How Do You Measure Up?

Christi Almarode, WVPT

Overview

Topic: Science, measurement, mass. This lesson is a study of metric measurement and the proper use of the balance scale and electronic balance. Students will participate in hands on activities that show a need for a universal system of measurement and that allow them instruction and practice in the use of mass measuring instruments. Students will work toward a culminating activity in which they will produce an instructional video on the use of an instrument of measurement that will be shared on the school web page. There are additional enrichment activities.

Time Allotment

Approximately two-three 50-minute periods
More time may need to be allotted to edit the movies, upload them and complete any enrichment activities.

Media Components

- Computer and presentation device
- ***Scientific Method and Measurement - Lesson Two.*** United Learning. 1993. http://wvpt.unitedstreaming.com.
  Segments used:
  Segment 1: A Brief History of Measurement, Weight versus Mass—What Is the Difference?
  Segment 2: Measuring Mass.
- iMovie (or comparable product)
- Digital movie camera – a camera for each movie group would be the ultimate goal, but you may use as many as you have.
- Optional: PowerPoint presentation software and PowerPoint presentation designed for use with this lesson for NTTI 2004 by Christi Almarode

Learning Objectives

The student will be able to:
- discuss the importance of a universal language of measurement
- identify the metric units used in scientific measurements.
- explain the difference between weight and mass.
- demonstrate the proper use of the triple beam balance and electronic balance.

(This lesson addresses Va. SOL Science 4.1, 5.1, 6.1, PS.1, ES.1; Math 8.1; C/T 8.1, 8.2)

Materials

For learning activity stations:
- 2 triple beam balances
- 2 equal arm balances and set of masses
- 2 electronic balances
- 13 - 15 different small solid objects (regular and irregularly shaped objects)

For each student:
- 1 copy of each worksheet needed: “Measurements I Have Found” and “How Do You Measure Up?” (attached)

Teacher Preparations

• Download ***Scientific Method and Measurement - Lesson Two — Scientific Measurement*** from unitedstreaming.com (must have a user ID and password).
• Obtain computer and presenter for video presentations.
• Obtain needed scientific measuring tools: (equal arm balances, triple beam balances, and electronic balances).
• Obtain needed objects for lab investigation.
• Duplicate student handout materials: PowerPoint with notes, "Measurements I Have Found" and "How Do You Measure Up?"
• Make a spreadsheet for data collection in "How Do You Measure Up?" activity.

Introductory Activity

Hand a sheet of paper to each student as they come into the classroom. Have them trace and cutout an outline of their foot for a later activity.

1. Brainstorm ways we use measurement in our classroom: Have partners come up with five ways we would use measurement in our classroom. Have students place their answers on one of the five large sheets of paper placed in the room. (Sheets are for measurements of mass, volume, length, temperature and force.)

2. FOCUS: "We are going to measure the classroom using the measurement unit called a foot. Girls I'd like you to line up on the left side of the classroom to measure the length of the room. Boys I'd like you to line up on the right side of the classroom to measure the length of the room. If we are all measuring in the foot unit, then we should come up with the same number. Right?" **PLAY.** Oversee the students as they measure the length of the classroom using their foot outlines made when they came into the classroom. **FOLLOW-UP:** "Does this show you a need for a universal measurement unit that we can all rely upon?"

3. Hand out Introductory Activity sheet. **FOCUS:** Tell the students: "Tomorrow you should be prepared to share a list of five items which you found last night that had a measurement of mass and then place them on the proper paper in the room. You will need to list the item, the measurement, and the unit used. You will also need to bring in one example to share in a class activity." **PLAY.** Have students take the activity sheet home on which to gather their information.

4. FOLLOW-UP: The next day discuss the items listed and brought to share along with the units used. Then proceed into the Learning Activity.

Pause vs. Stop

When using a video interactively with students, teachers need to decide when to use **PAUSE** and when to use **STOP**. **PAUSE** the video when the anticipated discussion or activity will take less than two minutes. **STOP** for longer periods.

Time Cues

To synchronize your VCR with the time cues that are included with this lesson, zero/reset your time counter at the very beginning of the program, before the introduction and titles. Time cues are expressed as "minutes:seconds;" for example, 3:15 means three minutes and fifteen seconds.

