teach content in this way. Instead, the theory encourages teachers to make sure there
is variation in their lessons. It is very likely that a lesson will in fact cover multiple intelligences at a time. While hundreds of educators around the country have begun embracing this idea, there are still thousands of schools focusing on teaching the same lectures with worksheets and textbooks (Armstrong).

Part of the blame for this belongs to the development of the No Child Left Behind Act (2002) and the Common Core (2009), which put a greater emphasis on core subjects like math and english. No Child Left Behind (NCLB) was created as an update to the Elementary and Secondary Education Act (ESEA) that was passed in 1965 to establish the federal government’s role in the United States K-12 education system, known as Title I. The passing of the NCLB law increased this role, holding schools accountable for the academic progress of every student.

Schools that accept the law are required to test students in grades three through eight and once more in high school on their reading and math comprehension. Each state had to decide what they considered “proficient,” and then students were expected to reach this level on tests by the 2013-2014 school year. In 2015, after the deadline had passed, no state had one hundred percent of their students over their given proficiency level (Klein, 2015). Nonetheless, the idea behind the law was very smart. Developers of NCLB sought to “advance American competitiveness” by hiring only highly qualified teachers and closing our achievement gap. This act also gives students a right to choose their school. Any school that fails to make “adequate yearly progress” two years in row must allow their students to transfer to a higher performing school in the same district (Klein, 2015). The creators of NCLB had the right idea, wanting to open up communication between parents and their children’s schools. However, not all parents have the means to get involved. Furthermore, the gap of successful versus unsuccessful schools is actually widening. The No Child Left Behind law has some good points to make, but it sometimes appears better on paper compared to its real life applications.
The Common Core is another controversial topic in the world of national education legislation. The development of these standards seemed like they would be a great success, because they were based on the best state standards already in use and actual teachers had a say in what went into them. Before the Common Core was created, each state had its own definition of what it meant for a student to be proficient. There was a “lack of standardization” in our county, and states felt something needed to be done to correct this (corestandards.org, 2016). The goal of these standards is to produce college- and career-ready students. The final Common Core State Standards were released on June of 2010, and “as of December 2013, 45 states, the Department of Defense Education Activity, Washington D.C., Guam, the Northern Mariana Islands, and the U.S. Virgin Islands have adopted the CCSS in ELA/literacy and math” (corestandards.org, 2016). The creation of both NCLB and the Common Core place high values on the core subjects that require state testing and subjects that back up STEM – science, technology, engineering, and math. As long as a state accepts the conditions of the acts, they will receive federal funding. States that reject the policies risk losing this funding, which often means having to make cutbacks on what they consider less important. Over the last 15 years, due to these regulations and budget cuts and the effects of the recent recession, we have seen a major decline in the number of arts programs available in schools.

This is unfortunate because we know the arts are widely recognized as a form of expression and enjoyment, as they have helped form every culture across time. They “inform our lives with meaning every time we experience the joy of a well-remembered song, experience the flash of inspiration that comes with immersing ourselves in an artist’s sculpture, enjoying a sublime dance, learning from an exciting animation, or being moved by a captivating play” (NCCAS). The arts hold value when it comes to the development of every human being; therefore, it is important to provide every child “with a well-rounded education that includes the
arts,” like encouraging STEAM instead of STEM, so that they feel fully prepared for a successful future.

Since our recent recession, however, more than 95 percent of students are attending schools that experienced significant budget cuts. As a solution to the cutbacks, many arts programs were the first to be partially or completely eliminated. This was especially true for dance and theater programs. “During the 1999-2000 school year, 20 percent of schools offered dance and theatre classes, but in the 2009-10 school year, only 3 percent of schools allocated funds for dance classes, and only 4 percent taught theatre.” While not as dramatic, visual art classes also dropped from being offered in 87 percent of schools to 83 percent. Music classes remained mostly consistent, with 94 percent of schools still offering them (Metla, 2015).

Due to less money being available to spend on education, government policies, like the No Child Left Behind Act and Common Core State Standards, have put the arts on the backburner in order to encourage a greater emphasis on core subjects. The thought was that increasing spending on the subjects that required standardized tests would help improve students’ overall test scores (Metla, 2015).

Nevertheless, studies such as the one conducted by the Programme for International Student Assessment (PISA) show countries that rank consistently among the highest for math and science test scores, such as Japan and the Netherlands, require arts and music education programs in their schools. Researchers have also found that having continued music and theater lessons in school have a strong correlation with greater achievement in math and reading, not to mention it also “promotes creativity, social development, personality adjustment, and self-worth” (Do Something, 2014). Finally, many studies have proven having art programs available keep kids in school. Schools with substantial programs in the arts have higher graduation rates.
because these classes motivate students, “especially low-achieving students, by fostering closer ties with peers and creating community-oriented environments” (Metla, 2015).

It is hard to ignore the positive effects of incorporating the arts in education. They provide cognitive, social, physical, and affective benefits to students, resulting in a well-rounded and successful educational experience. Nonetheless, it is not always possible to produce the funds required for these programs. That is where arts integration steps in. The Kennedy Center defines Arts Integration as “an approach to teaching in which students construct and demonstrate understanding through an art form. Students engage in a creative process which connects an art form and another subject area and meets evolving objectives in both.” There has been an increasing interest in this subject across the nation as educators search for ways to bring art forms into subjects such as science, mathematics, social studies, and language arts (Silverstein and Layne, 2010). The Changing Education Through the Arts program, or CETA, was developed by the Kennedy Center in 1999 as a way to partner with schools in the Washington, D.C. area and provide teachers with guidance on incorporating arts lessons through implementation and integration. This has become an essential concept for many teachers and schools as funding for programs in the arts continues to decline across the United States.

In order to assess the possibilities of arts integration as a valuable solution to the lack of arts programs, the CETA definition can be broken down to examine the connections its terms make to the arts and education. Using an “approach to teaching” indicates how something is taught instead of what is taught. From traditional to progressive, every teacher has a unique approach to the way they teach based on personal beliefs about how students learn. Arts integration requires a more progressive and student-centered method because it is focused on the belief that learning is an active, experimental, collaborative, and evolving process. It is through this approach that students can “construct and demonstrate understanding.” This means students
are provided with several ways to make sense of the information they are given and in turn are able to make this knowledge visible. It goes the extra mile to assist students in building a deeper understanding of the content they are presented with so that teacher may assess each student effectively through the art form. Through “arts integration, their learning is evident in the products they create” (Silverstein and Layne, 2010). Even though classrooms continue to become more diverse by many means, teaching still relies primarily on writing and speaking. However, incorporating the arts makes students more involved in their learning through observing, moving, and numerous other ways to gain knowledge. “The arts offer multiple modes of representation, expression, and engagement,” which all encourage engagement in the “creative process.” This results in original works that demonstrate students’ ideas, points of view, and feelings. It can often be difficult for teachers to give a creative problem without taking over the challenge completely, but allowing the creative process to be “messy” and unpredictable gives students a chance to try something new to reach a solution. While some ideas may not always work well, creative processes make the connections between “an art form and another subject area.” The interdisciplinary connections are what help clarify the aspects of arts integration. These explanations help meet “evolving objectives in both” the arts and the subject matter. Objectives change and develop gradually over time as students’ learning experiences develop. Teachers think of this as a common concept for school subjects, but they are not always as familiar with the similar evolving nature of the arts (Silverstein and Layne, 2010). It is important to recognize the necessary changes over time in all aspects of arts integration for successful teaching.

