



***Ladies and Gentlemen- Announcing the Great Tumbling Geometrics
Geometry and Gymnastics***

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This curriculum unit is recommended for:
(Math/Geometry/K-1)

Keywords: Geometry, 2-D shapes, 3-D shapes, movement, gymnastics

Teaching Standards: See [Appendix 1](#) for teaching standards addressed in this unit

Synopsis: Can you imagine a world without shape? How would we ever build buildings, or design cars, or create any artistic form? Where would we be without the expressive form of movement? Shapes are all around us. We go through each day using shape and geometry without even thinking about it. The world has an affinity for movement and sports. Whether the sport is competitive, recreational, or just for fun; human beings love to move. Thus we incorporate math and sports.

Young children are fascinated by shapes and they love to use various forms, sizes, and orientations of shapes as they learn in all of the content areas. This unit will invite kindergarten students to explore the world of geometry and gymnastics. Gymnastics provides the perfect venue to connect geometry and gymnastics. During this unit students will learn what constitutes a shape and that everything takes on a given shape. We will discover how to make shapes, as well as learn the names and attributes of the 2-D and 3-D shapes. We will then transfer what we know about shape and apply it to learning about gymnastics and the shapes our bodies can make. We will conclude our unit with a class gymnastics performance for the other Kindergarten classes.

I plan to teach this unit during the coming year in to 22 students in math/Kindergarten.

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Ladies and Gentlemen- Announcing the Great Tumbling Geometrics Geometry and Gymnastics

Cynthia Hicks

Background

I am a kindergarten teacher with 32 years of teaching experience. I have taught a wide range of math curricula. When I first started teaching the curriculum was very fluid. I had a great deal of latitude in determining what I wanted to teach, how I wanted to structure the skills, a time line for introducing concepts and skills and when and what I would assess. The math curriculum was entitled *Math Their Way* by *Mary Baretta Lorton*. By the late 1990's and the early 2000s, times had changed. We had traded the hands-on exploration approach for a textbook and a host of workbook pages. Math became more static and learning became a task to learn the information as opposed to truly learning and understanding math. I served on the math textbook adoption committee in 2003 which became an eye-opening experience. Over the course of several months we reviewed numerous math series that were being considered. Most of the books were textbooks with workbook components. Most included some form of manipulative set but it was not the basis for the program. We had been using pieces of the Investigations program which were used as individual topics. However, it had not been fully implemented across the district as the official program. Since this time the Investigations program second edition, which had been revised, became the official program for the district.

Now, as of 2013 we have taken a step forward. We have been working with Math Investigations for several years and we have now added Kathy Richardson Assessing Math Concepts. This program is based on the premise that we can learn the most about how our students learn and think when we work with them side by side each day, provide hands-on experiences, engage them in conversations, attend to their peer interactions, read their reflections, and observe them at work. Kathy Richardson has outlined critical learning phases which refer to the understandings that must be in place in order for students to approach subsequent learning with success. The instruction that occurs before the student reaches this milestone will result in imitation of the skills. Therefore it is vital for teachers to use assessment tools that will provide the information needed to ensure that students are not just learning the math but understanding the math¹. It is evident that Kathy Richardson Assessing Math Concepts is a program that teaches number sense. It is important for educators of young children to understand that numeracy is a foundation skill. The development of this skill requires a level of understanding about numbers and math concepts that will allow the student to enter into other math topics with success.

Rationale

Math can be a very intimidating subject to tackle. I think I always saw math as a challenge and sometimes shied away from it. When I became a teacher, I wanted to make the experience with math something that my students would find do-able and something that they could even say they were “good at”. Many people, educators included, seem to think that the beginning math skills are very easy and should be learned with very little “difficulty”. For some children, this is true. But for many others, math concepts pose a problem. At the kindergarten level, geometry opens up a world of line and shapes that the five year has not seen before. Yes, they have seen a book and even called it a rectangle or held a beach ball and recognized its roundness. But, now as they explore the world of shape it becomes more of an experience. And to do this is the realm of sports, will be awesome. Children love to move and see what their bodies can do. It will be so much fun participating with my students as we explore math and sports.

Content Knowledge Background

My school is made up of a diverse group of learners. We are a K-5 school with a population that includes a host of racial and ethnic groups. Most of our population is represented in Hispanic, African-American, and the Asian cultures. Our greatest minority population is Caucasian. My class shares representation from all of these groups. Our class has a gender balance of 14 boys and 9 girls. The grade level as a whole has a heavy population of boys this year. Our school also has a free and reduced lunch average of 69%. Currently, I have two students who will be referred for EC services.

