Gold Seal Lesson:

Copernicus Education Gateway

Author(s): *Michael Lucky Voiselle*			*Lesson Title:* *Let Us Raise Water*			
Grade Span			*ICLE Application Model*			
K-4	*5-8* *XX*	*9-12*	*A*	*B*	*C* *XX*	*D*

Instructional Focus:

Algebraic Concepts and Relationships
Students use algebraic methods to investigate, model, and interpret patterns and functions involving numbers, shapes, data, and graphs in a problem-solving situation. Students evaluate and communicate the reasoning used in solving these problems.

Basic Concepts and Knowledge
Students develop an understanding of scientific concepts using facts, theories, principles, and models.

Unifying Concepts and Processes
Students recognize patterns and processes, making connections in terms of systems and subsystems that explain the interrelationships of the natural and designed world.

Science as Inquiry
Students demonstrate knowledge and skills necessary to perform scientific inquiry.

Performance Task

Part 1

Your task is to determine why a column of water rises in an empty glass when placed over a lit candle stuck to the bottom of a shallow aluminum pie pan half -filled with water.
Attach a candle to the center of the pie pan with a drop of melted wax. Fill the pan half full of water. Light the candle and let burn for 5 seconds. Quickly place the empty glass over the top of the candle. Record all observations in a journal. These observations will be included in a conclusion write-up. You may work in groups of 2 or 3 students. You may use any resources available to help answer the following questions. Share this experiment at home and record the responses of 3 other family members or friends in a neatly organized chart. Observation is extremely important to arrive at proper conclusions. Include your final thoughts to these questions as part of your write-up.

1. What did you first notice as you quickly put the glass over the candle into the water?
2. Did the water level rise immediately after covering the candle?
3. What did the heat of the flame do to the air in the glass?
4. Why did the water level rise in the glass?

Part 2

Your task is to investigate the effect of different size glasses or jars on the length of time the candle burns. All candles should be the same size. Let each group have a different size jar and a stopwatch. As soon as the jar is placed over the candle, begin timing. Stop timing as soon as you see the flame extinguish and smoke evolves from the wick.
All groups are to determine the volume of their jar. The timings and the volumes from each group should be shared and placed in a well-organized data table. Each group should repeat their timings three times, average them, and then share the results. (Be sure to allow air to return into the jars between trials.)

Plot your data on a graph comparing volume of jar to the burning time.
Answer the following questions in a part 2 write-up. Both write-ups should be well-organized and free from grammar and spelling errors.

1. Why do we measure the burning time more than once before sharing?
2. How did you measure the volume of your jar?
3. What variable did you manipulate?
4. What is the relationship between the volume of the jar and the burning time?
5. What type of graph have you constructed?

ICLE Essential Skills

Apply in writing the rules and conventions of grammar, usage, punctuation, paragraphing and spelling. ELA1
Present information in well-organized fashion that will be clear to the target audience. ELA11
Compute the ***volume of three-dimensional figures*** (solids). M17
Know the components and properties of the ***rectangular coordinate system***, (i.e., x - y axis, origin, quadrants, abscissa (x-coordinate) and ordinate (y-coordinate), and the general representation of a point (x,y)). M23
Know and apply the principles of scientific inquiry. *(Implicit in this statement are the processes of prediction, estimation, developing hypotheses, drawing conclusions, evaluation, and following ethical principles and professional procedures.) (Not Ranked) S topic114*
Know the metric system and the units of metric measure and convert metric units to English units. S4
Exhibit good data management skills by collecting, organizing, and graphing data. S19

Scoring Guide:

RATE THE CRITERIA- 3=excellent, 2=satisfactory, 1=unsatisfactory, 0=does not attempt or does not understand

CRITERIA:	SCORE
Experimental procedure and group work	_____
Part 1 repeated for 3 other people	_____
Part 1 chart neatly organized	_____
Part 1 writ-up addresses all four questions in a neat and logical manner	_____
Part 1 write up well written and free from spelling and grammatical errors	_____
Part 2 chart neatly organized	_____
Graph neatly organized and plotted correctly	_____
Part 2 write-up addresses all four questions	_____
Part 2 write-up well written and free from spelling and grammatical errors	_____

Keywords

English Language Arts	Mathematics	Science
Reading	**Algebra-Coordinates, Graphs**	**Earth Science-Heat, Gases, Scientific Inquiry**
Writing-Grammar, Spelling	**Geometry**	**Life Science**
Communications-Listening	**Statistics**	**Chemistry**
Literature	**Calculus**	**Physics-Heat mechanics**
Other	**Trigonometry**	**Other**
	Other	