Learning Activities

1. FOCUS: Say: "We have started our study of measuring matter. What measurement techniques do you think early civilizations used?" **PLAY *Segment 1 – A Brief History of Measurement.*** (2:37) **STOP. FOLLOW UP:** "What ways did you see early civilizations use to measure? A change in rulers really changed a measurement for his country. How many of you have seen you mother or grandmother measure a piece of material by holding out their arm with the material and measuring to their nose? Now do you understand why they do that?"

2. FOCUS: Say: "We are going to start our class study with the measurement of mass. Mass is the term we will use in our classroom. Does anyone

know the difference between mass and weight? **PLAY Segment 1 – *Weight versus Mass—What's the Difference?*** (1:31) **STOP. FOLLOW UP:** "Now we know that mass is a unit that measures the actual particles that make up everything. This measurement will never change no matter where we are. However when we measure weight, we are really only measuring the pull of gravity on the object and this will change. Things will weigh less on the moon because there is less gravity on the moon.

3. FOCUS: Say: "What instrument do you use to find your mass?" Wait for class responses. "Would we use the same type of scale to weigh a small washer or a teaspoon of salt?" **PLAY *Segment 2 – Measuring Mass*** (:58). Play the first time without sound to focus students' attention on the actions directed in the videoclip. **STOP. FOLLOW UP:** "You saw the students using a triple beam balance and an equal arm balance. Which do you think would be easier to use? Why? **REPLAY** the videoclip with **SOUND ON** to reinforce the directions given for usage of the scale balance."

4. FOCUS: Say: "We will practice using these two instruments and an electronic balance. What units will we use when we find an answer with any of the instruments?" Lead students to the use of gram as the base unit used in measuring mass. Review the prefixes that might be used for both small objects and large objects. Prepare students for the Culminating Activity: "You have learned about the need for a universal language in measurement. You have also seen the process for measuring mass with several different instruments. Would it be easier for you to learn the use of these instruments if you had a personal video lesson telling you the precise steps to take in making a measurement? After we practice, your groups will combine to write dialog and make a video that explains the use of one of the pieces of equipment used to measure mass."

Culminating Activity

Complete the "How Do You Measure Up?" Lab. This activity will give students instruction and practice using the instrument used to measure mass in a science classroom.

Advance preparation:

1. Divide class into groups of four students per group.

2. Gather needed science equipment: Have a station for each of the three instruments used to measure mass and have the groups rotate among the stations.

3. Gather 24 objects for use with the balances. (small stones, batteries, etc.)

Before activity: Put needed materials at each station.

Station #1 Measuring Mass with an Equal Arm Balance

1. Direction sheet
2. Two equal arm balances
3. Eight small objects or containers of material to be weighed (number the objects so students can put in appropriate place in data table)

Station #2 Measuring Mass with an Electronic Balance

1. Direction sheet
2. Two electronic balances
3. Eight small objects or containers of material to be weighed (number the objects so students can put in appropriate place in data table)

Station #3 Measuring Mass

1. Direction sheet
2. Two triple beam balances
3. Eight small objects or containers of material to be weighed (number the objects so students can put in appropriate place in data table)

"How Do You Measure Up" Activity

1. Instruct students in the use of each piece of measurement equipment.

2. Distribute "How Do You Measure Up" worksheet. **FOCUS:** Say: "Scientists have to be very accurate when collecting data. This activity will see how accurately you can gather measurements. You will rotate among three different stations in which you will use each of three instruments used for measuring the mass of an object. Follow the written

directions that are provided at each of the stations." **PLAY.** Have student groups then rotate among the measurement stations to collect their data. (**PAUSE.** Assist students as necessary during activity.)

3. FOLLOW-UP: After completion of the activity, student groups should enter their data in a class spreadsheet made for the collection of this data. Find averages and then talk about why groups may have acquired different measurements for some of the stations.

4. Ask students if it would have been easier to learn to read the balances with a video giving a close up perspective and instruction on how to read the different balances.

5. Remind students they are going to be making instructional videos that will help other students learn to use the measurement instruments.

Culminating Activity

1. Assign student groups a single measuring instrument.

2. As a group they are to write a script for demonstrating and teaching another class how to use the piece of equipment. They will then video tape their scripted demonstration, with a digital camera, and edit it with iMovie. Once edited fully, export the movie via Quicktime to the computer desktop.

3. The Quicktime movies are to be placed on the class or school web page for others to view and use.

4. As time permits, use the following to extend this activity further: Once the movie is placed on the web, use video conferencing equipment to communicate with another class. Have the other class use your students' video presentations, on the web, to learn how to use the measurement equipment. Then by way of video conferencing equipment have your cooperating class demonstrate their use of the measuring equipment while your own students evaluate the demonstrations being completed.

