

## Metric Madness Unit Plan

**Title:** Metric Madness

**Description:** Students create persuasive brochures to convince the public to mandate the use of metrics as the only accepted measurement system.

### At a Glance

**Grade Level:** 6–8

**Subject sort (for Web site index):** Mathematics

**Subject:** Measurement

**Topics:** Metrics

**Higher-Order Thinking Skills:** Problem Solving, Persuasion

**Key Learnings:** Metrics, Measurement, Conversions

**Time Needed:** 2–4 weeks, depending on how many metric lessons must be taught in one math period per day

**Background:** Arizona, United States

### Unit Summary

After participating in activities to learn about components of the metric system, students share their knowledge and understanding of metrics with others by creating a slideshow presentation. Then students take on the role of mathematicians whose task is to show the importance of the metric system to the general public and Congress. The students' goal is to gather support for legislation to be passed that would mandate that the United States use only the metric system of measurement.

### Curriculum-Framing Questions

- **Essential Question:**  
How can math help me understand my world?
- **Unit Questions:**  
Why might you need to know the metric system?  
What difference does it make if you use inches or centimeters?
- **Content Questions:**  
What are the different metric measurements?  
How is measurement used in the real world?  
How does measurement help you solve a problem?

### Assessment Processes

View how a variety of student-centered [assessments](#) are used in the Metric Madness Unit Plan. These assessments help students and teachers set goals; monitor student progress; provide feedback; assess thinking, processes, performances, and products; and reflect on learning throughout the learning cycle.

## Instructional Procedures

### Investigating Metrics

Introduce the Essential Question, *How can math help me understand my world?* Log results on chart paper and hang it on a wall for students to add to throughout the rest of the unit. Consider keeping the chart up throughout the rest of the year for students to think about and add to during all math units.

Tell students they are going to begin a unit about metrics. Poll the students to see which metric measurements are familiar to them. Ask them the Unit Questions, *Why might you need to know the metric system?* and *What difference does it make if you use inches or centimeters?*

Have students write down their answers to the questions in a journal or notebook. Tell them they will be adding to their knowledge of these as they progress throughout the unit and that they will need to refer to their answers to complete some of the upcoming activities.

Keep the following important points in mind when teaching metrics:

- Teach metrics by itself. Make no English-unit comparison. Teach no conversion factors. Teach how to coexist and cope with standard units and metric units rather than teaching conversions from one system to the other.
- Stress the relationships between the monetary system (a decimal system) and metric system.
- Stress the relationship between the meter, liter, and gram.

The following is a minimal structure for teaching metrics lessons over a 2-week period. After each activity, have students, in pairs, reflect on the three questions asked at the beginning of the unit and add to their notes:

- Introduce the straw as a unit. Measure desks with straws (have different lengths of straws for different student groups). Point out discrepant events. Introduce standard units. Talk about why we should use metrics. Become familiar with metric vocabulary and the metric ruler.
- Introduce the millimeter and the centimeter. Review estimating. Estimate several objects and then measure them. Have students estimate then measure different parts of their body, such as fingers, shoulder to elbow, elbow to wrist, toes, and so forth. Measure height and arm span. Compare the measurements, and discuss the findings.
- Introduce meters and complete an activity where students measure objects in the room using meters. Reflect on the activity.
- Practice converting within the metric system from millimeters to centimeters, millimeters to meters, centimeters to meters, meters to millimeters, and so forth.
- Have students walk a kilometer. Discuss distances they are familiar with in kilometers. MapQuest or some other mapping program can help with metric distances.
- Introduce mass. Discuss the difference between mass and weight. Introduce a balance device and have students find the mass of numerous objects using grams and kilograms. Have students convert grams to kilograms and vice versa.
- Introduce volume—liters and milliliters. Have a variety of containers for students to estimate the volume of and measure those containers. Convert from liters to milliliters and vice versa.

- Introduce Celsius. Have students take part in a hands-on activity “feeling” different temperatures.