Our students come from a variety of academic backgrounds. The MAPS (Measure of Academic Progress) testing was completed at the beginning of the year. This assessment is used to provide a baseline for academic skills for the year. The assessment covers reading and math. The results of the assessment report skill levels as high, middle, and low levels of readiness. The report shows high levels of readiness in green, moderate levels of readiness in yellow, and low levels of readiness in red. Our class report indicates that we have 83% of our class in the yellow and red levels of readiness. As I talked with parents at the beginning of the year I found out that many of our students have not ever attended CMS Bright Beginnings program or any type of preschool. Some had attended an in home daycare that mostly provided care rather than also providing an educational environment. With this in mind, I have approached this year providing background experiences in what school is and how we use this environment to learn. For most of my students at the beginning of the year, the playground has been the highlight of the day. This has given me the opportunity to use their love for movement and playing as a format for also engaging them to learn.

Introduction

Math is part of every facet of our world. We find math in working with computer technology, planning timelines for corporations, comparing prices, managing schedule times, reading and interpreting various forms of data, and a myriad of information in sports. The world requires that today's students leave high school and enter the world stage being college and career readyⁱⁱⁱ. It is only natural that this process begins early in life. Therefore, within the academic environment, the kindergarten program has a great responsibility to ensure kindergarteners receive the most effective instruction in math as well as every other subject.

Geometry can be found throughout our everyday lives. We find lines, shapes and angles in every object that we see. Geometry defines the way we recognize things and call them by name. We know a tree is a tree by its shape. We know a ball is a ball by its shape. And we know a flag is a flag by its shape. As we learn more about shapes, we learn that a variety of shapes can come together to make a different shape. Hence, we can construct buildings using rectangles, squares, and triangles. This unit will progress from a very rudimentary definition and explanation of shapes to an interactive understanding of the concept of shape.

It is the goal of this unit that student will be involved in an investigative approach to math. Students of both genders, range of academic strengths and interests, members of diverse cultural, ethnic, and language backgrounds will find a meaningful way to become engaged in this unit of study. The investigative approach to this unit ensures that students will have time to explore the concepts in depth, begin to acknowledge that there are multiple solutions to the problems presented, there is open venue for students to create solutions rather than rely on memorized answers, and their mathematical thoughts can be expressed through talking, drawing, writing, constructing, and movement. Students may interact with the concepts individually, small groups, pairs, or as a whole group.

Kindergarten children have a natural inclination to move. They love to run, jump, twirl, roll, and climb. Their ability to tackle any task through movement makes it an inviting task to incorporate math skills in the form of active learning. Dr. Carla Hannaford^{iv} has noted that math and movement go hand in hand. Movement increases circulation. Certain types of movement provide stimulation for the release of dopamine and noradrenalin in the brain which are key components of learning^v. Movement plays a strong role in our ability to connect new information into the neural networks of the brain^{vi}.

Dr. Hannaford, a neurophysiologist, further explains that the part of the brain that is processing movement is the same part of the brain that is processing learning. The vestibular or inner ear and the cerebellum sensory system which refers to motor activity mature first. The canal of the inner ear and the vestibular nuclei act as the information gathering system and provides feedback for movement. The information moves back and

forth from the cerebellum to the other parts of the brain through nerve tracks. These destinations include the visual system and the sensory cortex. This system is also connected to the reticular activating system which is near the brain stem and patrols the sensory data that enters the brain. It is this interaction that helps us maintain balance and coordinate movement. Why is all of this information important for math and sports? Dr. Hannaford contends that activities such as swinging, rolling, and jumping stimulate the inner ear motion which promotes learning^{vii} (Hannaford, 2005).

Unit Overview

This curriculum unit will focus on using gymnastics to teach geometry. The gymnastics skills involve identifying the tasks and types of equipment used as they relate to geometric shape. Students will be able to observe, describe, compare, and represent the shapes they see around them every day. This unit will allow kindergarteners to be introduced to the concept of two dimensional shapes. They will learn the names of the shapes as well as develop the ability to recognize (visual and auditory), describe, copy, draw, and construct the shapes. Additionally, they will identify the 2-D shapes that are represented in the gymnastic equipment that are also found in 3-D shapes. They will use their awareness of locomotor body movement to create shapes. They will use the information about the formation and description of shapes to experiment with the gymnastic skills using vault boxes, mats, parallel bars, rings, balance beams, ropes, spring box, hoops, and balls to further understand geometry. They will use direction/position words to describe the location of the shapes within various environments. The common core state standards will be addressed.