It is important to note the difference between integrating the arts in a classroom and simply implementing the arts. As mentioned above, integrating the arts means a standard in both the core content area and an art form. Students are learning about both subjects simultaneously through three lessons. One focuses on the art content, the next teaches the content area, and the
third brings both subjects together. Implementing the arts means teachers are using an art form to teach a core subject lesson. An example of this form of teaching in a social studies class might be using a song to help kids remember the fifty states. Students are not learning anything about the way the song was written, but it definitely assists them in meeting the history standard. On the other hand, dance could be integrated in a social studies lesson about the Underground Railroad by creating movement maps to represent the trails. Students are clearly learning a history lesson, but they are also being educated on the dance standard of pathways. Both the song and movement maps are beneficial teaching strategies; one is not better than the other. Even though there is no art standard being focused on in the case of implementation, children are still able to express their creativity and self-expression. Teachers should just be encouraged to be aware of how they are incorporating the arts in their lessons.

Integration is not meant to be a replacement to arts education, but when schools are unable to find funding for such programs, integrating an art form in the classroom of a core subject is still a good solution for students’ social and creative development. Not all children are able to learn in the same way; some require more than mathematical and lecture based lessons. Especially in low-performing schools, students may feel more comfortable and motivated to succeed if they are able to express themselves in a more artistic way. Implementing the arts is great, but if we can find a way to integrate artistic expression into a scholastic classroom we can guarantee we will be maintaining the integrity of a child’s creativity and imagination that may otherwise get lost with the increasing lack of art, dance, theater and music classes.

Before any educator can begin the process of connecting subjects, it is essential to familiarize oneself with the standards of the core subject and art form involved. In the case of this research, it meant the Common Core State Standards for Mathematics (CCSSM) and the National Core Arts Standards (NCAS). The CCSSM “require greater focus by teachers and
deeper knowledge by students than many previous state standards” (Excel in Ed). As mentioned earlier, the idea behind the new standards is to encourage college readiness. Because of this, students are expected to understand the concepts and methods required for solutions instead of memorizing answers. The standards ensure students are grasping the critical understanding of the content for maximum success by keeping the focus on fewer topics. The New York State Standards specifically rely on three design principles: focus, coherence, and rigor (Engage NY). Defined as “a process that guides educators in providing a unified quality arts education for students in Pre-K through high school,” the National Core Arts Standards, updated in 2014, also focus on a specific set of principles: creating, performing/presenting/producing, responding, and connecting. It is through these four principles that the arts standards ensure a well-rounded knowledge in an art form. Within each of these areas, there are several anchor standards. When writing a lesson plan, educators must include an anchor standard from each principle focus in order for their students to meet the overall objective. The arts standards encourage creative problem solving for ultimate success after graduation. Therefore, when working in an arts integrated setting, each lesson objective should meet a total of five standards.

**Making Connections: A Specific Look at Math and Dance**

In the world of education, it is very rare to hear the words “math” and “dance” in the same sentence. Anytime I suggest a connection between these two disciplines it is almost always accompanied with looks of confusion and disbelief. Mathematics is centered on logic and rationality, but dancing deals with physical and emotional expression. How could these two areas ever overlap? There are two men that have been changing the way people think about mathematics and dancing for almost thirty years. Dr. Karl Schaffer and Mr. Erik Stern are two of the most influential names in the field of math/dance integration.
Schaffer and Stern founded their dance company in 1987. In 1990, they created their first math dance titled, *Dr. Schaffer and Mr. Stern: Two Guys Dancing about Math*. Since then, the company has created five more shows that have been performed for over one hundred thousand people. The two men taught their first Math Dance workshop in 1991 and spent ten years compiling tips and strategies for integration before releasing their book, *Math Dance with Dr. Schaffer and Mr. Stern*. The activities in the book are not meant to replace the tradition math and dance lessons, but they encourage the use of their lessons when concepts in a normal setting are lacking energy or require deeper understandings physically, emotionally, and mentally. To these moving mathematicians, “dance and mathematics [are] more than equals, they [are] manifestations of the same interest in aesthetics and form, thought and expression” (Schaffer, Stern, Kim, 2001). Most recently, Erik Stern has developed a study with colleagues about the effectiveness of “Pattern Play.” The study looked at the effects of dance integration on college students enrolled in a math course, and the results showed 83% of those participating scored higher after integrating dance into the lesson, concluding positive effects of kinesthetic movement in a math classroom. I had the pleasure of participating in their workshop in 2014, and I can attest that being able to move increases the interest in a math lesson for many college students. However, lower division math concepts are more easily explored through dance concepts, and as such I focus on concepts for elementary students in third, fourth, and fifth grade.

I made my first connection between math and dance in my jazz class during my senior year. My calculus teacher’s daughter was in the class, and during Parent’s Watch Week she got very excited about the tangent lines some of us made to the circle made by the rest of our class. Since that time I have been determined to explore other ways movement could be used to express math ideas. Eventually, I developed my research question, “How does dance and whole body movement affect a student’s ability to comprehend his or her given math lessons when integrated
into an elementary classroom?” From there, I enrolled in my first Arts for Children course at The College at Brockport where I was able to developed the previously mentioned Multiple Intelligences lesson plan on multiplication and division for third graders and an Integrated lesson plan on geometrical shapes for fourth graders (Appendix B). The following semester I enrolled in Children’s Dance. Here, I learned the basics of teaching creative movement to children and realized the importance of arts education. By the end of this class I had written another integrated lesson plan. This time I looked at patterns for fourth graders (Appendix C). Of course, I could not properly answer my research question until I applied it in a class setting.

That is where Children’s Dance II came into play. This semester we had the honor of working with fifth graders from the Fred W. Hill School in Brockport, New York. As a class, we developed a unit plan made up of eight lessons teaching basic dance concepts. I was able to incorporate mathematics in two lessons specifically – body relationships and patterns. I instructed a lesson that related reflection and translation symmetries in math to the body relationships of mirroring and shadowing in dance (Appendix D). Students were able to embody the symmetries while learning vocabulary in both content areas. Their assessment was based on the ability to create choreography around the concepts and verbally confirm they recognize the connection between math and dance relationships. The second lesson looked at pattern development in both areas (Appendix E). I taught a simple, repeatable pattern for the classes to perform together and then gave additional instructions to increase the difficulty while still making sure they understood they were performing a pattern. The first day we went over it, it was far from perfect. With a little practice, most of the students started to really get the pattern thanks to improvements in their muscle memory. Due to time constraints, I was unable to teach a true integrated lesson plan. Instead, they were dance lessons with math concept implemented
within them. Nevertheless, I could still evaluate the students’ comprehension of both math and dance standards based on their verbal feedback.

Through these lessons I was able to use rubric and verbal/visual assessment to evaluate the students’ abilities to comprehend geometry concepts, pattern recognition, and personal space and appropriate touch through body relationships and made sure they were given specific math and dance vocabulary to apply to their learning. More on these assessments are found in the attached lessons (Appendices D and E). But what I found most valuable was the enjoyment the students found in the lessons. When working with my small group, it was clear to see each child was excited about being able to create something based on what they had learned that day. Furthermore, we each received a card from a student at the end of our session. Inside my card was a message from a student thanking me specifically for the lesson on reflections – a lesson he would never forget. After spending the last two years gathering this research, I truly believe making learning an enjoyable experience and bringing dance into a math classroom has a very positive effect on a student’s ability to gain knowledge and appreciate what they learn.

In Conclusion: My Teaching Philosophy for the Future

Personally, I feel as though I am constantly still learning in and out of the classroom. As a teacher, I want to encourage this continual growth and creativity in myself, and my students, through critical thinking and creative problem solving. I believe in embracing the social, cognitive, physical, and affective outcomes of learning and teaching by creating a positive space to learn for everyone. It is important to acknowledge the diversity of human brains. No student learns the exact same way. I want to motivate students to find their own path to success.

Including Howard Gardner’s Multiple Intelligences Theory in my classroom will ensure everyone has this fair chance at achieving greatness. Incorporating this style of integrated lessons
will help students that may not learn best in a traditional, structured classroom. Some students are verbal learners, some are visual, and some are logical. I believe in embracing the variation. Differentiating learning is a very important method for me to include in my teaching, because I have been that student that needed to move around or draw pictures to understand certain subjects. I personally understand how difficult a lecture-based classroom can be for some learners. I think group work can be an effective method of educating for some lessons, but planning interactive lectures, where everyone is able to contribute to a conversation, would be preferred. I enjoy keeping everyone involved in a classroom. Inclusion is very important to me when it comes to my students.

