Assignment Discovery Online Curriculum

Lesson title:
A Metric World

Grade level:
6-8

Subject area:
Mathematics

Duration:
Two class periods

Objectives:

Students will
1. learn how to convert quantities from the English system to the metric system; and
2. think about the many ways in which measuring quantities is a part of daily life.

Materials:
- Copies of Classroom Activity Sheet: Measuring in Daily Life
- Copies of Take-Home Activity Sheet: Metric Stories
- Pens
- Pencils
- Books about the metric system (optional)

Procedures:

1. Begin the lesson by asking students whether they are aware of the two systems of measurement used most commonly around the world. Then discuss these systems—the English and the metric. Explain that in the United States the English system is used, while most other countries around the world use the metric system. Tell the class that the metric system was established in France and that it is based on powers of ten.

2. Make a class list of common units in the English system (e.g., ounces, pounds, inches, and feet) and common units in the metric system (e.g., grams, kilograms, meters, and centimeters). Then review with students how to convert between English units and metric units. The following Web sites have conversion charts and instructions for converting from metric to English and from English to metric:

   To convert from English to metric:
   http://www.pueblo.gsa.gov/cic_text/misc/usmetric/tometric-conv.htm

   To convert from metric to English:

http://www.pueblo.gsa.gov/cic_text/misc/usmetric/frommetric-conv.htm

Remind students of the inverse law of multiplication and division. Explain that, if they use multiplication to convert from the metric to the English system, they can always use division to convert in the other direction.

3. Group students into pairs. Have each pair brainstorm about the different measurements they encounter on a daily basis, from the gallon of milk they pull from the refrigerator each morning to the distance they travel to soccer practice. Encourage them to think about length (distance), weight, and volume. Next, distribute the Classroom Activity Sheet: Measuring in Daily Life. Have students fill in the measurements in the English system first. Then have them convert each measurement to the metric system. Remind students to use the conversion charts to help them move from one system to the other. Encourage students to add other ideas to the sheet.

   The questions on the Classroom Activity Sheet are listed below:

   a. How tall are you?
   b. What is the difference in height between you and your best friend?
   c. How much milk do your parents usually buy at one time?
   d. How much bread do your parents usually buy at one time?
   e. About how much juice do you drink every day?
   f. What is the distance in miles from your home to school?
   g. What's the typical speed limit (in miles per hour) around town?
   h. What's the typical speed limit (in miles per hour) on the highway?
   i. Estimate how much your backpack weighs on a typical afternoon.

4. Go over the answers in class and check students' conversions from English to metric. If students have added other questions to the sheet, have them share their measurements with the class.

5. Assign the Take-Home Activity Sheet: Metric Stories. Have students use the information on their Classroom Activity Sheets to write a story, journal entry, or letter about *a typical day if they were to wake up in a world that used only the metric system.* Encourage them to include more examples of metric measurements in their daily life, such as speed limit signs and the price of gas per liter. If time permits, have students share their stories in class.

Adaptation for younger students:
Distribute the Classroom Activity Sheet and have students work in pairs to come up with measurements in the English system. Then work on the conversions as a class. You may also want to write a class story about what life would be like if the United States changed to the metric system.

Questions:

1. Why do you think it would be so hard for the United States to switch to the metric system? Do you think it is in the country's best interest to overcome these difficulties? Why or why not?

2. Which system did you find easier to use? Why?

3. Do you think it is confusing that the United States uses a different measuring system from the rest of the world? What kinds of problems arise because of the use of a different measuring system?

4. Were you surprised at how many measurements you use in daily life? Why or why not?

5. Think about specific jobs that require frequent measuring, such as architecture and construction. What changes would people in these professions have to make in their daily lives if the United States switched to the metric system? Consider how the change to metric would affect all aspects of their jobs, from buying materials to measuring spaces to actually constructing buildings.

6. Suppose you wanted to bake a cake, and the recipe you wanted to use listed metric quantities but your measuring cups and spoons were based on English measurements. How would you convert each quantity? What tools could help you solve this problem?