Identify and Describe Shapes CCSS.Math.Content.K.G.A.1 Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*. CCSS.Math.Content.K.G.A.2 Correctly name shapes regardless of their orientations or overall size.

CCSS.Math.Content.K.G.A.3 Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”). Identify and describe shapes.

Analyze, compare, create, and compose shapes. CCSS.Math.Content.K.G.B.4 Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length). CCSS.Math.Content.K.G.B.5 Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.

CCSS.Math.Content.K.G.B.6 Compose simple shapes to form larger shapes. *For example, "Can you join these two triangles with full sides touching to make a rectangle?"*

P.E. K.18- Demonstrate a variety of locomotor and combination skills in a movement pattern

Why is this important? Kindergarteners enter kindergarten with the expectation that they will “learn” something. Up to this point in their lives they have been learning” things which they can prove to you as they recite their ABCs, count to 10, and say their whole name. But this is evidence that their learning has been very static and processed as information without giving the information a genuine function. Even the kindergarten assessment for geometry only requires the identification of 4 basic 2D and 3-D shapes in isolation, to be able to tell how two shapes are alike and different, and draw the basic 2-D shapes. Through this unit, students will be able to experience geometry rather than only knowing information about geometry. They will be able to work with geometric shapes using hands-on lessons and activities. They will learn to use position words as they relate to the geometry and gymnastics. They will be able to understand and articulate instructions such as “Go over the vault box”. Through the gymnastics portion of the curriculum unit, the students will be able to experiment with various 2-D shapes but also using a variety of 3-D shapes for building and construction other structures to use in gymnastic activities. Through a series of CMS initial math assessments and performance assessments developed for this unit, I will be able to determine what my students know about geometry.

The curriculum unit will follow a progression by first identifying the concept of a shape and that everything has shape. It will continue to describe types of shapes. We will look at examples such as cars have shape, people have shape, and dogs have shape. This will lead in to the introduction of geometric shapes. Students will explore shapes using activities to identify, copy, draw, describe, sort, and locate other examples of shapes within the environment. Direction/position words will be used to help students locate the shapes. This format will be followed for 2-D and then 3-D shapes. The unit will include activities connecting geometry and gymnastics. Students will have the opportunity to work with specific gymnastics equipment as the corresponding shapes are introduced.

As kindergarten students engage in learning geometry through gymnastics, I envision additional benefits evolving from this unit beyond their ability to achieve mastery of academic standards. These include an increase in confidence and sense of pride as students demonstrate to themselves what their bodies can do. They will also be learning how to work within a group as an active supportive participant, and exhibit a willingness to try new tasks and activities. The students will also develop sharper listening skills and greater attention to details as they work on the gymnastics skills.

I will approach this unit by using the format used by van Heile in his work with teaching young students geometry. This format provides four phases of skill: inquiry, direct orientation, explicitation, free orientation, and integration^{viii}. The inquiry phase allows children to use various materials in an exploratory manner. Children are afforded time to make discoveries about the materials in relationship to the concepts. In the direct orientation phase lessons are presented to the students so that the characteristic structures of the concepts become evident. In the explicitation phase, the students work with definitions and terminology that students attach to the concepts. In the final phase of integration students are given the opportunity to make connections about their understandings and create new directions of inquiry. The lessons will also incorporate a series of progressive brain puzzles that help to illustrate the content of the lessons. The Brain Puzzles may be incorporated within the lessons as the teacher desires.

During the inquiry phase it is important to allow students to explore the manipulative materials freely to make some personal determinations about the concepts being explored at the time. During the direct orientation phase, the students will receive instruction or specific direction about the concept. During the explicitation phase the student will use the instruction and apply it to the activities that will be presented. The integration phase will allow students to take their learning a step further and explore, talk with other students about the concepts and draw, write, or demonstrate their new understandings. The lessons will be written in theme format. Each lesson may require more or less time depending on the amount of time allotted for math and the readiness level of the students in the class.