I believe in the value of self-assessment. I think when everyone is actively involved in a lesson they are better able to reflect on their own performance. Sometimes traditional testing is necessary, but taking advantage of a student’s ability to demonstrate a skill in another area of the multiple intelligences not found in written tests is important to me, and it is hopefully more meaningful to the learner to be assessed this way as well. This helps develop those critical thinking skills I find so necessary. I will use my assessment of my students to assess and improve myself as a teacher. If the majority of my students are not grasping a concept, I will look at that as an opportunity to try something different in my instruction. If the majority of my students are excelling with a lesson, I will recognize that I have taught effectively. I will look for feedback from my students from time to time, as well, because I know I can learn from them just as much as they can learn from me. I firmly trust in a collaborative structure in a classroom. We all have something to learn from each other.

That is why teaching is so important to me. I strive to make learning fun and meaningful for my students so that they may go into the world ready to teach others. This may not necessarily mean teaching in a classroom, but I believe there is a continual learning cycle. When
students enjoy learning, they get excited about sharing their knowledge with others. When those they are sharing with see their enthusiasm, they too may get motivated to learn. In my opinion, creating a collaborative, encouraging environment is a great way to maintain positive relationships with everyone around me. I want to install a sense of curiosity in my students, so that even after they leave my classroom they continue to be interested in everything else there is to learn.

“Do not train children to learning by force and harshness, but direct them to it by what amuses their minds, so that you may be better able to discover with accuracy the peculiar bent of the genius of each.” – Plato
Lesson Developed by: Rebecca Buranich

IAC 280

Date: 4/14/15

Grade Level: 3

Common Core Mathematics Standard Addressed:
Third Grade, Operations and Algebraic Thinking
Standard: Represent and solve problems involving multiplication and division.
3.OA.3 – Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

Objective:
Students will –
• Students will demonstrate multiplication within 100 to solve word problems.

Focus Question:
How do we use multiplication within 100 to solve world problems?

VISUAL-SPATIAL


Materials Needed: Standard Lego blocks – preferably 2x2, 2x3, or 2x4 sizes.

Format: Small group instructions at rotating stations.

Sequence of Activity: Begin by explaining to the students that we use specific words to describe things in math. In addition, when we add two numbers, the result is the sum. With multiplication, when we multiply two numbers, the result is called the product. The order of these numbers does not matter. The product will always be the same for a given pair of numbers. Once that is understood, students will be put into small groups and be placed at different stations. At each multiplication station, groups of blocks will be connected at different lengths. Explain to the
students that these are arrays, meaning they are equal groups separated in rows or columns, and they will connect them to form multiplication products. For example, connect 4 groups of 8 blocks. How many Lego blocks are there in all? Below is an example of a laminated card that will be found at each station (each station will practice a different multiplication table. The given sheet follows the 3s table).

**Lego Multiplication – The 3’s Table**

Show your work by writing the multiplication problem and product below:

1. Connect 6 arrays of 3 blocks. How many blocks are there in all?

2. Connect 2 arrays of 3 blocks. How many blocks are there in all?

3. Connect 5 arrays of 3 blocks. How many blocks are there in all?

4. Connect 3 arrays of 3 blocks. How many blocks are there in all?

5. Connect 7 arrays of 3 blocks. How many blocks are there in all?

6. Connect 9 arrays of 3 blocks. How many blocks are there in all?

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**MUSICAL-RHYTHMIC**

**Materials Needed:** Small drum or tambourine.

**Format:** Whole-group instruction.

**Sequence of Activity:** Begin by explaining that we can solve multiplication problems with repeated addition. Objects, amounts of money, and time are all examples of things that can be multiplied using this strategy. We can also use repeated addition to multiply measures of music to find the total number of beats in a given rhythm. We call this total number of beats the product. Now, the instructor would state a problem from the music worksheet (below) such as, “I am going to play 4 measures. Each measure has 3 beats. Let’s count each group of 3 beats together to find the product of 4 and 3.” Then, she would tap out the beats by measure while the class counts out loud, repeating the whole problem together at the end and writing down the
addition problem with the sum and then multiplication problem with the product. The activity continues using several examples from each number times table.

Musical Multiplication

| Addition: | 3 + 3 + 3 + 3 = 12 |
| Multiply: | 3 x 4 = 12 |

(Continued for several more examples with different time signatures, such as \( \frac{4}{4}, \frac{2}{4}, \frac{6}{8} \) and so on.)

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**BODILY - KINESTHETIC**

**Materials Needed:** Nothing but the students.

**Format:** Whole-group instruction.

**Sequence of Activity:** Begin by explaining that some examples of how we can solve multiplication problems are with repeated addition and skip counting. Objects, amounts of money, and time are all examples of things that can be multiplied using this strategy. We can also use these strategies to find the total number of bodies and body parts. Just like the total number in addition is the sum, in multiplication, we call this total number the product. The class then gets into a large circle. The teacher may ask 3 students to step into the middle, holding hands facing each other. She would then ask 3 more groups of 3 to get in the middle the same way. The class is then led in a skip counting exercise to count the groups before stating a multiplication problem together (i.e. “3…6…9…12…there are 12 students in the middle of the circle. 3 times 4 is 12”). Another problem may be used with each student putting both hands into the circle. The children then go around the circle counting by 2’s to find the total number of hands in the class.

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**VERBAL – LINGUISTIC**

**Attribution:** Adapted from [http://www.math-aids.com/cgi/pdf_viewer_10.cgi?script_name=word_multi_1digit.pl&fnums=0&xinfo=0&language=0&memo=&answer=1&x=66&y=20](http://www.math-aids.com/cgi/pdf_viewer_10.cgi?script_name=word_multi_1digit.pl&fnums=0&xinfo=0&language=0&memo=&answer=1&x=66&y=20) (attached at end of lesson plan)
Materials Needed: Multiplication worksheets for each student.

Format: The first half will be completed as a class, and then the second half will be completed individually.

Sequence of Activity: The worksheets will be distributed. Then begin by explaining that 2 ways multiplication can be solved is by using arrays which are equal groups shown in a row or column or with repeated addition which adds the same number a certain number of times to find the sum. Objects, amounts of money, and time are all examples of things that can be multiplied using these strategies. Also, multiplying 2 numbers gives us a result that we call the product. The order of these numbers does not matter. The product will always be the same for a given pair of numbers. The first 5 problems will be worked out together so they understand how it should be done. Then, the students will try the last 5 problems on their own. They can choose whether repeated addition or illustrating the array will work best depending on the information given in the problem.

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**MATHEMATICAL - LOGICAL**


Materials Needed: Flipbooks for each student.

Format: Whole-group instruction, with time for individual practice.

Sequence of Activity: Explain we are going to practice different ways to show multiplication and create a book that we will be able to use as a resource throughout the year. We can use arrays, or equal groups shown in rows or columns, grids, repeated addition, and skip counting to find the total number of a problem. In multiplication we call this number the product. A flipbook is passed out to each student along with 5 problems that the students will incorporate in their book using the different ways of solving multiplication problems. Not every student will have the same 5 problems. Next, they are going to practice using their flipbooks to problem solve word problems. Post a multiplication story problem on the board and have students work independently for 2 minutes to solve the problem. After the students have finished the problem, have a few students share how they solved it. Identify which strategies each used. If students finish early, they should complete another problem.

Sample problems:

1. Carla has 5 boxes of crayons. Each box holds 12 crayons. How many crayons does Carla have?

2. There are 8 candies in one bag. How many candies are there in all if Marta packs 9 bags of candies?

3. Rob decorated 6 cakes. He put 4 candles on each cake. How many candles did he use?
4. 7 students go to the library. Each student has 7 books to return. How many books are returned?