Assessment

1. Students will be evaluated on accuracy and skill in demonstrating the use of their piece of measurement equipment.

2. A group evaluation will be completed on the effectiveness of the instructional video.

Community Connections

1. Invite a local carpeting and tiling retailer to come to the classroom to discuss what measurement tools they use to figure surface area and then determine carpeting, linoleum or tile needs.

2. Invite a meteorologist to the classroom to discuss factors in your area that affect the range of temperature change throughout the year.

Cross-Curricular Extensions

History: Have students research the different systems of measurement throughout the years. Then make an illustrated timeline showing the date and country where different systems of measurement developed.

Math:
- Have students convert their metric calculations to British measurements.
- Have students take their mass measurements and convert from mg to cg to g.

About the Author

Christi Almarode
Mrs. Christi Almarode is an eighth grade Physical Science teacher at Stuarts Draft Middle School in Augusta County. She graduated from James Madison University where she earned a BS Degree in elementary education. She has taught at both the elementary and middle school level where she has been a leader in the introduction and use of computers in the classroom. Christi has been on her school improvement team and technology team and was

named Stuarts Draft Middle School teacher of the year. She continues to provide staff development on many instructional technology topics to teachers in Augusta County and teaches Lego Logo to students attending Augusta County's Summer Enrichment Program during the summer.

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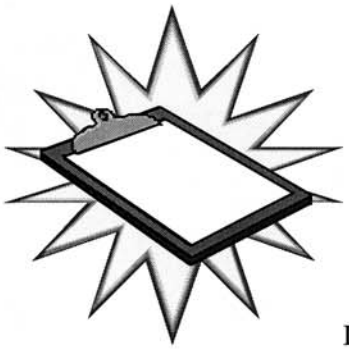
Measurements I Have Found



List objects you find at home in one evening that list a measurement on the product. Give the product, its use, and its measurement unit.

Product	Use
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Describe how you would make brownies for dessert without measurements of any kind!

How Do You Measure Up?

Follow the directions given at each station. Record your group data in the following data charts. Remember a measurement needs a numeral and a unit!!

Station #1 Measuring Mass using an Equal Arm Balance

Place the measurement for each object in the data table. List the object and the measurement in the appropriate box.

Object	Mass
1.	
2.	
3.	
4.	

Object	Mass
5.	
6.	
7.	
8.	

Station #2 Measuring Mass using an Electronic Balance

Place the measurement for each object in the appropriate data table. List the object and the measurement in the appropriate box.

Object	Mass
1.	
2.	
3.	
4.	

Object	Mass
5.	
6.	
7.	
8.	

Station #3 Measuring Mass

Place the measurement for each object in the appropriate data table. List the object and the measurement in the appropriate box.

Object	Mass
1.	
2.	
3.	
4.	

Object	Mass
5.	
6.	
7.	
8.	

Directions for each station:

Station #1 Measuring Mass with an Equal Arm Balance
USE METRIC MEASUREMENTS!!!

1. Each pair of students should take an Equal Arm Balance to use for the objects to be measured.
2. Each pair of partners should choose four of the provided objects to measure the mass of the objects using the equal arm balance.
3. Place an object on the left pan and then add masses to the right side pan until the pointer reaches the equal line. Repeat with the remaining objects.
4. Record your measurements in your data table for Station #1. Share your answers with your group members.

Station #2 Measuring Mass using an Electronic Balance
USE METRIC MEASUREMENTS!!!

1. Each pair of students should take an Electronic balance to use for the objects to be measured.
2. Each pair of partners should choose four of the provided objects to measure the mass of the objects using the electronic balance.
3. Place an object on the balance pan. Read the measurement on front of scale. Repeat with the remaining objects.
4. Record your measurements in your data table for Station #2. Share your answers with your group members.
5. Each pair of students should then take one of the remaining objects and measure its mass using the electronic balance and record it in their data table.

Station #3 Measuring Mass using a Triple Beam Balance
USE METRIC MEASUREMENTS!!!

1. Each pair of students should take a triple beam balance to use for the objects to be measured.
2. Each pair of partners should choose four of the provided objects to measure the mass of the object with the triple beam balance.
3. Place one object on the pan. Move each of the slides until the pointer registers a balanced measurement. Repeat with the remaining objects.
4. Record your measurements in your data table for Station #3. Share your answers with your group members.