Content Objectives

The objective of this unit is to identify shapes within our world and to understand the concept of shape through body movements –gymnastics. Students will understand that shapes can be describes by specific attributes which can be defined by the number of sides, number of angles, and as plane or solid. There are other attributes that may be attributed to the shape but do not define the shape (color, size, or orientation). They will be able to identify shapes as closed figures. It is my goal that as students progress through the year, they will move from informal language used to describe shape (it looks like a box, it looks like an ice cream cone) to formal mathematical language (triangle, vertices, angles, same length).

Students will work with shapes to understand that they can relate the shapes as similar or different by describing the attributes of 2 dimensional and 3 dimensional shapes. Students will use various shapes to create new shapes. For example, students will have the opportunity to create a hexagon using triangles, trapezoids, and rhombi.

As we begin the gymnastics exploration I initially want to create an environment that is non-threatening. Although young children love to move and be active, some children are not as adventurous as others. I want them to feel empowered to try the activities and feel successful at whatever activity they attempt. The individual skill level should not present a barrier to their feeling of success. The objective is to help students develop spatial awareness, body awareness, and to connect the concept of shape to their ability to move their bodies in gymnastic activities.

Lesson 1: Basic Concepts of Shape

Phase: Inquiry

Brain Puzzle: What Is That?

Gymnastics: ribbon activities

I will begin the unit by introducing the concept of shapes. We will read the book *The Shape of Me and Other Stuff* by Dr. Seuss. The focus of the book is to introduce the concept that everything is made of shapes. We look at a tree and we know it is a tree by its shape. We can recognize that the tree looks different from a car because of its shape. As people, we also have shape. We will look at die cut shapes of objects on the overhead or the smart board and the students will work together to determine the identity of each object. Students will create their own book about *Everything Has Shape*. Each student will select 5 die cut templates to trace and on black paper. The name of the object is written on the back of each shape. The students will cut out each object (teachers or older students may help with the cutting since this lesson will be taught very early in the year—the goal is to be able to see the outline of the object). It is also possible to use pre-cut or die cut shapes for this lesson.

Gymnastics: Children love to make things move. We will do movement activities to the direction in the music and later to instrumental music which will allow students to make up their own movements. We will use gymnastic ribbons to make lines that go up and down, sideways, diagonal, and around in many ways (circles in front of us, circles around our bodies). We will make them stream outwards as we run and use other modes of movement.

Lesson 2: What Makes a Shape?

Phase: Direct Orientation

Brain Puzzle: Follow the Line...

Gymnastics: continue working with gymnastic locomotor movement using ribbons.

As we begin lesson 2 in week 2 we will read *When a Line Bends a Shape Begins* by Rhonda Gowler Greene. In this lesson we will begin to identify what makes a shape. We will examine the variety of shapes that we have discussed so far. These will include common shapes of things like a car, tree, and kite. They will also include the 2-D geometric shapes. I will demonstrate how to create a line and from a line we will create the geometric shapes. I will use an 8 inch piece of yarn to demonstrate how a line can be straight, curved, or zig-zag. I will also identify the end points of the yarn 'line' and discuss how the end points can touch to actually form a shape. We will explore making the basic 2-D shapes (circle, oval, square, rectangle, triangle, diamond or rhombus, hexagon, and trapezoid) using the yarn. The students will be given their own piece of string to work with to make straight, curved, and zig-zag lines. Students will begin to make connections between the orientation of the lines and the movements used with the ribbon activities. Then I will put the students in groups of 2 or 3 and let them work on making shapes with their own yarn. The students will be able to help each other make sure the ends touch and the sides are formed correctly for the shapes they are making.

Math Talk: I will facilitate a discussion about the concept of lines and sides and how they can be manipulated to form new shapes. Students will be encouraged to use the new vocabulary words as they work with the yarn and talk to their partners about the task. Students will be given a Math Journal to record the information they have learned about each shape on their own anchor chart.

During the Investigations time the students will work with the yarn to do further exploration. Students will also be given plastic models of various shapes to trace in salt trays or on paper with pencils and crayons. Students will also be able to use the yarn to go around the plastic shape models.

Lesson 3- Identify 2-D Shapes

Phase: Explicitation

Brain Puzzle: Can You Find the Shape?

Gymnastics: continue working with gymnastic locomotor movement using ribbons.