Once you feel your students have a good handle on metrics, have them complete a multimedia slideshow presentation showing their understanding of metrics. Divide the class into groups of four, and, within each group, assign one student to different units of metric measurement, as follows:

- Student 1: millimeters and centimeters
- Student 2: meters and kilometers
- Student 3: grams and kilograms
- Student 4: liters and degrees Celsius

Allow each student to use their notes to complete a presentation that includes the following:

- Explanation and/or definition of the measurements
- Mathematical written form with a conversion from a larger or smaller unit
- Photographs of at least three objects measured using the metric measurements
- Word problem that involves the assigned measurements and an explanation of how to solve the problem
- Slide that answers the Unit Question, *Why might you need to know the metric system?*

Distribute the [presentation scoring guide](#) and review the criteria. The [multimedia presentation](#) represents what each student would complete within their topic area. When all members of the group have completed their slides, have students put the slides together to make one presentation. Students can present these to:

- Parents during conferences (students can teach their parents metrics!)
- A younger class of students

Review with your students their answers to the Essential Question, *How can math help me understand my world?* Have students add to the chart paper list that the class generated earlier.

### **Building an Argument**

Tell students they will be taking on the role of mathematicians. Their task will be to show the importance of the metric system. They must convince the general public to vote to pass legislation that would mandate that the United States use only the metric system of measurement.

Have students research and discuss the importance of the metric system. Discuss as a group the two Unit Questions that will help students with their final product—*Why might you need to know the metric system?* and *What difference does it make if you use inches or centimeters?*

Inform students that they will create a brochure highlighting important reasons to learn metrics, which will be passed out to the general public as well as legislators. Distribute the [brochure rubric](#) and explain the following guidelines for the [brochure](#):

- Story telling why we need to know metrics
- Something to show how easy metrics is to use and why other countries use the system

- Math problem showing the difference in ease of use between metrics and English systems
- Reasons why we should switch to metrics
- How we currently use metrics in our daily lives

After students finish their brochures, have a mock public forum to have students present their findings and brochures. Be sure that the audience uses the [feedback form](#) for each presentation.

At the end of the unit, revisit the Essential Question, *How can math help me understand my world?* Direct students to think about their peer's presentations and have them add thoughts to the chart paper started at the beginning of the unit.

#### **Prerequisite Skills**

- Working knowledge of desktop publishing software and multimedia slideshow software
- Working knowledge of word processing skills
- Working knowledge of Internet research

#### **Differentiated Instruction**

##### **Resource Student**

- Allow extended computer use
- Extend time requirements for the completion of the math assignments
- Provide a brochure template
- Have the student dictate information to a scribe
- Use a teacher assistant or instructional aide
- Arrange partnering with another non-resource student

##### **Gifted Student**

- Challenge the student to master complexity within applications as well as analyze and synthesize learning
- Enlist the student to use leadership skills to organize and focus the group
- Have the student exchange correspondence with a mathematician or person living in a metric country
- Encourage the student to make arrangements for a guest speaker
- Have the student complete a class Web site that showcases class learnings

##### **English Language Learner**

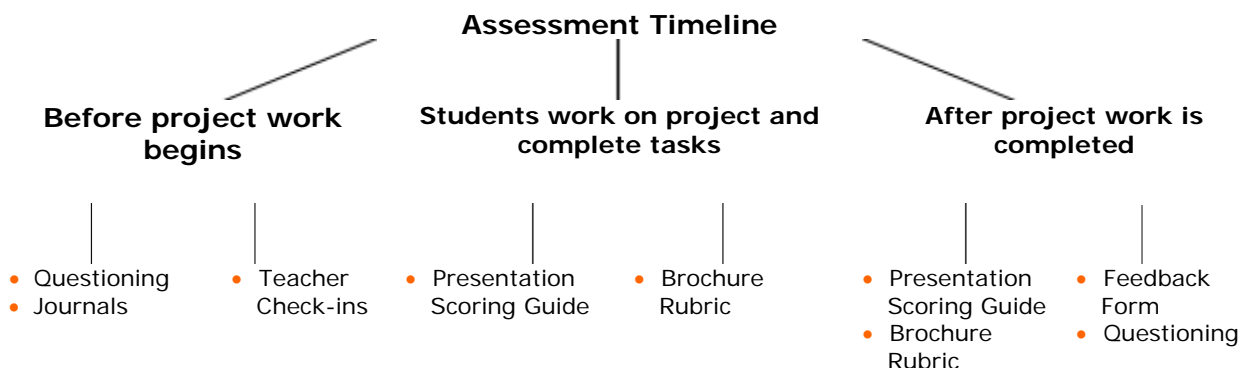
- Pair the student with a native English speaker to assist in project work
- Encourage the student to share experiences with using the metric system in the student's native country

