

Measurements in Science

Summary

This lesson plan will enable the students to develop an understanding of the importance of a standardized system of measure. The tools used to make measurements in science will be introduced. Students will learn the metric system of measurement, why it is important for all to use, and will have practice in the use of the metric system to include conversion from one size unit to another size unit using the metric ladder. This will be accomplished by student involvement in lab experiences, internet research, internet practice sessions both practicing the use of metrics and practicing the knowledge base about metrics. The last part of the lesson plan will require that students demonstrate a proficiency in both critical metric system knowledge and metric system use to include the use of metric measurement tools. While the eighth grade core does not require instruction directly in the use of various tools to measure metric units and does not require that students be taught to convert from one size metric unit to the other, it very definitely does show an expectation that the students will perform measurements of various kinds that are or should be done using metric units. Since most eighth grade students do not know how to use appropriately either the metric system or the various metric measurement tools used to measure in the metric system it becomes necessary for the instructor to teach the student not only how to use the metric system and to convert from one size unit to another but also to instruct the student in the use of various metric measurement tools. Also the metric system is not in any other science core prior to the eighth grade and is not in any math core that I could find. If we are going to expect that students to use the metric system in the eighth grade core to measure those things in the following core objective areas, then we must teach it to them.

Time Frame

6 class periods of 45 minutes each

Group Size

Large Groups

Life Skills

Thinking & Reasoning, Communication

Materials

Metric Rulers, Metric Balances, and Graduated Cylinders

Background for Teachers

The instructor should have a basic working knowledge of the metric system before attempting to use this lesson plan. The student need know very little about the metric system.

Intended Learning Outcomes

1. Students will recognize the need for a standard system of measurement.
2. Students will develop a clear understanding of the metric system.
3. Students will learn to convert metric units from one size to another.
4. Students will demonstrate the ability to use the appropriate tools to make scientific measurements using the metric system.
5. Students will enhance their observation skills by being able to better quantify what they are observing.
6. Students will learn the set of knowledge that will be necessary for them to have in order to complete successfully the various metric measurement portions of the eighth grade core.
7. Make observations and measurements (uses instruments as

appropriate). 8. Use reference sources to obtain information (library data bases, handbooks, encyclopedias, internet information sources etc.)

Instructional Procedures

The day before the slide show and internet portion of this lesson plan is started, students should be involved in a 10 minute question and answer session concerning the importance of making measurements. After that discussion is finished, begin students with a lab in which they as groups of two or three students, decide what kind of unit they can measure a paper clip, desktop, textbook, height or each student in the group, length and width of the room, pencil, and any five other items they choose. They are to do this after determining a new unit of measure, as though none had ever been developed. Day 1: The day before the slide show and internet portion of this lesson plan is started, students should be involved in a 10 minute question and answer session concerning the importance of making measurements. After that discussion is finished, begin students with a lab in which they as groups of two or three students, decide what kind of unit they can use to measure a paper clip, desktop, textbook, height of each student in the group, length and width of the room, pencil, and any five other items they choose. They are to do this after determining a new unit of measure, as though none had ever been developed. Day 2 Discuss with the teams what unit of measure they developed and how important it is, if we are going to communicate scientific investigation or any other results to other people, that we use the same units of measure. Turn on the first slide of the presentation. Continue clicking the mouse one click at a time. As each item comes on screen discuss it briefly. Go to slide 2 Place the pointing hand on the 'Learn More About Metrics' box in the bottom left corner of the screen. Click the left mouse button. This will take you to an internet site which has a great deal of information about the metric system (<http://edie.cprost.sfu.ca/~rhlogan/metric.html>). After a very brief introduction to the site, hand out the assignment for this internet site (The assignment can be printed from one of my web pages. Enter in the net site rectangle, (<http://www.mlms.logan.k12.ut.us~mlowe.teachers>) and press enter. When my starting page comes up place the cursor on the rectangle marked 'Corel Presentations Software' and press the left mouse button. On this page place the cursor on the page 1 under metric measurement and press the enter key. The first page of the assignment will come up. just press the print button and the first page of the assignment will be printed. Put the cursor on the back button and press the left mouse button. This will take you back to the previous page. Put the cursor on page 2 under metric measurement and follow the same process. The assignment is in order with the information in the internet site. Instruct the students to search for the appropriate information to complete their assignment. In some cases, you may have to help them along a little. Scroll through the material as the students are able to complete each section of their assignment. (However, you should determine the speed not the students.) When all students have finished the assignment, close the internet. You will be back to the slide you were on before you left the slide show. Now begin introducing them to the metric conversion ladder by starting with the place on the ladder where the whole units are located, or using the idea of a base 10 system, the ones column. Discuss with them the various units used to measure different things in the metric system as they are introduced on the slide. Make sure to include what each is used to measure, the correct symbol, and the scientific tools used to make the measurement. Discuss when each kind of measurement would be useful in every day life. Day 3 Review the first two slides with the students. Go to the third slide. Begin constructing the metric ladder going from bench up to kilo. Include, names, symbols, numeric equivalent, and the exponential equivalent on each level as you work up the ladder. Request student help, based on their internet assignment from the previous day, to construct the ladder. (MAKE SURE EACH STUDENT IS DRAWING THE METRIC LADDER ON A PAGE IN THEIR NOTEBOOK WHILE IT IS BEING CONSTRUCTED ON THE SLIDE. THEY WILL NEED IT LATER FOR METRIC CONVERSIONS.) Day 4 Review the steps for using the metric ladder with your students. (Some students may choose

to use the algebra approach to metric conversion called Dimensional Analysis, that's OK.) As you continue clicking the left mouse button, the slide presentation will come up with two internet choices on the bottom of the slide. Click on 'Metric Madness 1', This will take you to an internet site on which I have placed some metric conversion practice assignment materials (<http://www.quia.com/custom/5494main.html>). Work together as a class for the first four or five problems and then have each student start to work individually. The students are to complete this practice session during class by the end of day 4. Invite students who are understanding metric conversions to teach the skill to students who are having trouble with the assignment. Day 5: Go to slide 6. Review the steps for using the metric ladder with them again. Practice a little more if needed. Now click on the 'Metric Madness 2' button. This will open an internet page of practice materials designed to help the student prepare for the test on the metric system and metric conversions (<http://www.quia.com/custom/5489main.html>). The test will be the following day. Day 6 Review any material about the metric system students may choose to discuss in preparation for the test over the metric system and metric conversions. (The test should be designed by each individual instructor. It should include basic metric knowledge, use of metric measurement tools, and metric conversions.) Most students should no longer need to use the metric ladder for conversions, but it is up to the individual instructor.

Extensions

1. As you continue through the core, your students will be able to get considerably more out of those sections of the core that require the use of the metric system and metric measurement tools. 2. Students will begin to apply the metric knowledge they have gained to the real world around them.

Assessment Plan

1. The assignment that the students did with the metric internet page can be graded for assessment. 2. The Metric Madness 1 and 2 can be used for assessment because the number correct and incorrect is automatically tallied for you as the students go through the activities. This also allows the student to carry on self assessment and attempt to improve his or her score without actually hurting their grade. 3. The final assessment tools should be designed by each instructor as each instructor will stress different portions of the metric information. At the least it should include a test of their ability to use, the metric ladder or Dimensional Analysis to convert metric units from one size to another, appropriate metric tools for measurement, and a good basic knowledge of the metric system.

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