We will read the book *Shapes, Shapes, Shapes* Tana Hoban. This story will allow the students to understand that while everything has shapes, some objects can be identified by a specific geometric shape. At this point 2-D shapes can be introduced by using the shapes people and poems (Ex. Sammy Square is my name. I have 4 sides all the same.). There is a poem for each of the shapes. The shapes names and descriptions will be introduced one at a time. I will introduce vocabulary to assist in describing the shapes. The vocabulary will focus on the terms-end (end point, line, side, vertical line (head to toe line), horizontal line (side to side line), diagonal line (slide to the left, slide to the

right), same, longer, and shorter. I will display an enlarged shape and ask the students to help me describe the shape using the vocabulary we had discussed. As we identify the attributes of each shape, we will create an anchor chart of the shapes. The chart will identify the name of shape, the orientation of the lines, the number of sides and corners, and what it looks like.

Math Talk: As the week progresses we will use the information from the anchor chart to discuss what we know so far about shapes. We will discuss what to do if we were going to make the shapes ourselves. I will give the students an 8 inch piece of yarn, a pipe cleaner and short and long ½ inch card stock paper strips. We will talk about what we need to do in order to make shapes. We will explore creating the various shapes. Using the appropriate vocabulary, we will discuss the following questions: 1. Which shape are we making? 2. Can you describe it? 3. Are the end points touching? 4. Does it look like any other shape or any part of another shape?

During the math investigations time we will use geoboards/geobands, toothpicks, clay, yarn, short and long paper strips, and short and long pipe cleaners to practice making the shapes. Laminated shape cards (5x5 inches) will be placed in each investigation center for students to use as a model. Students will be placed in small groups to work on the shapes. I will facilitate discussions as I move to each group. Students will be encouraged to talk with each other about their discoveries, successes and struggles as they work on the tasks. Students will also have access to technology, games and activities focusing on matching and sorting shapes.

Lesson 4: Identify 2-D Shapes in the Environment

Phase: Free Exploration

Brain Puzzle: Can You Find the Shape?

Gymnastics: continue working with gymnastic locomotor movement using ribbons. Add body movement exercises that highlight line orientation; Simon Says for direction/position words

I will introduce the students to picture cards of things that have a given shapes. We will identify the object and the shape. We will use pattern blocks and pattern block cards to make the pictures. Students will be able to build the picture on top of the picture card. After some practice and the students become familiar with how the shapes work together to make the picture, they will create the pictures on a blank mat. Then they will be given paper pattern block shapes to re-create the shape pictures on blank paper. The paper shapes will be glued on the paper to make a recording of the selected shape picture. We will also use worksheets to identify and match shapes. We will be taking shape tours. We will walk around the school and locate examples of 2-D shapes. We will make a list of

the objects that we find in the school that represent the shapes. Students will work in teams to pick their favorite 2-D shape. We will use a camera to take pictures of the shapes we find. The team will also be pictured in the photo. Some examples include circle-clock, square-picture frame, rectangle- seat of the swing or door, and triangle-slice of pizza.

Gymnastics : Students will begin to add direction words to their movements with ribbon, balls, and hoops. Students will play games with their gymnastic equipment such as Simon Says and the Hokey Pokey. The Simon Says directions will say “Simon says make your ribbon go around, pass your ball over your head, or step into your hoop. Hokey Pokey directions may say, “Put your ribbon in, pass the ball to the right, or using your hoop-put your body in...).

Math Talk: During our math talk time we will discuss the names of the objects the shapes they represent. We will play a game called “I Think This is a Circle”. In this game I will hold up a picture card that represents a shape. For example I will be ‘IT’ and I will hold up a picture care of a door. Without looking at it myself, I will say ‘I think this picture is a circle’ (this will be my phrase for every picture card). The students will try to convince me that it is actually a rectangle by giving me clues (ex. But it has straight lines, it has 4 sides, it does not curve). When I have determined that my shape is actually a rectangle, the students will continue to give me clues so that I can guess the actual picture on the card. We will continue to play this game over time and the students will have the opportunity to be ‘IT’ as they show readiness.

During math investigations centers students will be able to work independently with the pattern block shapes pictures. Shapes books will be added. Students will create a book shaped as a specific shape (square book will be shaped like a square...). The contents of the book will be magazine pictures or drawings of things that possess that shape. The square book may contain a cracker, a slice of bread, a tile, and a carpet square. The centers will also provide experiences with matching the picture cards of objects to the

Lesson 5: Body shapes

Phase: Free Exploration

Brain Puzzle: Build It!

