**Lesson Title:** Which is more ice cream?

**Unit Title:** Geometry

**Teacher Candidate:** David Flores, Jackie Johnson, Jay Dumas, Larissa Parker, Daniel Rios

**Subject, Grade Level, and Date:** Pre-Algebra, 8th grade, January 29th 2016

**Placement of Lesson in Sequence**

The placement of this lesson is in a Pre-algebra class as a part of a Geometry unit. This lesson is the last of a three segment unit, where students previously learned the conceptual and procedural knowledge of volume of 3D figures. This lesson will focus on the application aspects of modeling volume using real world examples.

**Central Focus and Essential Questions**

This lesson is in the geometry math content area. The central focus of the lesson is the application problem of solving for volume. The learning target is to know the volume of a sphere and be able to use it in a real world math problem. During this lesson students will be using GeoGebra in there group work to complete this lesson. After the lesson, student will be assessed using Kahoot to check for understanding of the concept.

Which is more ice cream? A small waffle cone with two scoops of ice cream or a big waffle cone with one scoop of ice cream? The waffle cone options are the mini flat top sugar cone with a 3cm diameter and the large flat top sugar cone with a 6cm diameter. The scoop of the ice cream will have the same diameter as the waffle cones respectively.

**Content Standards**

**[CCSS.MATH.CONTENT.8.G.C.9](http://www.corestandards.org/Math/Content/8/G/C/9/)** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

[**CCSS.MATH.PRACTICE.MP1**](http://www.corestandards.org/Math/Practice/MP1/) Make sense of problems and persevere in solving them.

[**CCSS.MATH.PRACTICE.MP3**](http://www.corestandards.org/Math/Practice/MP3/) Construct viable arguments and critique the reasoning of others.

[**CCSS.MATH.PRACTICE.MP4**](http://www.corestandards.org/Math/Practice/MP4/) Model with mathematics.

[**CCSS.MATH.PRACTICE.MP6**](http://www.corestandards.org/Math/Practice/MP6/) Attend to precision.

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| **Learning Outcomes** | **Formative Assessment Process** |
| * Students will hypothesize which option holds the more ice cream.
* Students will identify and explain geometric objects needed to model the ice cream problem using GeoGebra.
* Students will use data from the GeoGebra model of the ice cream problem to give and justify a solution to the ice cream problem.
* Students will use their knowledge of the formula for the volume of a sphere to generalize a comparison between changing the diameter.
 | * Kahoot
* Monitoring
* Activity sheet
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| **Success Criteria** (method and criteria for interpreting student success in relation to learning target) | **Plan for Providing Feedback to Students** |
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| **Learning Targets** | **Student Voice** |
| * I will hypothesize which option holds the most ice cream
* I will identify and explain geometric objects needed to model the ice cream problem using GeoGebra.
* I will use the data from the GeoGebra model to give and justify a solution to the ice cream problem.
* I will use the formula of the volume of a sphere to compare between changing the diameter.
 | The teacher will use the worksheet to communicate the learning target by asking the students to explain how they will use the worksheet to assist them to solve the ice cream problem through the modeling process. In addition, students will answer questions using Kahoot to self-assess their understanding of the formula of a sphere. |

**Prior Content Knowledge and Pre-Assessment**

Students have developed an understanding of what volume is and how to derive the formula and use it correctly.

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| **Academic Language Demands** |
| **Language Function** | **Vocabulary & Symbols** | **Secondary Language Demand** |
| * Student will be able to discuss how the volume of a sphere connects to the volume, and radius variables to create a volume model of an ice cream cone
 | * Volume
* Diameter
* Radius
 | **Mathematical Precision:****Syntax:** * Identify the variables in the volume of a sphere equation.
* Identify the variable in the volume of a sphere in GeoGebra model for the volume of a sphere.

**Discourse:**Discuss how to create a GeoGebra model for the volume of a sphere and an equation for the volume of an ice cream cone. |

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| **Language Target** | **Language Support**  | **Assessment of Language Target** |
| I will be able to identify variables in the ice cream cone problem related to finding the volume of a sphere. | Students will be given a journal to keep all pre-existing vocabulary and new vocabulary which they can use during this activity. | Student will be observationally assessed during group discussions specifically focusing on student’s participation and language used during activity. |

**Lesson Rationale (Connection to previous instruction and Objective Standards)**

This lesson is the next stop for the students in creating a math model to solve a problem. Using the known equations for the volume of a sphere, students can use their previous knowledge and skills to practice more complex math modeling problems. GeoGebra will be introduced as a whole class activity to guide the students on how to use computer programs to model mathematical situations. Kahoot, an online gaming assessment, will also be used to check for understanding.