Evaluation:

Use the following three-point rubric to evaluate students' work during this lesson.

> Three points: cooperative work with partners to complete the Classroom Activity Sheet and develop a list of additional quantities to measure; determination of these quantities in English units and conversion of them into metric units; ability to come up with several more examples of what life would be like if we used the metric system
>
> Two points: somewhat cooperative work with partners to complete the Classroom Activity Sheet and develop a list of additional quantities to measure; determination of most of these quantities in English units and conversion of some of them into metric units; ability to come up with a few additional examples of what life would be like if we used the metric system
>
> One point: relatively ineffective cooperative work with partners to complete the Classroom Activity Sheet and develop a list of additional quantities to measure; determination of a few of these quantities in English units and conversion of a few of them into metric units; ability to come up with one or two additional examples of what life would be like if we used the metric system

Extensions:

Grocery Store Math
Have students list their favorite foods. Ask them to look at the packages to see how much food is in each package in both English and metric units. (Both are usually listed.) Then have them go to the grocery store and find out the prices of these foods. Was the price more or less than they thought? Ask students what this told them about the price of food. Did they notice anything about the price of food when it is bought in bulk as compared with when it is bought in small amounts?

History of the Meter
Challenge students to trace the history of the meter. Ask them to find out when and how the length of the meter was first established. Then have students explore how the method tof establishing the scientific length of the meter has changed over the last 200 years. Have students write brief reports to present to the class.

Suggested Reading:

The Story of Weights and Measures
Anita Ganeri. Oxford University Press, 1996.
An excellent introduction to the concepts of weight and measurement are encompassed in this slim book. Using lots of illustrations matched with short entries, the development of instruments for accurate weighing and measuring is traced. A short timeline and glossary are included.

Vocabulary:

kilogram
Definition: The basic metric unit of mass and weight, nearly equal to the mass of 1,000 cubic centimeters of water.
Context: Dry goods, such as flour and sugar, are measured in **kilograms.**

liter
Definition: A metric unit of capacity equal to the volume occupied by one kilogram of water at a specific temperature and atmospheric pressure.
Context: Water is often bottled in amounts of 1 and 2 **liters**.

meter
Definition: The basic metric unit of length, approximately equal to 39.37 inches.
Context: Olympic track-and-field events are measured in **meters,** not miles.

volume
Definition: The amount or quantity of something measured in milliliters, liters, pints, or quarts.
Context: The **volume** of a gallon container is greater than that of a quart container.

Academic standards:

Grade level:
6-8
Subject area:
Mathematics
Standard:
Understands and applies basic and advanced properties of the concept of measurement.
Benchmark:
Solves problems involving units of measurement and converts answers to a larger or smaller unit within the same system.

Grade level:
6-8
Subject area:
Mathematics
Standard:
Understands and applies basic and advanced properties of the concept of measurement.
Benchmark:
Understands formulas for finding measures.

Credit
Audrey Carangelo, freelance curriculum developer.

Name: _____

Metric Stories

Now that you have some experience "thinking in metric," write a story, journal entry, or letter about a typical day in a world that uses only the metric system. Use the examples from the Classroom Activity Sheet, and try to come up with additional ideas, too. Make sure your story covers as many parts of your life as possible that would be affected by the use of the metric system.

Classroom Activity Sheet: **A Metric World**

Name: _____

Measuring in Daily Life

The questions below invite you to think about the ways that quantities and measurements come up in daily life. First, answer the question in English units. Then convert the measurements to metric. Try to think of more examples and add them to the list.

Question	**Measurement in English Units**	**Measurement in Metric Units**
What is the difference in height between you and your best friend?		
How much milk do your parents usually buy at one time?		
How much bread do your parents usually buy at one time?		
About how much juice do you drink every day?		
What is the distance in miles from your home to school?		
What's the typical speed limit (in miles per hour) around town?		
What's the typical speed limit (in miles per hour) on the highway?		
Estimate how much your backpack weighs on a typical afternoon.		