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**NATURALIST**

**Materials Needed:** Acorns or small stones and a sheet of paper for each student.

**Format:** Whole-group instruction.

**Sequence of Activity:** Again, begin by explaining to the students that we use specific words to describe things in math. In addition, when we add two numbers, the result is the sum. With multiplication, when we multiply two numbers, the result is called the product. The order of these numbers does not matter. The product will always be the same for a given pair of numbers. We can find the product using arrays, equal groups displayed in rows or columns. Each student will receive around 30 small rocks (or acorns if available that season) and a piece of paper to show their work on. They will then be asked to split the pebbles into equal arrays and determine how many rocks they have total. They are encouraged to draw the arrays on their paper and then write the multiplication problem and product. Example array questions found below:

### Counting Pebbles

Draw your groups of rocks then write the multiplication problem and product below.

1. Separate the rocks into 3 groups of 6. How many rocks are there in all?

2. Separate the rocks into 4 groups of 2. How many rocks are there in all?

3. Separate the rocks into 7 groups of 3. How many rocks are there in all?

4. Separate the rocks into 5 groups of 4. How many rocks are there in all?

(And so on if more examples are desired.)
**INTRAPERSONAL**

Attribution:  
http://www.commoncoresheets.com/Math/Multiplication/Rewriting%20Multiplication/English/3.pdf (attached at the end of the lesson plan)

Materials Needed: Enough worksheets for each student.

Format: Whole-group and individual learning time.

Sequence of Activity: Begin by explaining to the students that we use specific words to describe things in math. In addition, when we add two numbers, the result is the sum. With multiplication, when we multiply two numbers, the result is called the product. We can multiply objects in a number of ways, such as repeated addition or skip counting. Today we will use arrays. Once the lesson is taught, students will be given a multiplication worksheet to practice their straightforward problem solving. The first 3 or 4 problems will be done together, but the rest of the sheet will be completed individually.

**INTERPERSONAL**

Attribution: Based on the cards found at https://www.superteacherworksheets.com/multiplication/multiplication-ihavenwhohas_TWZDR.pdf

Materials Needed: I Have, Who Has multiplication cards.

Format: Whole-group instruction.

Sequence of Activity: Begin by explaining to the students that we use specific words to describe things in math. In addition, when we add two numbers, the result is the sum. With multiplication, when we multiply two numbers, the result is called the product. The order of these numbers does not matter. The product will always be the same for a given pair of numbers. It should also be explained that arrays are equal groups organized in rows or columns. The cards, stating a problem with a picture of the given array below it, are distributed one per student. Starting with the first card, the student will stand and say, for example, “I have 4 groups of 9 ____ (subject of the problem will change). Who has the product of 4 and 9?” The person with 36 will then stand and say the product before stating the problem on their card. When the product of a card is announced, the student that read the problem will sit down and turn their card face down. This activity is get children working together as a team to solve problems.
Sample Card:

42

I have:

Who has the product of

$4 \times 9$?
Word Problems
Write the repeated addition problem, or draw the array. Then write the multiplication problem with the product.

1. Mike goes fishing with Sam. Mike catches 6 trout. Sam catches twice as many trout as Mike. How many trout did Sam catch?

2. Jessica, Nancy, and Mary each have 9 crayons. How many crayons do they have in all?

3. Benny was at the beach for five days and found 7 seashells every day. How many seashells did Benny find during the beach trip?

4. Tom goes out to lunch with Joan and Jason. Each person orders the $7 lunch special. Tom agrees to pay the bill. How much will he have to pay?

5. Tom has 6 nickels in his bank. How much money does Tom have in nickels?

6. A restaurant sold 9 pizzas every day for a week. How many pizzas were sold during the week?
7. Nancy has 8 five dollars bills. How much money does she have?

8. Sam worked 4 hours for 8 days. How many hours did he work in total?

9. There were a total of 6 basketball games a month. The season is played for 2 months. How many basketball games are in the seasons?

10. Keith has 9 black balloons. Alyssa has 2 times more black balloons than Keith. How many black balloons does Alyssa have now?
Rewriting Multiplication Problems

Determine how you would express the groups shown as a multiplication problem.

Ex.

1) 

2) 

3) 

4) 

5) 

6) 

7) 

8) 

9) 

Ex. $8 \times 10$

1. 

2. 

3. 

4. 

5. 

6. 

7. 

8. 

9. 

Name:

Answers
B. Creating Geometrical Shapes Through Dance and Movement
An Arts-Integrated Math/Dance Lesson

Unit developed by:
Rebecca Buranich
5/15/15
IAC 280

Grade level: Grade 4

Length of lesson/number of lessons in sequence:
The overall lesson will be taught in three smaller lessons. Lesson One: Dance skills lesson. Lesson Two: Math lesson. Lesson Three: a lesson integrating the two. Each of these lessons will take thirty to forty-five minutes. The entire lesson will take a total of about two hours.

Prior knowledge: I can assume the students have a sense of directionality and know the difference between locomotor and non-locomotor movements to change body shapes and levels. They should also know that shapes in different categories (such as rhombuses, rectangles, etc.) might share attributes, like the number of sides, and these attributes may define a larger category (e.g. quadrilaterals).

Curriculum focus: Mathematics and Dance

Objectives:
Students will –
• Construct straight and angular static shapes with their body.
• Demonstrate an understanding of two-dimensional figures using points, line segments, and angles.
• Use their bodies to demonstrate an understanding of two-dimensional figures to construct points, line segments, and angles.

Focus questions:
• How can we make straight and angular static shapes with our bodies?
• How can we use points, line segments, and angles to identify two-dimensional figures?
• How can we create points, line segments, and angles with our body to identify two-dimensional shapes?

Key vocabulary words:
- Straight – extending or moving uniformly in one direction only; without a curve or bend.
- Angular – having angles or sharp corners.
- Static shape – stationary or fixed.
- Negative space – the empty or open space around an object that defines it.
- Positive space – the subject or area of interest.
- High space – movements executed in standing, tiptoeing, or jumping.
- Low space – movements executed while lying or rolling.
- Middle space – movements executed while crawling, kneeling, or sitting.
- Two-dimensional – appearing to have length and width, but no depth.
- Point – represents a position or exact location only; has no size.
- Line – has an infinite length extending in two directions; has no width.
- Line segment – portion of a line lying strictly between two points; finite length and no width.
- Angle – the space usually measured in degrees between two intersecting lines or surfaces.
- Acute angle – an angle with a measure less than 90 degrees, but greater than zero degrees.
- Obtuse angle – an angle with a measure greater than 90 degrees, but less than 180 degrees.
- Right angle – an angle measuring exactly 90 degrees, as in a corner of a square or the intersection of two perpendicular lines.

National Core Arts Dance Standard addressed:
DA:Pr4.1.4.a. Make static and dynamic shapes with positive and negative space. Perform elevated shapes (jump shapes) with soft landings and movement sequences alone and with others, establishing relationships with other dancers through focus of eyes.

Common Core Mathematics Standard addressed:
Fourth Grade Geometry
Standard: Draw and identify lines and angles, and classify shapes by properties of their lines and angles.
4.G.1 – Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

Lesson One - DANCE

Objective: Students will construct straight and angular static shapes with their body.

Focus Question: How can we make straight and angular static shapes with our bodies?