Gymnastics: continue working with gymnastic locomotor movement using ribbons. Add body movement exercises that highlight line orientation-Lesson 4

The fifth lesson will lead us into using our bodies to construct the shapes that we have learned so far. I will ask a student to pick one of the large paper shape model. We will lay the shape in the middle of the floor. I will ask students to help me think of a way to make

this shape with our bodies. We will discuss the name of the shape, what we will use to make the shape, the orientation of the lines/sides, the number of vertices, where the vertices are located, and where the vertices will touch. After our math talk we will make the shapes with our bodies. First we will explore them by using the large paper model as a guide. Later we will take the model away and display a smaller picture of the shape. Students will be asked to work with a small group to create the shape with their bodies. When the groups feel comfortable with their work, we will let each small group demonstrate their accomplishments for the large group. (ex. A group of 3 students will have a triangle card. Two of the students will form the diagonal lines and one student will form the horizontal line. Their heads and feet will touch to form the vertices).

Math Talk: Our math talk time will allow students to identify the parts of the shape that must come together to make this shape. We will discuss what we will use for line (our bodies) and what our bodies must do to become a line. We will answer the questions about the orientation of the lines (straight, curved, vertical, horizontal, diagonal). Students will be able to draw the lines on the white board/smart board and also demonstrate what the body will look like making the lines.

During Investigation time students will have access to the manipulative materials such as toothpicks, wiki sticks, craft sticks, pipe cleaners, glue, and paper to practice creating shapes. Students will glue one example in their Math Journal.

Lesson 6: Body Shape Locomotion

Phase: Direct Orientation

Brain Puzzle: none

Gymnastics: Forward and backward rolls.

Lesson 6 will focus on using our bodies to make shapes move. We will read the book *The First day of Gymnastics*. We will borrow gym mats from the P.E. teacher or use the gym during a free period. Our goal will be to identify a shape by name and determine what we can do with our bodies to make that shape into a movement. We will mainly focus on circles for this lesson. We will discuss how to make a circle with our bodies that is not flat. We will watch the video demonstrating how to do forward and backward rolls and the safety rules that govern movement activities. The teacher or P.E. teacher will demonstrate the movements of the forward and backward rolls. We will provide the following directions: to complete a forward roll we will stand with our legs apart then we will place our hands on the mat near our feet. We will look through our legs until we see the ceiling and then push with our toes. We will know that we have done it correctly if we feel the back of our head touch the mat. If the top of our head touches the mat, we need to look more toward the ceiling and push more with our toes.

To complete a backward roll we will do the following: review video directions.

Math Talk: During our math talk time we will discuss the attributes of a circle. We will look back at our anchor chart and determine what looks like a circle and how we can make our bodies move like a circle. Through our discussion we will identify the ways our bodies will change from making a flat circle on the floor to making our circle that moves.

During Investigations time we will use the floor mats and practice our forward and backward rolls with our partners. We will ensure that all safety rules have been introduced and that the students understand the reasons why we must be careful as we use our own bodies and as we work with others.

Lesson 7: What Is a 3-D Shape?

Phase: Explicitation

Brain Puzzle: Puzzle Mania!

Gymnastics: Continue working with gymnastic locomotor movement for forward and backward rolls during investigations time.

In lesson 7 I will introduce 3-D shapes by sitting the students in a circle and placing an oversized faces for a cube in the middle of the circle. The faces of the cube will be blank. The teacher will take one of the faces of the cube and ask a student to place a large colored dot on the side that is face-up. We will continue this process until all the faces have a colored dot. After our math talk per the students instructions. When all the sides are taped we will begin a new anchor chart for 3-D shapes. We will use duck tape to secure the sides together. We will give the new shape a name- cube. Throughout the week we will continue to create new 3-D shapes (rectangular prism, cone, pyramid, cylinder, sphere) and add them to the new anchor chart for 3-D shapes. The 3-D anchor chart will record name of the shape, type of lines used, faces, vertices, and what it looks like. (See the Appendix for directions for creating 3-D shapes) As a follow up to this lesson we will create a 3-D Object Gallery. Students will find objects at home and bring them to school for the display. We will also take another tour of the school to find 3-D objects to photograph for our class book.

Math Talk: As the lesson is unfolding, the class will engage in math talk. We will discuss the names of the shapes we are using for our dots. The name is square. The class will discuss that each of these squares is flat. Each has a front and a back but there is no space in between the front and the back. I will ask students to think about a way that we can connect the flat shapes together to make a new shape that has some space between the front and the back. The students will offer suggestions for ways this could be done. One way would be to put the faces together on their sides and tape them. When all the sides

are put together, I will ask the class what it looks like and to identify the front and the back and to determine whether there is space between the front and the back.