**Differentiation, Cultural Responsiveness and/or Accommodation for Individual Differences**

Students who struggle will be supported by their peers from working in groups. GeoGebra will also help the students conceptualize the equations related to the volume of a sphere by creating models of spheres in GeoGebra and using them to double check their answers. As a formative assessment, after the lesson student will participate in a Kahoot activity. This is an online activity that will be beneficial to all students in that it is a low stress assessment that utilizes technology that can benefit students with disabilities.

**Materials – Instructional and Technological Needs (attach worksheets used)**

Classroom computer projected for the class discussion, the “Which is more ice cream?” worksheet, and devices (smart phone or tablet) for students to participate in Kahoot assessment activity.

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| **Teaching & Instructional Activities** |
| **Time** | **Teacher Activity** | **Student Activity** | **Purpose** |
| 5 mins. | Teacher hands out worksheet for students to read over while the teacher takes attendance. | Students will read the worksheet and be ready to discuss the expectations of the worksheet. At this time students can get out their journals to have them as a resource to help with any language confusion. | To clarify the learning target. |
| 10 mins. | Break the students into groups of four. Teacher will refresh the students on how to find the volume of a sphere and identify the variables. Ask students to make a prediction to the solutions and complete the worksheet and be ready to share their hypothesis. | Students will discuss the problem in their groups and make a prediction of the solution and write this on their worksheet. A student from each group will explain to the rest of the class what their group came up with. | For students to work in groups and to use the vocabulary to understand the problem so they solve it. |
| 15 mins. | Teacher will introduce the class to GeoGebra and show to create a geometric model for the ice cream cone. Teacher will call on a group to ask what is needed to be known about the ice cream cone problem. Then the teacher will ask students from another group how with information can be used to create the model on GeoGebra. At this time the teacher will also be note taking and observing students as the assessment for academic language. During the discussion the teacher will create the model. | Students will share information from their group discussion. Students will give information to help create the model for the ice cream cone. Students will draw the picture from the GeoGebra model on their worksheet | To have students respond from each group to guide in making a model of the ice cream cone in GeoGebra. Teacher will use student’s responses to give feedback on proper language use on the volume of a sphere. |
| 5 mins. | Teacher will ask the students how to use the model from GeoGebra to get the information needed to solve the ice cream cone problem. | Students will explain how to use the GeoGebra model to get the information needed to solve the ice cream problem. | For students to use their knowledge of the volume of a sphere and the GeoGebra model to solve the ice cream cone problem. |
| 10 mins. | The teacher will discuss the information the students have provided and then ask the students to write a solution to the ice cream cone problem and justify how their solution is related to the volume of the two different size cones. The teacher will walk around the classroom to help any students that are struggling to complete the worksheet. | Student will write a solution to the ice cream cone problem and justify their answer with an explanation on how it is related to the volume of the two different size cones. | For students to write their solutions and justify their answers with a generalized explanation. |

**Which is more ice cream?**



At an Ice Cream Parlor you want a waffle cone and there are two options: a mini flat top sugar cone that has a diameter of 3cm with two scoops of ice cream, or a large flat top sugar cone that has a diameter of 6cm with one scoop of ice cream. The scoops of the ice cream will have the same diameter as the waffle cone you choose. You want the most ice cream you can possible get on one cone, so which option should you choose?

Prediction: 3cm cone with two scoops 6cm cone with one scoop

**Understanding the problem:**

What knowledge is needed for this problem?

**Describe the GeoGebra model for this problem:**

Draw a picture of the GeoGebra model.

What are the variable for each option?

**Data:**

Record that total area of the two scoops of ice cream with a 3cm diameter. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Record the total area of the one scoop of ice cream with a 6cm diameter. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Conclusion:**

Which waffle cone holds more ice cream? Why?

**Activity Rubric:** 4 points possible

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| **Activity Criteria** | 0 points | 1 point | 2 points |
| Complete understanding, Describing GeoGebra Model, and Data Section | Completed one or no sections of the worksheet. | Completed two sections of the worksheet. | Completed all sections of the worksheet. |
| Conclusion | Not Correct answer. | Correct answer but vague or incorrect reasoning, or missing | Correct answer and reasoning. |