Materials/Resources: The students will only need themselves for this lesson.
Multiple Intelligences Addressed:

- Verbal-linguistic
- Visual-spatial
- Bodily-kinesthetic
- Mathematical-logical
- Musical-rhythmic
- Interpersonal
- Naturalist
- Intrapersonal

Attribution: Adapted from “Shapes Relay,” a dance lesson plan by Kimberleigh Anderson. Kimberleigh.Anderson@evergreenps.org

Sequence of Activities:

1. Discuss and provide examples to students of contrasting shapes – curved, straight, angular, low, high, etc. Clarify that we will be working with straight and angular shapes at different levels in space. Call out a shape and level for the students to create without pre-planning, having them freeze in the shape to look at the others. (ex: low space straight, high space angular, etc.). Do this several times, pointing out interesting shapes seen, asking for favorites the students see.
2. Next, students arrange themselves in three or four straight lines – maximum of 12 students per line – with the leader of the line facing into the open space of the room. Each student should be standing in “neutral” position (arms by their side, feet together).
3. The student at the back of the line is the first to move. At the call of “go” the last student runs to the front of the line and freezes into a shape. It can be any shape besides neutral and at any level.
4. Immediately after the first students have made their shapes, the next student (now at the back of the line) runs to the front and makes a contrasting shape.
5. Continue the process, creating new shapes that vary in level, quality, direction, balance and focus. Students must hold their shape until it is their turn to run again.
6. Remind students not to repeat their shapes, but create new ones each time.
7. The first line to make it to the other side of the room wins the “shape race.”
8. Divide the class in half and have them perform for each other – only this time they must also physically connect to the person when they form their shape. Encourage various body parts to be used each time they make a shape. Discuss unsafe connections prior to trying this.
9. Ask for comments, “could you…” provide feedback to the performing group. Ask the students to compare and contrast the movement choices of the groups. Have the group perform again.
10. Repeat the process with the second group.
11. Have both groups go again, this time they must connect AND go over or under the shape. Discuss what over and under can look like (one body part, whole body, etc.) and that this is a good example of using negative and positive space to form shapes with each other.
12. Afterwards, ask the students if they observed any shapes or connections that surprised them – describe what they saw and explain what they liked about it using shape terms.
from the lesson.

**Assessment:**
I will know that the students can “answer” the focus question when they complete the task of the “shape race” that requires a different shape every time. Success with the variety will show they know how to produce static shapes in space. Further assessment will prove the gain of knowledge by the articulate responses to their peers’ shapes. Using proper vocabulary from the lesson in their critiques will show they have learned about making angular and straight shapes. There is double assurance in this assessment by having a verbal and kinesthetic way of demonstrating their knowledge.

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**Lesson Two – MATHEMATICS**

**Objective:** Students will demonstrate an understanding of two-dimensional figures using points, line segments, and angles.

**Focus Question:** How can we use points, line segments, and angles to identify two-dimensional figures?

**Materials/Resources:** Students will be given colored pencils, graph paper, and rulers or straight edges.

**Multiple Intelligences Addressed:**

- **Verbal-linguistic**
- **Visual-spatial**
- **Bodily-kinesthetic**
- **Mathematical-logical**
- **Musical-rhythmic**
- **Interpersonal**
- **Naturalist**
- **Intrapersonal**

**Sequence of Activities:**

1. Students will learn a point has no size. It is only an exact location. In geometry, a point connecting two lines or line segments is called the vertex. They will learn a line segment connects two points. A line extends without end, but a segment has a definite length. Students will also learn an angle is the amount of turn between two lines or line segments that meet at a common end point, or vertex. An acute angle is an angle less than 90 degrees, an obtuse angle is an angle greater than 90 degrees, and a right angle has a measure of exactly 90 degrees. Explain these elements form two-dimensional shapes, such as triangles, squares, hexagons, and so on. An example of each will be shown as they are stated.

2. Each student will receive graph paper, a ruler, and colored pencils. They will be asked to choose a different color for point, line segment, acute angle, obtuse angle, and right angle and create a key on their paper for which color represents what.
3. Guide the students in creating different angles and 2D shapes. They will place points first in one color, then connect the points with the color specified for line segments. When each line segment has been drawn, they will circle the vertex angles with the corresponding colors.
4. Ask the students what shapes have acute, obtuse, or right angles. How many of each angle does a triangle, square, etc. have? Discuss the correlation between the number of line segments and the number of points a shape has.
5. Their papers will be collected at the end of the lesson for review.

Assessment:
I will know the students can “answer” the focus question based on their verbal responses to the questions asked. I will also assess their pieces of graph paper to be sure they used the proper colors for each angle, line segment, and point based on their keys, confirming if they grasped the concept or not.

Lesson Three – INTEGRATED

Objective: Students will use their bodies to demonstrate an understanding of two-dimensional figures to construct points, line segments, and angles.

Focus Question: How can we create points, line segments, and angles with our bodies to identify two-dimensional shapes?

Materials/Resources: Students will use their bodies with the assistance of elastic loops for this activity.

Multiple Intelligences Addressed:

<table>
<thead>
<tr>
<th>Verbal-linguistic</th>
<th>Bodily-kinesthetic</th>
<th>Visual-spatial</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Physical-relational</td>
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</tr>
<tr>
<td>Naturalist</td>
<td>Interpersonal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intrapersonal</td>
<td></td>
</tr>
</tbody>
</table>

Sequence of Activities:
1. Students will learn a point has no size. It is only an exact location. In geometry, a point connecting two lines or line segments is called the vertex. They will learn a line segment connects two points. A line extends without end, but a segment has a definite length. Students will also learn an angle is the amount of turn between two lines or line segments that meet at a common end point, or vertex. An acute angle is an angle less than 90 degrees, an obtuse angle is an angle greater than 90 degrees, and a right angle has a measure of exactly 90 degrees. Explain these elements form two-dimensional shapes, such as triangles, squares, hexagons, and so on. An example of each will be shown as they are stated. Also, discuss and provide examples to students of contrasting shapes –
curved, straight, angular, low, high, etc. that can be made with our bodies. Clarify that we will be working with straight and angular shapes in order to indicate where each point, line segment, and angles are.

2. Distribute an elastic loop to each student and have the class split into two groups so they can watch each other. Explain the only rule is to safely produce a shape that meets the requirements given. Some shapes may require partners or other forms of creative problem solving (Can you use your head? Elbows? Other?). For an example, ask the students in the first group to form a shape with three sides. These three sides are the line segments. Ask the group not forming shapes to explain what the shape is, where the points of this shape are located and what angles are involved.

3. The groups will alternate turns for four-sided, five-sided, up to ten-sided shapes, not necessarily in numerical order. Repeat shapes and see if students can come up with different solutions not seen the first time.

4. Split the groups again so they are in groups of four or five and have the students form a shape with as many vertices as possible. One group will go at a time so the rest of the students can learn from their peers’ creative problem solving.

5. After this activity is complete, have the students discuss what they noticed. Can they come up with the correlation between the number of points and the number of line segments in a shape?

**Assessment:**
I will know that the students can “answer” the focus question based on the variety in the creative problem solving the students demonstrate. If they truly understand the concept, the verbal explanations following the activity will make that clear.

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**C. FINDING PATTERNS**
**An Arts-Integrated Dance/Math Lesson**

**Lesson developed by:**
Rebecca Buranich
12/15/15
DNS 483

**Grade level:** Grade 4

**Length of lesson/number of lessons in sequence:**
- Lesson One: Dance – 60 minutes
- Lesson Two: Math – 45 to 60 minutes
- Lesson Three: Integrated Lesson – about 60 minutes
**Prior knowledge:**
- Students know body parts, basic locomotor and nonlocomotor movements, and different levels
- Students know basic addition, subtraction, multiplication, and division problems (within 100)
- Students know the shapes of the body, as well as common geometrical shapes

**Curriculum focus:**
Mathematics: Generate number patterns
Dance: Time – Rhythm Patterns

**Objectives:**
- Given a lesson Rhythm, 4th grade students will be able to demonstrate patterns of different rhythms 9 out of 10 times.
- Given a lesson on Patterns, 4th grade students will be able to identify and generate number and shape patterns with 100% accuracy.
- Given an integrated lesson on Patterns, 4th grade students will be able to demonstrate mathematical patterns through kinesthetic movement 4 out of 5 times.