During Investigation Time the teacher will play a game with the students that will allow them to manipulate 3-D shapes for fun. The teacher will place the students in a pre-determined number of lines with equal numbers of students in each line. A beach ball will be placed at the feet of the first student in the line. The students will be instructed to move the ball down the line by specific directions (pass the ball over head to the next person, turn and toss the ball to the next person, the first person will toss the ball through the arms of the second person whose arms are extended upward to form vertical or diagonal lines). The students will use hoops to pass the hoop down the line by stepping through the hoop or passing it overhead.

Lesson 8: Imagining 3-D Shapes

Phase: Integration

Brain Puzzle: none

The students will watch the movie Flatland. It is based on a book by Edwin Abbott named "Flatland". This is an animated computer generated movie about geometric shapes living in a two-dimensional world. A young girl named "Hex" begins to think outside the box which is forbidden. Her life becomes endangered and it is up to her grandfather to save her. As Hex discovers a third dimension, a new world opens up to her.

By watching this 45 minute DVD, my students will begin to make connections about their own knowledge of shapes and explore the concept of a dimension. The class will integrate their knowledge of shapes into a broader realm of 3-dimensions. Width becomes the new concept.

Lesson 9: Constructing 3-D Shapes

Phase: Free Orientation

Brain Puzzle: Look Again

Gymnastics: continue working with gymnastic locomotor movement using equipment

In lesson 9 we will use various types of blocks to build 3-D constructions. We will use snap cubes to make larger cubes that show depth. We will work with wooden blocks to make building, road, and communities. We will use K'Nex to make larger 3-D constructions. The constructing phase will promote the development of logical thinking

skills as the students work with understanding how 2-D shapes come together to make 3-D shapes.

Lesson 10: Gymnastic Shapes

Phase: Direct Orientation

Brain Puzzle: Geo-Gym

Gymnastics: continue working with gymnastic locomotor movement using equipment.

We will go the gym to work with the gymnastic equipment. With the help of the P.E. teacher, the students will review locomotor and non-locomotor movement. They will bend, stretch, extend, balance, move forward, backward, and sideways on high, medium and low levels in straight, curved, and zigzag paths. The students will be taught the names of the equipment and how to use each one safely. They will be introduced to the climbing rope, parallel bars, vault box, floor routine mats, spring board, and the balance beam.

Math Talk: In the classroom I will show the students pictures of each piece of gymnastic equipment. We will discuss the shapes that we see within the equipment.

During Investigation Time the students will use the geoblocks, wooden building blocks, wooden and colored cubes, and other 3-D blocks to make creative constructions.

Lesson 11: Introducing the Tumbling Gymnastics

Phase: Integration

Brain Puzzle: none

Gymnastics: Create gymnastics routine using body movements and gymnastics equipment

After the students have practiced for several weeks using the equipment, they will begin to work on a performance routine on one of their favorite pieces of equipment. They will incorporate the skills they have learned about locomotor and nonlocomotor movement. They will use the geometric name of the shape in the title of their routine (ex- balance beam- Rectangular Prism Balancers). We will use background music to enhance each routine. We will invite the other kindergarten classes to watch our performance.

Bibliography for Teachers

[Coussement, Frank, Peter De schepper, Keith Kay, Des MacHale, Paul Sloane, and Norman Willis. *Brain Strains Power Puzzles* . New York, NY: : Sterling Publishing Company, 2002.](#)This book is full of brain puzzles for all ages.

[*Investigations and the Common Core State Standards*. Cambridge, MA: TERC, 2008](#) this document provides the common core standards for math and how it correlates with [Investigations Math](#).

[*Investigations in Number, Data, and Space. Make a Shape, Build a Block:2-D and 3-D Geometry* . Cambridge, MA:](#) This K-5 math curriculum has been updated to include the Common Core State Standards. It provides lessons that approach learning in an investigative format and supported by games and hands-on activities for all learners.

[*Progressions for the CCSS in Mathematics: Geometry, The Common Core Standards Writing Team, Tucson, AZ: University of Arizona, 0.*](#) This documents gives an in depth look at the common core standards for geometry. It provides examples of ways to use the standards effectively.

[Stewart, Ian . *Flatland: The Movie- A Journey of Many Dimensions*.. New Orleans, LA: . Notices of the AMS, 2007](#) The article gives a good overview of the movie. It gives some background information about the original work that inspired the creation of the movie. .

