SCSU CRISP CCSA Kit Pages 2016

Title of Module: Measurement and Conversion

Subject or Unit of Study: Measurement, Conversion

GRADE LEVEL 9 **LENGTH OF DEMO/LESSON**: 80 – 100 min

STUDENT OBJECTIVES

- Students will demonstrate the ability to accurately measure various items and use these measurements to perform specific tasks.

NEXT GENERATION SCIENCE STANDARDS

- Use Mathematics and Computational Thinking
- Apply ratios, rates, percentages, and unit conversions in the context of complicated measurements problems involving quantities with derived or compound units (such as mg/ml. Kg/m3, acre-feet, etc.).

COMMON CORE STANDARDS

CC-ELA/Literacy Standards	**RI.5.7** • Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.(5-PS1-1) **SL.8.5** • Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2)
CC-Math	**MP.2** • Reason abstractly and quantitatively. (5-PS1-1) **MP.4** • Model with mathematics. (5-PS1-1) **5.NF.B.7** • Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1) **5.MD.C.3** • Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1) **5.MD.C.4** • Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft., and improvised units. (5-PS1-1) **6.EE.C.9** • Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-2)

MATERIALS
25-foot tape measures
Fake dollar bills
Triple beam balance
Rulers with 1/16 inch increments
Dry erase markers
Erasers
Misc. objects to be measured
Thermometers
Beakers
Hot plate
String
Dial calipers
Calculators (at teacher's discretion), internet use for research
Ice - Not provided

SAFETY

- Teacher should instruct students in the proper use of thermometers. Students must be aware of general lab safety around the hot plate and water.

LEARNER BACKGROUND
Students need to have prior knowledge of using rulers, tape measures, calipers, thermometers and balances.

LEARNING ACTIVITY OR PROCEDURE:

Students will rotate through six stations in which they will work in teams to accurately measure, record and compute the data to answer a specific question.

Station #1:
Twenty five foot tape measure. Students will measure the dimensions of the classroom and draw a sketch of the room indicating the length, width and height of the room. Be sure to make your sketch to scale, using ¼ inch to represent 1 foot. Include the doors and windows in your drawing.

Station #2:
How much does a dollar bill weigh?

Students use a triple beam balance to determine the mass of the bill. Students will determine in pounds the weight of the money required to purchase a Tesla car in cash.

Station #3:
Students will use a 12-inch ruler to measure common objects found in a typical classroom, in inches and fractions, to the nearest sixteenth of an inch.

Length, Height, and Width of a dry eraser

Length, Diameter, and Radius of a pencil, pen, or marker Paper clip
Screen size of a cell phone, tablet, or computer Thickness of a biology book

Station #4:
Temperatures: measure the temperature of an ice water bath. What is the scale used? Measure the temperature of the room.
Measure the temperature of a beaker heating on a hot plate.

Whatever the scale of your thermometer, convert that reading to Fahrenheit, Celsius, and Kelvin.
$F = 1.8C + 32$ $C = 0.55(F - 32)$ $K = C + 273$

Station #5:
Students will receive pieces of string of the same length. They will have to "measure the length" without a measuring device (no rulers, meter sticks, yard stick, etc., in other words nothing with a number on it).

This activity can be setup as a challenge, the group the closest to the real value wins something. Initially the students are not constraint to the unit they need to report in (cm, inches, thumbs, arm length, etc).

Have all the groups put their measurements on the board – comment on the common denominator which most probably will be inches (students tend to use the size of a letter sized paper).

Have students convert their unit to centimeters. Emphasize units matter 1in or 1ft is not the same thing. Have a student make a "real measurement" in cm and determine the winner.

Comment on the fact that we convert on a daily basis in real life, conversions are not that scary. Also, units matter. It is important to know if you have 200 cents or 200 dollars or 200 thousand dollars in the bank, right?

Station #6:
Students will measure some of the same small objects they measured in Station #3, such as the dry erase marker, pencil, paper clip, etc. This time, they will use a caliper to get measurements to the nearest thousandths of an inch.

They will then convert their fractional measurements from Station #3 into decimal measurements and then compare their answers.

ASSESSMENT:

Students will complete a packet with questions and instructions as they rotate through the stations. They will record their measurements and calculations on the packet.

ADDITIONAL RESOURCES:
Apply any links or additional information for students or teacher including videos, websites, etc.

TEACHER NOTES:
This lesson could be implemented in a variety of contexts. It could be used as a pre-assessment at the beginning of a course to identity gaps in student skills. It could be used as a summative assessment at the end of a unit on measurement.

STEM CAREERS:

Engineer
Machinist
Architect
Civil Engineer
Mechanical Engineer
Researcher

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