**Lesson Title: Units of Measure and Precision**

**Unit Title: Quantities**

**Teacher Candidate: Justin Martin**

**Subject, Grade Level, and Date: Mathematics, 11th grade Algebra 2.**

**Placement of Lesson in Sequence**

This lesson would take place in an Algebra 2 class after covering material over rational numbers, irrational numbers, and properties of rational exponents. Students will have also had covered material on probability and statistics. This lesson focuses on units of measure and deciding which types of units are most effective in specific situations.

**Central Focus and Essential Questions**

The central focus of this lesson is for students to analyze possible error in measurement when using specific units on specific sizes of objects. The main idea is that students understand the precision of various units of measure. The lesson will consist of a small amount of class instruction and examples covering possible error based on units of measure, and a modeling activity where students physically measure objects with varying units of measure.

**Content Standards**

The Common Core State Standard for Mathematics for this lesson is:

N-Q.3

“Choose a level of accuracy appropriate to limitation on measurement when reporting quantities”

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| **Learning Outcomes** | **Assessment** |
| After this activity and bookwork students will be able to calculate possible error based on units of measure. Students will be able to compare possible error relative to size of objects in specific units. Also, students will be able to determine effective units of measure for varying sizes of object based on this comparison.  | Students will be assessed using participation in the activity, and the worksheet for the modeling activity. Students will be put in small groups of 2-3 students, and will individually complete a worksheet. I will formatively assess students throughout the activity by walking around the classroom, and ensuring students are making progress. Lastly, I will grade the worksheets based on mathematical accuracy. The rubric used to grade the worksheets is attached below. |

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| **Learning Targets** | **Student Voice** |
| I can calculate the possible error of units of measure.I can compare possible error relative to size using specific units, and choose efficient units when measuring. | Students will have an opportunity to express their understanding or lack thereof while I explain how to calculate possible error. I will give a very short instructional session to express this concept. I will show the students a few examples, and I will have them complete a few on mini whiteboards afterwards. Based on student’s accuracy on the examples, I will decide if they are ready to move on to the activity. Also, I will show the students how to measure specific units on the yardstick. |

**Prior Content Knowledge and Pre-Assessment**

This lesson requires little prior content knowledge other than a basic ability to count and perform arithmetic. However, it would be beneficial if students were aware of basic units of measure.

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| **Academic Language Demands** |
| **Vocabulary & Symbols** | **Language Functions** | **Precision, Syntax & Discourse** |
| * Possible measurement error
* Unit
* Measurement
* Centimeters (cm)
* Inches (in)
* Feet (ft)
* Yards (yds)
 | * Students will be taught the terms measurement, units, and possible measurement error when I give the small instructional session involving examples.
* Also, I will give a quick tutorial over the specific units and show the students where they are on the yardstick.
* In order to successfully complete the activity, students will need to know what possible measurement error is in order to answer the questions on the worksheet. Also, students will need to be able to identify the correct units of measure such as inches and feet when completing the activity and worksheet.
 | **Mathematical Precision:**  In this lesson specifically, students will have to be precise in measurement of specific units. This includes physically counting the correct number of units, and learning how to decide which type of units to used based on sizes of objects. **Syntax:** **Discourse:**  |

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| --- | --- | --- |
| **Language Target** | **Language Support**  | **Assessment of Language Target** |
| I understand what possible measurement error, and units such as centimeters, inches, feed and yards are and can use them in real life. | I will support the understanding of possible measurement error, and the varying units during the short instructional example section. The concepts are relatively straight forward, and the students should be able to understanding quickly. Also, I will have a visual aid of a yardstick to show students how to measure specific units. If necessary, I will draw a enlarged version of a yardstick on the whiteboard to illustrate specific units.  | In order to assess whether or not students understand possible measurement error, I will have each student respond to examples using mini whiteboards. This will tell me whether or not they understand that language function. Also, to assess whether or not the students understand specific units, I will walk around the classroom while they complete the activity. I will check to make sure they are using the appropriate units at the appropriate time. Also, I will check answer they have completed at various times to make sure they are in a relative ballpark. Lastly, students will be assessed using the attached rubric. |

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

As mentioned above, this lesson takes place after students complete material over rational exponents. Based on the common core state standards for mathematics, material on measurement and precision is required thereafter. Hence, this lesson teaches students how to create precision in measurement using a modeling activity. Based on previous material covered, students will be able to manipulate numbers easily, and his lesson connects that ability to measurement and precision.

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

This lesson accommodates for individual differences because it is a hands-on activity. Students will have visual modeling to help them understand the concept. Also, students are working in small groups to incorporate peer learning. Lastly, the small instructional session involves formative assessment in the form of mini whiteboards so I can ensure every individual is on the right page.

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

For this activity, I need mini whiteboards, markers and worksheets for every student in class. I need yardsticks for every 2-3 students.

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| **Teaching & Instructional Activities** |
| **Time** | **Teacher Activity** | **Student Activity** | **Purpose** |
| 15 minutes | I will explain the concept of possible measurement error directly after expressing the learning targets for the day. I will have students do a few examples on the mini whiteboards to ensure understanding. I will then give an explanation of units of measure while showing the students on a yardstick. | Students will take notes during the short activity, and they will respond on their whiteboards to the examples I have them complete on possible measurement error. Depending on students performance, they may have to complete more examples. Also, students will follow along on their yardsticks while I explain different units of measure.  | This activity makes students familiar with different units of measure, and the concept of possible measurement error. It helps them be prepared for the modeling activity coming directly afterwards.  |
| 45 minutes.  | After completing the above instruction session, I will group students and administer the worksheet (attached). I will then briefly explain the process and have students begin work. The students will be required to measure their pencils, desks, and the wall using centimeter, inches, feet and yards. To increase efficiency I will have groups stagger where they begin measuring.  | Students will group up and complete the activity over measuring the objects. Then, they will complete the follow up questions based on the measurements and error comparisons.  | This activity will ideally show students how different units are more effective for measuring different sized objects. The activity will have students compare possible error using specific units and justify the use of particular units of measure in particular situations.  |
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**Name:**

**Fun With Measuring Precision**

**Directions:** I will assign you to a group of 2-3. Each group will have a yardstick. Measure the length of the following objects in the classroom in centimeters, inches, feet and yards. Then, find the most possible error within each unit of measure. Lastly, decide which unit is the best for each object based on the amount of error compared to its size. (error should be less than 5% of size)

**A pencil:**

**Centimeters: Error:**

**Inches: Error:**

**Feet: Error:**

**Yards: Error:**

Best Unit/Conclusion:

**A Desk:**

**Centimeters: Error:**

**Inches: Error:**

**Feet: Error:**

**Yards: Error:**

Best Unit/Conclusion:

**A Desk:**

**Centimeters: Error:**

**Inches: Error:**

**Feet: Error:**

**Yards: Error:**

Best Unit/Conclusion:

**Rubric**

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| --- | --- | --- | --- | --- |
|  | 3 | 2 | 1 | 0 |
| Mathematic accuracy finding possible measurement error | Student completed the worksheet with no mistakes calculating possible measurement error | Student completed the worksheet with no more than 2 mistakes calculating possible measurement error | Student completed the worksheet with more than 4 mistakes calculating possible measurement error | Student did not complete the worksheet |
| Connection between best method of measurement based on error | Student chose the correct unit of measure for all three objects | Student chose the correct unit of measure for two objects | Student completed each conclusion, but answered only one or less correct  | Student did not complete worksheet |