Reading List for Students

The Shape of Me and Other Stuff by Dr. Seuss. This book shows how everything has a shape.

Shapes, Shapes, Shapes by Tana Hoban. This book uses photographs to identify shapes within everyday objects.

When a Line Bends, A Shape Begins by Rhonda Gowler Greene. This book uses a line to illustrate how a shape begins.

Mouse Shapes by Ellen Stoll Walsh. This book illustrates how we can create things by putting different shapes together.

A Circle Here, A Square There by David Diehl. This book shows the many different things a shape can become (square- gift box).

The Wing on a Flea: A Book about Shapes by Ed Emberley. This book identifies the names of the shapes and what they look like individually and as part of a group.

The First Day of Gymnastics by Anita Ganeri. This book tells students about the beginning lessons in gymnastics

Paul and Morgan Hamm: Olympic Heroes by Amanda Bader. This book shares the life of male gymnasts.

List of Materials for the Classroom

Brain Puzzles

Follow the Line

Can You Find the Shape?

Gymnastics

Ribbons, Balls, Hoops

Other Materials

Shape People and Poems

Yarn

Pipe Cleaners, Wiki Sticks, Toothpicks

Card Stock (paper strips)

Geoboards/Geobands

Laminated Shape Cards (5x5)

Math Journals (composition books or teacher created)

2-D, 3-D large and oversized plastic shapes

Picture Cards of Objects (multiple sets)

Pattern Blocks/Pattern Block Cards

Geoblocks, Wooden Building Blocks. Wooden Cubes, Colored Cubes

Digital Camera

Blank Paper

Shape Templates for Student Created Books

Magazines

Gymnastics for Kids Video

Flatland (video)

K'nex

Crayons, Markers

3-D objects (representing shapes)

Gymnastics

Gymnastics Equipment (mats, ropes, balance beam, parallel bars, vault box, spring board)

Games

I Think This Is a Circle

Hokey Pokey

Appendix 1

Implementing Common Core State Standards

The Common core State Standards ask students to describe the physical world in which they live using geometric concepts and vocabulary. These standards invite students to connect with the world in terms of shape, orientation, and spatial relations. The names of 2-D shapes are introduced as well 3-D shapes. Throughout the year, the vocabulary for the names of the shapes will move from everyday language of a box, ball, to more formal language using terms like cube and sphere.

This information will be used to understand how shapes are alike and different, and to describe them in terms of their orientation and position. As the students work with the concept of orientation they will understand that regardless of the size of a shapes or how a shape is turned, it is still the same shape. The location of the shapes will also be explored (beside, under, over, on).

Kindergarten students need many experiences manipulating the physical shapes and using them to construct other shapes as well as using them to build other things. Ample time must be given to provide those experiences that allow students to identify, locate, and connect the concept of shape to the world in which they live. Students must explore their own bodies and discover how they can become lines and shapes. These geometric explorations lead them to develop a command of their bodies through purposeful movement. Gymnastic skills and concepts will allow students to explore and make this connection between geometry and gymnastics.

Identify and Describe Shapes

- CCSS.K.G.A.1 Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*. CCSS.K.G.A.2 Correctly name shapes regardless of their orientations or overall size. CCSS.K.G.A.3 Identify shapes as two-dimensional or three-dimensional. Identify and describe shapes.

Analyze, compare, create, and compose shapes.

- CCSS.K.G.B.4 Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts and other attributes. CCSS.K.G.B.5 Model shapes in the world by building shapes from components and drawing shapes.
- CCSS.Math.Content.K.G.B.6 Compose simple shapes to form larger shapes
- P.E. K.18- Demonstrates a variety of locomotor and combination skills in a movement pattern

Endnotes

ⁱ Richardson, K.(2010). Number Talks: Grades K-5: Helping children build mental math and computation strategies. Sausalito, CA: Math Solutions

ⁱⁱⁱ Coleman, D. (2011). Bringing the common core to life: Introduction to the common core state standards. Albany,NY: Student Achievement Partners.

^{iv} Hannaford, C. (2005). Smart moves: Why learning is not all in your head. Arlington, VA: Great Oceans Publishers.

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^{vii} Hannaford, C. (2005). Smart moves: Why learning is not all in your head. Arlington, VA: Great Oceans Publishers.

^{viii} Van Heile, P. (1999). Developing geometric thinking through activities that begin with play. Teaching Children Mathematics.310-316.