**Focus questions:**
- Can students recognize and describe the vocabulary words of rhythm?
- Can students identify and create mathematical patterns?
- Are students able to express the emotions they feel when moving through patterns?
- Are students able to work together to create a dance pattern using different colors?
- Are students able to work together to recognize a pattern using kinesthetic rhythm?

**Key vocabulary words:**
- **Rhythm** – a strong, regular, repeated pattern of movement or sound
- **Pulse** – a single vibration or short burst of sound, electric current, light, or other wave
- **Breath** – the air taken into or expelled from the lungs
- **Pattern (Dance)** – combined pulses in a repeatable series
- **Grouping (Dance)** – the meter; tells us where the accent is
- **Accent** – a distinct emphasis given to a syllable or word in speech by stress or pitch
- **Pattern (Math)** – series of repeating numbers, shapes, symbols, or objects arranged following a rule or rules
- **Grouping (Math)** – the arrangement or formation of things in a group or groups
- **Addition** – the action or process of adding something to something else, resulting in a sum
- **Subtraction** – the process or skill of taking one number or amount away from another, resulting in a difference
• **Multiplication** – the process or skill of multiplying, resulting in a product
• **Division** – the action of separating something into parts, or the process of being separated, resulting in a quotient
• **Least Common Multiple (LCM)** – the smallest number that two numbers are factors of

**NYS Standards addressed:**

**National Core Arts Dance Standards** –

**DA:Cr1.1.4.b** - Develop a movement problem and manipulate the elements of dance as tools to find a solution.

**DA:Pr5.1.4.a** - Demonstrate fundamental dance skills (for example, alignment, coordination, balance, core support, kinesthetic awareness) and movement qualities when replicating and recalling patterns and sequences of locomotor and non-locomotor movements.

**DA:Re7.1.4.a** - Find patterns of movement in dance works that create a style or theme.

**DA:Cn10.1.4.b** - Develop and research a question relating to a topic of study in school using multiple sources of references. Select key aspects about the topic and choreograph movements that communicate the information. Discuss what was learned from creating the dance and describe how the topic might be communicated using another form of expression.

**Common Core Mathematics Standard** – Fourth Grade Operations and Algebraic Thinking

4.OA.C.5: Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

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**Lesson One - DANCE**

**Lesson Developed by:**
Rebecca Buranich
12/15/15
DNS 483

**Length of Lesson:** One Hour

**Objective:**
• Given a lesson Rhythm, 4th grade students will be able to demonstrate patterns of different rhythms 9 out of 10 times.

**Focus Question:**
• Can students recognize and describe the vocabulary words of rhythm?
• Are students able to express the emotions they feel when moving through patterns?
• Are students able to work together to create a dance pattern using different colors?

**Multiple Intelligences Addressed:**

- Verbal-linguistic
- Bodily-kinesthetic
- Visual-spatial
- Mathematical-logical
Musical-rhythmic  Interpersonal
Naturalist  Intrapersonal

**Attribution:**  Exercises found in “Creative Dance for All Ages,” by Anne Green Gilbert

**SEQUENCE OF ACTIVITIES**

**Warm-up:**

1. We will begin with “Shake Down.” It is assumed that this is how we start every class to get the brains focused and blood pumping.
2. Then, sitting a circle I will explain that when we do our shake down, we are experimenting with time. I will go over the vocabulary of Rhythm (*pulse, pattern, breath, grouping*) and explain that we will be focusing on patterns and groupings mostly, but it will help to keep all the vocabulary in mind as we continue.
3. “Echo” will be our warm up game. “I will move for 4 counts, then you echo my movement for 4 counts. When I move, you are still; when I am still, you move. We do not move at the same time. You are my echo!”
4. Some examples of simple patterns I would use might include 4 punches, 4 jumps, or 4 runs in place. More complicated patterns I could use might be 2 punches and a slow stretch, or 4

**Exploring the Concept (Guided Exploration):**

1. We will look at accents in a rhythm now. I will teach a simple count of 8 to the class, where there is a new movement on each beat (*i.e. step, clap, hop, step, punch, kick, clap, jump*).
2. I will use moving accents to explain syncopated rhythms. “We are going to move the accent 1 beat over each measure: 1-2-3-4-5-6-7-8, 1-2-3-4-5-6-7-8, 1-2-3-4-5-6-7-8…and so on.” We will practice clapping on the moving accent first. Then we will go through the phrase, emphasizing the movement that falls on the accented count.
3. Afterwards, I may ask the students how this type of pattern makes them feel.

**Developing Skills:**

1. We will have a small developing skills section for this lesson to allow more time in the creating and cool down sections.
2. I will select a short poem or two. As a class, or in two groups, we will create combinations to these pieces of literature to demonstrate interesting rhythms.
3. If split into two groups, we will watch each group’s combinations. After we are done moving, we will discuss how putting movement to poetry felt.

**Creating:**

1. I will split the class into groups of 3 or 4. Each group will get a stack of colored paper. They will have to assign specific movements to each color.
2. Once they know what movements they are using, they will have to arrange the colors in a pattern and perform their movements to this pattern.
Cooling Down:

1. We will begin by sharing everyone’s color/movement patterns. As each group performs, will try to guess what movement each color represents.
2. Then, we will review the vocabulary from the day once again while in a circle

Assessment:
I will know the students can “answer” the focus questions based on their group responses throughout the lesson. I will also assess the creative problem solving the students use to create their own patterns using the poems and colors.

Lesson Two - MATH

Objective(s):
• Given a lesson on Patterns, 4th grade students will be able to identify and generate number and shape patterns with 100% accuracy.

Focus Question(s):
• Can students identify and generate mathematical patterns?

Materials/Resources: Pattern worksheet for each student, projector, possibly 3 buzzers for the jeopardy game, http://www.superteachertools.us/jeopardyx/, and “hundreds chart” booklet for each student

Multiple Intelligences Addressed:

<table>
<thead>
<tr>
<th>Verbal-linguistic</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Bodily-kinesthetic</td>
<td>Mathematical-logical</td>
</tr>
<tr>
<td>Musical-rhythmic</td>
<td>Interpersonal</td>
</tr>
<tr>
<td>Naturalist</td>
<td>Intrapersonal</td>
</tr>
</tbody>
</table>

Attribution:
• http://betterlesson.com/community/lesson/21386/finding-the-rule-to-a-pattern
• http://www.education.com/worksheet/article/pattern-play/
• http://buggyandbuddy.com/finding-number-patterns-using-a-hundreds-chart-with-free-printable/

Sequence of Activities:
1. I will begin by handing out a simple “what comes next” worksheet with repeating patterns that the students will have to fill in on their own as a warm up (see attached). When everyone has completed the worksheet, we will go over it together. I will ask random students for their answers to see how well students grasp patterns already before going over the formal vocabulary and skills for the day.
2. Next, I will explain that a pattern is a series of repeating numbers, shapes, symbols, or objects. This is important, because patterns will not always be numbers, and so we must understand them all as potential patterns. “The one and only key to patterns is to “FIND THE RULE!” There is always a rule when you are asked to complete or extend a pattern. Sometimes you will be asked to fill in a missing number in a pattern, and the key to solving that is the same, just find the rule.”

3. We will go over several increasing number patterns, finding the rule together. We will ask ourselves, what is the relationship between each number?:
   - 2, 5, 8, 11, __, __? (add 3)
   - 1, 2, 4, 8, 16, __, __? (multiply by 2)
   - 3, 8, 13, 18, __, __? (add 5)

4. We will then play a jeopardy-style game to explore all different kinds of patterns. The class will be split into three groups. I will have a projector of some kind to display the questions. Questions will be different patterns that groups will need to buzz in (or raise their hand) to answer what comes next in the pattern. Category titles might include: Shapes, Numbers, Symbols, Colors, Food, Objects, etc. A prize of some kind will be available to the winning team.

5. After our game, I will distribute “hundreds chart” booklets to each student with 5 charts per book (see attached). Students will have to color in patterns for homework so I may include it in my assessment the following day.

