Gold Seal Lesson:

Copernicus Education Gateway

Author(s): ***Michael Lucky Voiselle***			***Lesson Title:*** ***THE SLINKY MAKES A COMEBACK***			
Grade Span			***ICLE Application Model***			
K-4	***5-8***	***9-12*** ***X***	***A***	***B***	***C***	***D*** ***X***

Instructional Focus:

Reading
Students read a variety of grade level materials, applying strategies appropriate to various situations

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.

Communication
Students communicate and apply scientific concepts.

Performance Task

You are to perform several tasks that involve using a slinky to investigate transverse and longitudinal wave motion. This marvelous toy was used extensively in the 1960's and 1970's for that purpose and is making a comeback. It was put on the market again in 1999 and is packaged in its original box.

Task 1
Your group of 4 students should become familiar with transverse and longitudinal waves by using any resources available to you including textbooks, teachers, parents, encyclopedias, and the Internet. Record all researches and observations in a science journal that you may consult later to write a summary of this experiment.

Task 2
Obtain a slinky and have two people stretch the slinky out holding each of the ends in an immovable position against their chest. Standing next to one of the ends, pinch together 10 of the slinky rings and let go. What did you see? What made the pulse travel across the room? What happened when the pulse reached the other person? Repeat several times to increase your observational skills. What type of a wave did you create?

Task 3
Standing in the same place as in task 2, lift the slinky upward about 30-40 centimeters and let go. What happened? How was this pulse able to travel down the slinky? What happened when it reached the other person? What type of wave is this? Try two quick pulses one full second apart and observe what happens. What happens when the returning wave meets the second pulse? Repeat and observe carefully.

Task 4
Keep the slinky stretched out as you place it on the floor. Have one person hold their end still while the other pushes the slinky forward 30 centimeters and pulls back to the original spot in a quick motion. What type of wave was created here? Do the same motion twenty successive times in rapid motion and record the results. What would happen to the created waves if the slinky were 1 kilometer long?

Task 5
Move the slinky 30 centimeters to the right and 30 centimeters to the left in a quick motion. What type of wave was created? Repeat 20 successive times and describe what happens. What would happen to this wave if the slinky were 1

kilometer long? Repeat the right and left movement until you see the wave motion appear to stand still. What is a wave called that appears to stand still?

Task 6
You are to summarize all your research, observations, and group experiences in a well-organized summary free from spelling and grammatical errors. Be sure to address all questions in the 5 tasks above.

Task 7
Each member of your group must pick one of the 4 topics below. You are to research that topic and share it orally with your group members that they may include your sharing in answering the three topics they did not choose. Each group member is to analyze, ask questions and synthesize the oral presentation of the other members. Each student is to address all 4 topics in another well-organized summary free from spelling and grammatical errors. Be sure to identify which topic was yours and which three were shared with you.

1. Investigate how seismologists use longitudinal and transverse waves to locate the epicenter of an earthquake. How does each wave travel through the earth?
2. Both sound and light travel in waves. However they are not the same type of transmission. Investigate the differences and similarities between light waves and sound waves.
3. Investigate the Doppler Effect as related to sound waves and explain this phenomenon. Also investigate the blue and red shift as related to light waves and explain this phenomenon. Find three occurrences on earth or in space where each of these phenomenons plays a role.
4. Investigate the meaning of the following words. Use all of them in a write-up describing light and sound waves. The write-up must be free from spelling and grammatical errors and well written. (wavelength, crest, trough, vibration, amplitude, frequency, hertz, sine wave and standing waves)

ICLE Essential Skills

Apply in writing the rules and conventions of grammar, usage, punctuation, paragraphing and spelling. (ela1)
Give oral or written directions that are clear and are understood by another person (ela2)
Participate, sometimes leading, in group meetings by contributing, taking turns speaking, and working toward a common goal. (ela20)
Gather information from a variety of sources, including electronic sources, and summarize, analyze, and evaluate its use for a report. (ela3)
Use writing as a tool for learning in formats such as learning logs, laboratory reports, note-taking, journals and portfolios. (ela40)
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 114)*
Exhibit good data management skills by collecting, organizing, and graphing data. (s19)
Understand earthquakes by examining the different types of seismic waves, wave velocities, how waves are transmitted through solids and/or fluids, and how to locate an epicenter by analyzing the travel times of seismic waves. (s32)
Know the characteristics and phenomena of sound waves and light waves. (s90)
Know the concepts and theories of waves (i.e., a vibratory disturbance that propagates through a material or space, and how energy transfer, pulses and periodic waves, and wave motion is incorporated). (s93)
Know the characteristics of periodic waves (i.e., frequency, period, amplitude, phase, wavelength, speed, the Doppler Effect, and wave fronts). (s109)

Scoring Guide:

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

CRITERIA	**SCORE**
Experimental procedure and group cooperation	_____
Task 1	_____
Task 2	_____
Task 3	_____
Task 4	_____
Task 5	_____
Task 6	_____
Task 7 self researched single question written well and free from spelling and grammatical errors	_____
Task 7 Three orally told summaries were analyzed and written well and free from errors	_____
Student demonstrates an understanding for transverse and longitudinal waves as related to sound and light _____	

Keywords

English Language Arts	Mathematics	Science
Reading **Comprehension** **Research**	**Algebra**	**Earth Science** **Earthquakes** **Light** **Science Inquiry**
Writing **Grammar** **Spelling** **Journal** **Expository**	**Geometry**	**Life Science**
Communications **Listening** **Oral Presentation**	**Statistics**	**Chemistry**
Literature	**Calculus**	**Physics** **Sound** **Light** **Wave Mechanics**
Other	**Trigonometry**	**Other**
	Other	