

**Academic Standard for Mathematics**

- 6.5.4 Understand the concept of the constant  $\pi$  as the ratio of the circumference to the diameter of a circle. Develop and use the formulas for the circumference and area of a circle.
- 6.5.5 Know common estimates of  $\pi$  (3.14, 22/7) and use these values to estimate and calculate the circumference and the area of circles.
- 6.5.7 Construct a cube and rectangular box from two-dimensional patterns and use these patterns to compute the surface area of these objects.
- 6.5.8 Use strategies to find the surface area and volume of right prisms and cylinders using appropriate units.

**Lesson Objective**

Students will know the basic shape categories and the complex shapes that belong in those categories.

Students will be able to analyze the equations associated with specific shape categories.

Students will be able to calculate area, surface area, volume, circumference, or perimeter of given shapes.

**Standards for Mathematical Practices**

- ☐ Make sense of problems and persevere in solving them.
- ☐ Reason abstractly and quantitatively.
- ☐ Construct viable arguments and critique the reasoning of others.
- ☐ Model with mathematics.
- ☒ Use appropriate tools strategically.
- ☐ Attend to precision.
- ☐ Look for and make use of structure.
- ☒ Look for and express regularity in repeated reasoning.

**Common Core Literacy Standards:**

Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as  $3x = y$ ) to describe relationships between quantities.

**Supporting Diverse Learners**

I have four ESL students in my classroom that I will have to give extra support to. All of the students are native speakers of Mexican Spanish. All of the students are in different stages of language acquisition. Sunlight is in the

**Type of Mathematical Knowledge Objective is seeking to measure**

- ☒ Declarative
- ☒ Procedural
- ☒ Conceptual

**Mathematic Conceptual Categories**

- ☐ Number and Quantity
- ☐ Algebra
- ☒ Functions
- ☐ Modeling
- ☐ Geometry
- ☒ Statistics and Probability

early production stage, Juan is in the speech emergence stage, Roberto is in the intermediate fluency stage, and Sam is in the advanced fluency stage (Hill and Flynn-Chapter 2, 2006).

Sunlight is a very happy student who always has a smile on his face. Unfortunately his language acquisition is not nearly as high as his happy personality. He speaks a little, but not much and he can only produce some written language. He usually does not get overly frustrated when he does not know a word. He just asks for the translation, usually from an aid or another student, and moves on. Sunlight is a student who really wants to learn. My hope is that with Sunlight being able to manipulate the shapes in today's lesson, he will be able to understand the concepts of area, surface area, and volume without understanding every word in the definition in his textbook.

Juan's English vocabulary is growing daily and he has become a more avid speaker in class. He is also able to express himself in writing. Though he still makes many grammatical errors, it is still understandable. I hope that Juan can help Sunlight be more productive in his speech. I hope that this presentation will help Juan to start creating his academic language, spoken and written. He does not use much academic language, but now that he has started to become an active speaker in class I want to help him develop academic language and math language skills.

Roberto is a good student who gives his very best effort in everything he does. This is a big strength that he will be bringing to the group project/presentation. His language skills are very good. He can write answers to word problems with academic math language. I hope to see Roberto working with Sunlight to help him develop his vocabulary enough to become a more confident speaker and with Juan and Sunlight to become better writers.

Sam has been living in the area for most of his life and he sounds and writes like a native speaker. His vocabulary is impressive for an ESL student. It is my hope that Sam can be a leader to the ESL group for the group project/presentation. But I also do not want Sam to completely take over and not include the other students. I think with a little reminding, some observation, and clear instructions Sam will not take over the project.

#### **Language Objectives:**

The students will create a working understanding of the key vocabulary terms that will be defined in the lesson.

#### **Rationale for Method(s): Why are you approaching the lesson this way?**

I am using small groups in order to give the students choice, opportunity to move around, to socialize, and to work collaboratively with their peers. The small groups also allow me to group my ESL students together to help with the language barrier and the student's reluctance to participate. By grouping the ESL students together it also allows for the possibility of them working in both languages, native and second (Levine and McCloskey-Chapter 9, 2009).

I am using a hands-on activity/project/presentation so that the students will be able to learn about the material and then manipulate it. It can be difficult for students to visualize why the equations for area, surface area, and volume of shape are what they are. If the students are able to rearrange the shapes to make them into a shape they are more knowledgeable about, then the equations come more easily to them. The presentation gives them the chance to be an expert on something.

I am having the students use technology instead of creating a poster board, or something of that nature, because there are several different applications/websites that create shapes in 2-D and 3-D. This can help the student visualize these somewhat strange shapes. The use of technology for the presentation also takes the language pressure off the ESL students. This way they can type what they are thinking and even use online translators for phrases that they are unsure of. It is also an easy way to make the words of their project come to life in a visual way for all students, not just ESL (Rance-Rooney, 2010).

