Metric Olympics Project

Objective – Students will investigate the metric system by using meters, volume, kilograms and density to measure various objects.

Key Vocabulary – Metric, area, volume, density, mass, prediction, kilogram, meter, estimate, graph

Materials needed – paper, pencil, meter stick (metric tape measure optional)

Procedure:

Students will measure the area of a designated portion of sidewalk outside the school. The area being measured can vary as needed until students become very familiar with the concept of area. Students will work in teams of three, with two students actively measuring while one student takes notes and organizes the data.

Students will measure the volume of air in their classroom, the hallway outside of their classroom and estimate the volume of air in the entire school based on their measurements and predictions. Students will use meter sticks to measure the area of their classroom, hallway and school building. Students must measure height of the room and hallway as well in order to calculate volume. Students will measure the outside of their school building, including height estimate, to compute the total volume of air inside of it.

Students will calculate the total mass of air held in their classroom, the hallway and their school using the volume and density of air contained in each space. Air density for a particular altitude location can be found online at:

http://wahiduddin.net/calc/calc_da.htm

Students will graph their area (m^2), volume (m^3) and mass (kg) results for the classroom, the hallway and the school.

Time Estimate: 4 hours, 10 minutes

Metric Olympics Worksheet

Area = length * width = x meters * y meters = xy meters^2

Example: A sidewalk measures 1.2 meters by 14.3 meters. What is the area of the sidewalk?

Area = 1.2 m * 14.3 m = 17.16 m^2

Volume = area * height = xy meters^2 * z meters = xyz meters^3

Example: A room measures 11.5 meters by 12.3 meters. The ceiling is 1.1 meters above the floor. What is the volume of the room?

Volume = 11.5 m * 12.3 m * 1.1 m = 155.595 m^3

Density = mass/volume; Mass = density * volume

Example: Air density in the room at 70° F (21.1^o C) at an altitude of 4,500 feet (1,363.64 m) with air pressure of 995 hPa and a dew point of 12° C = 0.993 kg/m^3

Mass of air in the room = 155.595 m^3 * 0.993 kg/m^3 = 155.595 * 0.993 kg = 154.506 kg air = 79% nitrogen, 20% oxygen & 1% argon + other

What kind of graphs can be made for area, volume and mass of air for the classroom, the hallway and the school? What should be on the y-axis and what should be on the x-axis? Can line graphs be drawn? What about bar graphs?

Challenge: Students will convert metric units to U.S. measures of length, area, volume and weight.

Scaffold: Students will measure the sidewalk area and the area and volume of the classroom and hallway. Students will calculate the mass of air in these two portions of the school.