Gold Seal Lesson:

Copernicus Education Gateway

Author(s): *Michael Lucky Voiselle*			*Lesson Title:* *RAISING WATER REVISITED*			
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.

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

Habits of Mind
Students develop habits of mind including curiosity, open-mindedness and persistence.

Communication

Students communicate and apply scientific concepts

Performance Task

Your task is to determine the relationship between the amount of candles used and the volume of water raised in 4 glasses the same size.
You will need 10 candles the same size. Large birthday candles will do. Attach one, two, three, and four candles to the centers of each of four aluminum pie pans with a drop of melted wax. Light the single candle and quickly place one of the glasses over it. Record your observations in a journal. Light the two candle-pie pan system and quickly place a second glass over the two candles. Again record your results in a journal. Repeat for the three and four candle-pie pan systems.
You must observe carefully to answer some questions that will follow. All observations and questions will be included in a conclusion write-up. The write-up should be well organized and free from spelling and grammatical errors.
Determine a suitable method to find the volume of water in each of the four glasses in milliliters. Record the number of candles verses the volume of water in a neatly organized chart and plot the data on graph paper.
Using the graph you have constructed, you are to predict the volume of water that a 5 candle-pie pan system will hold. Show your prediction to your instructor before you light the 5 candle system to verify that prediction.

Questions to be addressed in your conclusion write-up.
1. Why did we use identical glasses and candles?
2. What variable did you manipulate?
3. Do we need to pour the same amount of water in the pie pan for each system?
4. Which candle-pie pan system did heat develop the most?
5. Was the amount of air trapped under the glasses the same for all four systems?
6. Why did the water level rise the highest in the four-candle system?
7. Was more oxygen burned up in the four-candle system?
8. What was your percentage of error between your five-candle system prediction and the actual measured volume of water in the glass?

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
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*
Make observations using senses and instruments. Inferences and interpretations are arrived at based on observations. Classify observable properties and organize observations in a meaningful and logical way. S5
Exhibit good data management skills by collecting, organizing, and graphing data. S19

Scoring Guide:

RATE CRITERIA: 3=Excellent, 2=Satisfactory, 1=Unsatisfactory, 0=does not attempt or does not understand

CRITERIA	**SCORE**
Experimental procedure and group work	_____
Data chart complete and neatly organized	_____
Graph constructed neatly and correctly	_____
Prediction from graph was accurate	_____
Conclusion write-up addresses all questions	_____
Write-up well organized and free from spelling and grammatical errors	_____

Keywords

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