#### **Credits**

A teacher participated in the Intel® Teach Program, which resulted in this idea for a classroom project. A team of teachers expanded the plan into the example you see here.

## THINGS YOU NEED (highlight box)

### Assessment Plan



Questioning is used throughout the unit to assess prior knowledge and help students develop higher-order thinking skills and process content. Students record their understanding of new knowledge and questions throughout the project, and reflect in a journal on the Essential and Unit Questions after each activity. The teacher periodically checks the journals. Students use the [presentation scoring guide](#) and [brochure rubric](#) to help guide their learning, stay on track, self-assess throughout the project, and develop high-quality convincing materials. The scoring guide and rubric are used for final assessment of the products. At the final mock forum, audience members provide feedback on the persuasiveness of students' presentations using the [feedback form](#).

### Targeted Content Standards and Benchmarks

#### Targeted National Standards:

National Council of Mathematics Teachers Standards

Measurement:

Grades 6–8

- Understand both metric and customary systems of measurement
- Understand relationships among units and convert from one unit to another within the same system

Problem Solving:

- Build new mathematical knowledge through problem solving
- Solve problems that arise in mathematics and in other contexts
- Apply and adapt a variety of appropriate strategies to solve problems

#### National Council of Teachers of Mathematics Curriculum Focal Points and Connections

As of 2006, the National Council of Teachers of Mathematics (NCTM) released math curriculum focal points to describe an approach to curriculum development. The approach focuses on areas of emphasis in each grade from prekindergarten through grade 8. ([Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics\\*](#))

This Unit Plan meets the following curriculum focal points and connections:

#### **Focal Points**

- Grade 6: Number and Operations: Developing an understanding of and fluency with multiplication and division of fractions and decimals

- Grade 7: Number and Operations and Algebra: Developing an understanding of operations on all rational numbers and solving linear equations
- Grade 8: Geometry and Measurement: Analyzing 2 and 3-dimensional space and figures by using distance and angle

### **Connections**

- Grade 6: Measurement and Geometry: Find areas or volumes from lengths or find lengths from volumes or areas and lengths

### **Student Objectives:**

Students will be able to:

- Perform mathematical operations using measurement units
- Demonstrate the ability to use measurement
- Measure to the appropriate degree of accuracy
- Demonstrate an understanding of metric measurements
- Create a mathematical problem for others to solve
- Construct a persuasive brochure
- Solve mathematical problems
- Calculate conversions within the metric system

## **Technology and Resources**

### **Printed Materials**

- Student worksheets for metrics activities

### **Supplies**

- Metric scales
- Containers for volume
- Celsius thermometers
- Drinking straws of varying lengths

### **Internet Resources**

- "The Metric System" by Edward Willett  
[www.edwardwillett.com/Columns/metric.htm](http://www.edwardwillett.com/Columns/metric.htm)\*

General information about the metric system

- National Institute of Standards and Technology  
<http://ts.nist.gov/ts/htdocs/200/202/lc1136a.htm>\*

Lots of information about the metric system and its international importance

### **Other Resources**

- Scientists or other guests to speak about their use of metrics

**Technology—Hardware**

- Computers for research and to create multimedia and publishing documents
- Projection system to share multimedia presentations with others
- Digital cameras to take pictures of objects to insert into multimedia presentations

**Technology—Software**

- Multimedia software to create student presentations
- Internet connectivity to aid in researching for information to include in brochures
- Desktop publishing software for creating brochures
- Web page development software for gifted students to create class Web pages