<b>Method(s) for Instruction</b> <input checked="" type="checkbox"/> Class/Group Discussion <input type="checkbox"/> Cooperative Learning <input checked="" type="checkbox"/> Small Group <input type="checkbox"/> Guided Practice <input type="checkbox"/> Lecture or Direct Instruction <input type="checkbox"/> Question/Answer <input type="checkbox"/> Learning Stations		<input checked="" type="checkbox"/> Teacher Modeling/Demo. <input checked="" type="checkbox"/> Journal writing <input type="checkbox"/> Role Play <input checked="" type="checkbox"/> Hands-on <input checked="" type="checkbox"/> Inquiry Learning <input type="checkbox"/> Game <input type="checkbox"/> Simulation/Role Playing <input type="checkbox"/> Independent Learning <input type="checkbox"/> Other		<b>Use of Technology</b> <input type="checkbox"/> Cell Phone <input type="checkbox"/> PollEverywhere.com <input type="checkbox"/> CPS Clickers <input type="checkbox"/> Elmo Document Camera <input type="checkbox"/> Software <input checked="" type="checkbox"/> Student Computers <input type="checkbox"/> Teacher Computer w/LCD <input type="checkbox"/> Video Clips/DVD <input checked="" type="checkbox"/> Website <input checked="" type="checkbox"/> Web 2.0 tool <input checked="" type="checkbox"/> Other: tablets	
<b>Study Skills</b> <input type="checkbox"/> Two column notes <input type="checkbox"/> Guided note taking <input type="checkbox"/> Opinion-proof chart <input type="checkbox"/> Problem-solution chart <input type="checkbox"/> Venn diagram <input type="checkbox"/> Cause and effect frames <input type="checkbox"/> MVP Most Valuable Point <input type="checkbox"/> Creating metaphors  <input checked="" type="checkbox"/> Other: Graphic Organizer	<b>Reading Strategy</b> <input type="checkbox"/> EQW Experience/Questions/still wondering <input type="checkbox"/> KWL (word problem chart) <input type="checkbox"/> Five-Step Problem solving <input type="checkbox"/> Reciprocal teaching <input type="checkbox"/> Graphic Organizer <input type="checkbox"/> Anticipation/Prediction guides <input type="checkbox"/> Word Problem Roulette <input type="checkbox"/> Problematic Situation <input type="checkbox"/> Read-talk-write <input type="checkbox"/> Directed reading thinking activity <input type="checkbox"/> Other: shape families	<b>Writing Strategy</b> <input type="checkbox"/> Learning Logs <input type="checkbox"/> Question/Answer Relationship <input type="checkbox"/> Question the Author <input type="checkbox"/> RAFT <input type="checkbox"/> Writing to Learn <input type="checkbox"/> Social-academic language translations <input checked="" type="checkbox"/> Graphic organizers <input type="checkbox"/> Outlining  <input checked="" type="checkbox"/> Other: Journals	<b>Vocabulary Strategy</b> <input checked="" type="checkbox"/> Frayer model <input type="checkbox"/> List-group-label <input type="checkbox"/> Semantic feature analysis <input type="checkbox"/> Word Sorts <input type="checkbox"/> Number Cubes <input type="checkbox"/> Cue Cards <input type="checkbox"/> Vocabulary self-awareness activity <input type="checkbox"/> Creating metaphors <input type="checkbox"/> Concept Definition Maps  <input type="checkbox"/> Other		

**Strategies Rationale: Why are you selecting these support strategies? What will these help you and your students accomplish?**

I selected graphic organizers as one of my main support strategies because it will help students visualize the shape we are discussing in class. It will also help them with the organization of the shapes into their respective shape families. I chose a Frayer Model for my vocabulary strategy because of its design. It makes the students think about the vocabulary and learn it, not just memorize it (Hill and Flynn-Chapter 5, 2006).

**Agenda**

**Anticipatory Set: How will you support students in accessing prior knowledge, personal, real world, and/or cultural connections?**

Environment: At the front of the class there will be multiple objects: a basketball, a piece of paper, a tissue box, a triangular ruler, alphabet blocks, a pyramid shaped paper weight, a cylindrical candle holder, a triangular prism, a rectangular box, and a baseball. On the board in the front of class will be written circle, square, rectangle, and triangle (Hill and Flynn- Chapter 5, 2006).

The students will start the class off with a warm up. The students will open their notebooks and free write what they know about the different shape families: Circles, Squares, Rectangles, and Triangles. (3 minutes)

After free writing about their knowledge of the shape families they will go to the front of the class to observe the objects. They will try to classify each object into the shape family that they believe the shape belongs to. (4 minutes)

When time is up the students will return to their seats so that a class discussion about their classifications can start.