Assessment:
I will know the students can “answer” the focus question based on their active participation within their group during Jeopardy and based on the number of correct answers given throughout the class. I will also assess the success of my teaching and my students through the quality of their completed homework booklets.

Lesson Three – INTEGRATED ACTIVITY

Objective(s):
• Given an integrated lesson on Patterns, 4th grade students will be able to demonstrate mathematical patterns through kinesthetic movement 4 out of 5 times.

Focus Question(s):
• Can students properly identify and create mathematical patterns?
• Are students able to work together to recognize a pattern using kinesthetic rhythm?
• Are students able to express the emotions they feel when moving through patterns?

Materials/Resources:

Multiple Intelligences Addressed:
Sequence of Activities:
1. After reviewing the vocabulary, we will begin in two groups. One group will perform a 3-pattern, and the other will perform a 4-pattern. The 3-pattern group will clap their hands once then slap their thighs twice (“clap, slap, slap” or “Css”) with the accent on the clap. The 4-pattern group will do the same, except with 3 slaps (“Csss”).
2. Each group will practice a couple times separately and then both groups will begin at the same time. I will have them repeat their patterns several times so that they hear the claps match up at least twice. I will ask how many sounds total each group has to make before the claps are on the same beat (12 sounds). This will demonstrate how patterns begin to match up after a while by finding the least common multiple.
3. Next, I will explain we can do the same thing with our names! Consonants are slaps and vowels are claps. The first letter of everyone’s name is the accent. I will demonstrate my name, “R-E-B-E-C-C-A,” as “slap, clap, slap, clap, slap, slap, slap, clap.” We will then go around the room to hear everyone sound out their name. Once everyone practices their name a couple times in a row without pauses, I will have everyone pick a partner (making sure no pair has the same number of letters in their name).
4. The goal of each pair to play their names together and figure out how many beats it takes to hear the accent of the first letter of their name match up. Once everyone has figured it out, we will go around the room again to hear the partners play their names until the accents match up.
5. Afterwards I may ask questions like, “Did any of those patterns have particularly pleasing rhythms to anyone?” or “Was it hard to stay in time with your partner sometimes?”
6. Finally, we will take our name patterns and turn the slaps and claps into two different dance moves. Everyone will find a different partner so that they can discover new patterns. Then the pairs will come up with their two moves to apply to their names. Each pair will perform their names for the class, up to the accented move again.
7. We will come together as a class to discuss what we saw, what we liked about the creative process, and what we liked about our peers’ creativity.
Assessment:
I will know the students can “answer” the focus question through their self-assessment and assessment of their peers. Their ability to recognize when patterns align will also be assessed.

(What comes next worksheet – would download full, clear version if actually using in a classroom)

D. KNOW YOUR PLACE

Lesson Developed by:
Rebecca Buranich
DNS 484
2/29/16
Age Group: 5th Grade

Length of Lesson: 50 minutes

Learning Objective: Given a lesson on body relationships and place, 5th graders will be able to demonstrate relationships in self and general space with 90% accuracy.

Focus Questions:
- Can the students identify the opposing relationships (i.e. near-far)?
- Do students appear to feel more comfortable in self-space or general-space?
- Do students properly demonstrate the different relationships assigned to them?
- Are students able to mirror and shadow each other without conflict?

National Standards Addressed:

<table>
<thead>
<tr>
<th>Standard Addressed</th>
<th>Standard Code</th>
<th>Anchor Standard</th>
<th>Where Do You Address This In Lesson Plan?</th>
<th>Connection to Bloom’s Taxonomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build content for choreography generated from a variety of stimuli (for example,</td>
<td>DA:Cr1.1.5.a</td>
<td>Creating</td>
<td>Developing Skills, Creating</td>
<td>Applying, Analyzing, Creating</td>
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<tr>
<td>music/sound, text, objects, images, notation, observed dance, experiences).</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrate static and dynamic shapes and floor and air pathways into dance</td>
<td>DA:Pr4.1.5.a</td>
<td>Performing</td>
<td>Explore the Concept</td>
<td>Understanding</td>
</tr>
<tr>
<td>sequences. Establish relationships with other dancers through focus of eyes and</td>
<td></td>
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<td>other body parts. Convert inward focus to outward focus for projecting out to far</td>
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<tr>
<td>space.</td>
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<tr>
<td>Demonstrate the ability to adapt dance to alternative performance venues by</td>
<td>DA:Re6.1.5.a</td>
<td>Responding</td>
<td>Warm up, Cool Down</td>
<td>Remembering, Evaluating</td>
</tr>
<tr>
<td>modifying spacing and movements to the performance space.</td>
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</tbody>
</table>


Compare two dances with contrasting themes. Discuss feelings and ideas evoked by each. Describe how the themes and movements relate to points of view and experiences.

<table>
<thead>
<tr>
<th>Primary Elements/Principles of Dance Addressed:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Body – Relationships</td>
</tr>
<tr>
<td>• Space – Place (self space, general space)</td>
</tr>
</tbody>
</table>

**Key Vocabulary:**
- Relationships in terms of dance – body part to body part, near-far, around-through, mirroring-shadowing, alone-connected, over-under
- Symmetry – two parts of an overall shape have the same measure
- Reflection – the half of one shape is symmetrical to half of the opposite shape
- Translation – also know as sliding symmetry, an object shifts without any rotation or reflection
- Self-space – the space your body takes up
- General-space – the space we use as we travel
- ABA choreography – the first and third section of a dance are identical with a different section in the middle

**Attribution:**
*Math Dance with Dr. Schaffer and Mr. Stern*, by Karl Schaffer, Erik Stern, and Scott Kim

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**THE LESSON**

**Warming-up:** (5 minutes):

1. Students will get back together with the combined subgroups from last class and be given another group’s movement map. Before practicing this map, leaders will review the shapes and locomotion learned in the previous lesson.
2. After review, groups will practice the new maps. When they feel comfortable with it, everyone will sit in the front of the room and watch as one group at a time performs the movement map they were given.

**Exploring the Concept (Guided Exploration):** (10 minutes):  
1. Students will learn that self-space is the space your body takes up, like your own personal bubble. They will also learn general-space is the space we use as we travel, but you cannot pop anyone else’s bubbles. They will have about 30 seconds to practice each of these. “Practice moving in your self-space. Remember you can’t move your feet at all. Now practice moving through general-space by finding a new place in the room.”

2. Ask the students if they have learned about symmetries in their math class and how they would define symmetry. Then explain that we use symmetries in dance too. “In math we call it “reflection” and “translation” symmetry, but when dancing we use “mirroring” and “shadowing.”” Explain that mirroring is like looking in a reflection, and when I raise my right hand, my reflection raises its left hand. Students practice being the leader’s reflection for a few seconds. Then explain shadowing is when the leader faces away and you move the identical body part the leader moves. Students practice shadowing the leader for a few seconds before being told to find a partner wearing the same color as them.

3. When everyone has a partner, it will be designated who partner A is and who partner B is. Each partner will take turns mirroring and shadowing the other, 30 seconds each, while music from 1940’s plays in the background. When they are finished with that, everyone will gather in a group for the next activity.

**Developing Skills:** (10 minutes):  
1. Two lead teachers will demonstrate the following relationships and students will have to guess what it is. “What words can be used to describe these relationships?”  
   - Body part to body part, near-far, around-through, mirroring-shadowing, alone-connected, over-under

3. An obstacle course will be set up to help kids practice relationships with objects: under a ballet barre, around a chair, over a rolled up yoga mat, through a teacher bridge, mirror a
teacher, and leap down the line back to the start to create a “body part to body part” statue. Encourage different locomotive movements throughout the course.

4. Students will go through the course a second time staying connected to a partner.

**Creating:** (20 minutes):

1. Subgroups will combine with a different subgroup than last class. Each group will be given relationship cards that they must arrange in ABA format and develop a dance with 1 count of 8 for each relationship for a total of 3 counts of 8. The cards will display the relationships from the Developing Skills section.

2. Groups will perform their dance to popular music of the 1940’s while the rest of the class watches quietly in front.

**Cooling Down:** (5 minutes):

1. Students will get to play the Newspaper Game to cool down. Each student starts on his or her own newspaper unfolded. Every time students move to a new paper they fold it in half, so each time it gets smaller and smaller. Newspapers represent self-space and they dance through general space to get there.

2. Encourage relationship vocabulary still by saying, “Move to a near newspaper” or “Move to a far newspaper.”

**Assessment:**

There will be a visual assessment throughout the lesson with a quick checklist:

- Are students able to mirror/shadow their partner or teacher properly?
- Do students follow directions and use proper relationships during the obstacle course?
- Do students make relationships clear during the dance they create?

If students display relationships clearly throughout the lesson, then it will be clear they grasp the concept.

**Reflection:**

The obstacle course actually went by smoother than expected; however, there was a lack of diversity of locomotion for the students. It would have been nice to see them try new things.
Even though we may not have had enough time for everything, I think students were able to understand the relationships we went over and got the general concept of Place. I enjoy letting kids be creative with their movement, but they did need a little more guidance when developing their own phrases. This will become easier over time as they practice creating more.

E. REPEAT AFTER ME

**Lesson Developed by:**
Rebecca Buranich
DNS 484
3/28/16

**Age Group:** 5th Grade

**Length of Lesson:** 50 minutes

**Learning Objective:** Given a lesson on patterns and size, 5th graders will be able to demonstrate their knowledge of pattern recognition and sizes by creating a patterned phrase that demonstrates the groups’ given sizes.

**Focus Questions:**
- Can the students keep with the rhythm of the pattern in order to perform the pin shape on the right count?
- Do students get overwhelmed while practicing their patterns in groups?
- Can students properly demonstrate the difference between small, medium, and big sizes?
- Are students able to collaborate on choreographing a size dance?

**National Standards Addressed:**

<table>
<thead>
<tr>
<th>Standard Addressed</th>
<th>Standard Code</th>
<th>Anchor Standard</th>
<th>Where Do You Address This In Lesson Plan?</th>
<th>Connection to Bloom’s Taxonomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explore through movement the feedback from others to expand choreographic possibilities</td>
<td>DA:Cr3.1.5.a</td>
<td>Creating</td>
<td>Developing Skills, Creating</td>
<td>Applying, Analyzing, Creating</td>
</tr>
</tbody>
</table>
for a short dance study that communicates artistic intent. Explain the movement choices and refinements.

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<thead>
<tr>
<th>Contrast bound and free-flowing movements. Motivate movement from both central initiation (torso) and peripheral initiation (distal) and analyze the relationship between initiation and energy.</th>
<th>DA:Pr4.1.5.c</th>
<th>Performing</th>
<th>Warm Up, Developing Skills</th>
<th>Remembering, Applying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find meaning or artistic intent from the patterns of movement in a dance work.</td>
<td>DA:Re7.1.5.a</td>
<td>Responding</td>
<td>Explore the Concept, Creating, Cool Down</td>
<td>Understanding, Analyzing, Creating, Evaluating</td>
</tr>
<tr>
<td>Choose a topic, concept, or content from another discipline of study and research how other art forms have expressed the topic. Create a dance study that expresses the idea. Explain how the dance study expressed the idea and discuss how this learning process is similar to, or different from, other learning situations.</td>
<td>DA:Cn10.1.6.b</td>
<td>Connecting</td>
<td>Explore the Concept, Creating</td>
<td>Understanding, Analyzing, Creating</td>
</tr>
</tbody>
</table>

**Primary Elements/Principles of Dance Addressed:**

- Time – Pattern
- Size – Big, medium, small

**Key Vocabulary:**

- Pattern – repeatable sequence, in both math and dance
- Big size – far reach
- Medium size – mid reach
- Small size – near reach
THE LESSON

Warming-up: (8 minutes):

1. Students will meet with their groups from the end of the last lesson to review the stories they wrote together. Each group will select one member to read the story while the rest of the group performs the story for the class.
2. Teachers should take note of their use of vocabulary and ability for students to follow directions.
3. Then one of the topics of the day will be introduced: “Today we will be learning about sizes. Can anyone name some sizes?” Tell the students big sizes consist of a far reach, medium sizes use a mid reach, and near reach is another way of staying small.

Exploring the Concept (Guided Exploration): (5 minutes):

1. Tell students we return to sizes later in class, “but right now we are going to learn about patterns.” Explain that in dance, like in math, patterns are repeatable sequences. “Just like how we can create numerical and shape patterns on paper, we can use our bodies to make shape and rhythmic patterns.”
2. Students will learn a 4-beat sequence all together (slap, clap, clap, slap) facing the front.
3. Counting off by fours, students will get into these large subgroups. Each group will be given a different number (1, 2, 3, or 4). This number represents the count that the group will make a pin shape during the old pattern. For example: the 1 group’s new pattern will be “pin, clap, clap, slap.”
4. Explain to students this new phrase is still a pattern. After practicing, the groups will come back together (lined up in order of their numbers) and perform their new patterns all together. This is form a wave of pin shapes down the line.
5. Alternate option: If there is a lot of success with this, students could alternate 1, 2, 3, 4, 1, 2, 3, 4… or any other order to show different patterns with their pin shapes.
Developing Skills: (12 minutes):

1. Now students will get to practice the sizes we talked about in the warm up.
2. While spread out in a circle, the teacher will call out different sizes for the students to embody. Have a few students take turns calling out sizes for their peers to give them the chance to lead.
3. Then we will move on to a balloon activity for a more structured size practice. “Start in a small shape at any level. Blow up like a balloon until you are the biggest shape possible, feeling like a giant balloon until you might pop. Then pop! Let all the air out and shrink to a small shape.” Repeat, but with a new shape and color and small leak instead of popping. Could repeat again, floating around the room.

Creating: (20 minutes):

1. Break into the same groups from the EXPLORE THE CONCEPT to go over instructions for size dance.
2. Each group will receive 4 cards with 2 sizes: big/small, medium/big, medium/small, small/big
3. The students in each group get to decide how to organize these cards into a pattern. Then they will turn this pattern into a phrase of 2 counts of 8 total.
4. After practice for a few minutes, each group will get to perform what they created.

Cooling Down: (5 minutes):

1. To close, we will review our hand jive choreography from the first lesson. Mention this organization of the original hand jive is another pattern found in dancing.

Assessment:
The assessment will focus on the size pattern dances created at the end of the lesson. During performances, the group on the floor and the audience of peers will be assessed.

- Did the performing group ensure their dance was a pattern of sizes?
- Are the students watching able to identify the sizes shown in the dances they see?
**Reflection:**

Unlike our last lesson, the kids were full of too much energy today and really like the focus needed to learn. Some kids were also selfish when it came to creating. They wanted to choreograph or write everything themselves, which was a little different to work around at times. Nonetheless, we got through the pattern lesson easily. Some were confused, but I think our sccs pattern is just something that takes practice. We also may need to revisit the difference between levels and sizes, because some kids seemed to think they could only make a shape that displayed a certain size when really any shape can be made at any size.

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**F. VIDEOS AND PHOTOS FROM APPLIED RESEARCH**

1. Video Montage of my semester with Children’s Dance II:

   [https://www.youtube.com/watch?v=RzxQcQpXnEU&feature=em-upload_owner](https://www.youtube.com/watch?v=RzxQcQpXnEU&feature=em-upload_owner)

2. The final performance featuring the Children’s Dance II class and our 5th graders, beginning with the product of our Pattern Recognition lesson:

   [https://www.youtube.com/watch?v=X8ml2L-KFsE&feature=em-upload_owner](https://www.youtube.com/watch?v=X8ml2L-KFsE&feature=em-upload_owner)
Works Cited


<http://www.education.com/worksheet/article/pattern-play>/.