**During: What support strategies will you use to scaffold students learning so they meet or exceed targeted**

## **objective?**

I will ask the students to pair up with their shoulder partner and share what family they sorted each object into. Then I will ask students to raise their hands to share with the class which objects the pair disagreed on. I expect that most students will know how to sort the easier objects: triangular ruler, alphabet blocks, rectangular box, tissue box, basketball, piece of paper, and baseball. I also expect that there will be some who are unsure of what to classify the harder objects: the pyramid, the candle holder, and the triangular prism. (5-7 minutes)

After the classification for all of the objects is discussed, I will pass out a two page packet and the students will turn in their notebooks. The packet is multiple Frayer Model graphic organizers (Hill and Flynn, ) for their shape families. Using the packet I am going to teach the key vocabulary words for lesson. The key vocabulary words are: **sphere, cylinder, cube, rectangular prism, pyramid, triangular prism, area, surface area, volume, circumference**, and, **perimeter**. I will use the smart board to fill out the definition section of each graphic organizer in packet with the students. After we go over the definitions of each key vocabulary term I will put the students into pre-assigned heterogeneous by ability groups of 3 students (Levine and McCloskey, 2009). I will group Sunlight, Juan, Roberto, and Sam together. In the groups they will finish filling out the Frayer Model graphic organizers for each other families. (20 minutes)

Next I will hand out laminated flash cards with the shape families on them to each group. They will match up the picture of the shape to its name and shape family. (3-5 minutes)

Then I will collect the flashcards and as I do that I will ask each group to nominate a representative. After I have collected the flashcards I will ask for the representatives to come to my desk. Each representative will draw a piece of paper out of a hat. On the paper will be the name of a shape family. The name they drew will be the family that that group has to become experts on. I will then tell the students that they have to decide what role each person will play in the project. I will then describe for them that there are three roles: Researcher, Scribe/Creator, and Leader/Facilitator. I will also explain that the representative does not have to be the same person who drew the piece of paper out of a hat. Next I will describe the responsibilities of each role. The Researcher will be responsible for gathering the information about their shape family from different resources. The Scribe/Creator will physical create the project on the computer or tablet. They will also need to do any writing that they group is responsible for. Lastly, the Leader/Facilitator will help keep the group on task, manage time, and be the main speaker of the group. After the groups have chosen roles I will finish my explanation of the project. They will have to create a presentation that will teach their peers about the shape family they have been assigned, and solve a problem for each equation associated with that shape family. (6-8 minutes)

To create the presentations student will be able to use computers and or tablets. Each group will be given 2-4 tablets depending on the technology they want to utilize. The groups will use their chosen technology to create a glog, infographic, fluidchart, PowerPoint, or other forms visual media (as long as I approve it) that they believe will be an media for their presentation.

I will walk around the classroom listening to each group. At different point through the rest of the class period I will check in with each group to see who is fulfilling each role and what visual media they will use to create their presentation. I will take a little extra time talking with Sunlight, Juan, Roberto, and Sam because I want to make sure that everyone understands what the main goal is and responsibilities for their role in the project is. (50 minutes)

## **Wrap up/Closing: How will you engage students in self-assessment and/or reflection on key concepts taught?**

As the class comes to an end the students will save their presentations (if using the computer) or email them to me (if using a tablet). They will log off the computers, turn off the tablets, and return them to my desk. Then each group is going discuss the progress they made on their presentation and what they need

to do in order to have a productive next class so they can finish their presentation. The scribe fore each group will fill out a provided exit slip. The students will place the exit slips in the class tray as they leave the classroom.(3-8 minutes)

**Daily Assessment** How do you know your students met your lesson objective(s)?

- ☒ knowledge
- ☐ comprehension
- ☒ application
- ☒ analysis
- ☐ synthesis
- ☐ evaluation

**Formative:**

- ☐ Class discussion
- ☐ CPS clickers
- ☐ Email teacher
- ☒ Entrance/Exit slip
- ☒ Teacher Observe
- ☐ Thumbs up, neutral, or down
- ☐ Homework check
- ☒ Listened to conversations
- ☐ Math Journal
- ☐ Quiz
- ☐ Video quiz
- ☐ Voting
- ☐ Whiteboard Check
- ☐ Other

**Summative:**

- ☐ Test
- ☐ Project
- ☐ Report
- ☐ Presentation
- ☐ Final Exam
- ☒ Other: Check in

**Use of Materials**

- ☐ Teacher's Manual pg #
- ☒ Student Text pg #
- ☐ Picture Books
- ☒ Handouts: Graphic Organizer for Shape families, Warm Up, Exit Slip,
- ☒ Manipulative: Physical representations of the shapes being discussed: basketball, etc. Flashcards
- ☒ Related Equipment: tablets
- ☐ Adapted materials:

**Additional Reference/Sources of Information:**

Hill, Jane D. and Flynn, Kathleen M. (2006). *Classroom Instruction That Works with English Language Learners*. Unknown: Association for Supervision and Curriculum Development.

Levine, Linda New and McCloskey, Mary Lou. (2009). *Teaching Learners of English in Mainstream Classrooms (K-8): One Class, Many Paths*. Boston: Pearson, Allyn, and Bacon.

Rance-Rooney, Judith. (2010). *Jump-Starting Language and Schema English-Language Learners: Teacher-Composed Digital Jumpstarts for Academic Reading*. *Journal of Adolescent and Adult Literacy*, Vol. 53, No. 5, 386-395.