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Wave Introduction Guided Inquiry with Simulations

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Phillip Gauldin**Subject taught:** High School Regents Physics**Grade Levels:** 10th -12th**Topic:** Waves Unit**Today's Lesson:** Wave introduction guided inquiry with simulations**Time Frame:** one block period**Objectives:**

Students

Create pulses and waves along a spring

Map the shape of a pulse and wave

Describe two or three basic vocabulary terms for waves (Wavelength, Crest, Trough, wave height)

Compare a wave simulation to a recreational wave pool

Key Ideas and standards:*Key Idea 4- Energy exists in many forms, and when these forms change, energy is conserved.**Performance indicators**4.3: Students can explain variations in wavelength and frequency in terms of the source of the vibrations that produce them**Major Understand**4.3a: An oscillating system produces waves. The nature of the system determines the type of wave produced.***Materials:**

Large heavy-duty spring with tie wraps, meter stick, computers logged onto the internet, and handout.

Internet sites to be used:

Water Wave simulator-

<http://www.nationalgeographic.com/volvoceanrace/interactives/waves/index.html>

Earthquake simulator-

<http://dsc.discovery.com/anthology/unsolvedhistory/earthquake/interactive/interactive.html>

Description

Teacher role

A five E model for the lesson will be used for the teacher to instruct the lesson. Since most of the lesson is a guided inquiry style, most of the instruction will lend itself to going over directions for a worksheet to be completed.

To engage the students, a super slinky will be setup along the floor attached to a fixed position. Some standing waves will be produced for a visual effect. The teacher will announce a short introduction of waves to the class and how the class will be investigating various types of waves. A general question to the class will be posed. What types of waves are familiar with and how can they be described. This prompt for prior knowledge will begin an initial discussion of waves. Key points will be placed on the white board.

Students will be put into groups of no more than five. There will be three stations. Give the students a handout on the activity. Describe each station giving basic directions reviewing the handout. Each group will be at each station for 15 minutes.

Station one- Wave simulator

Station two- Earthquake simulator

Station three- Spring

The teacher will make sure that the groups will rotate through the stations exploring the particular activity and filling in the required information of the handout. Any questions will be redirected into the group for the group to try to answer themselves. To elaborate, the teacher will stop the station work and ask each group to give three findings of their station work. These findings will be placed on a poster board or white board for referencing. The teacher will ask the class to see any similarities or differences in the findings and then proceed to do a brief explanation on some of the comments.

Student role

Students will observe the slinky spring engagement activity and ask questions on the phenomena. Students will be operating in groups of five students and will have to share data and computers, equipment. Each student and group will be required to fill in all information on the attached handout sheets which outlines the student role in each station. (See hand out)

Upon completing the stations, each group will confer about a few points which will be offered up to the class. Students will participate in some discussion of the topic which at this point will be teacher directed.

Handout – Spring Station

1. Draw a sketch of the spring labeling points A and B. Show the 'x' and 'y' axis on the sketch.

2. Create a single disturbance on the spring by pulling down and releasing the spring in the 'y' direction near point A. This will create a pulse on the spring.

What direction does the pulse move in?

What direction was the disturbance in (what direction did you pull down the spring)?

What happens to the pulse at point B?

Draw a sketch of a snap shot picture of the pulse between points A and B.

3. Create a continual disturbance on the spring by moving the spring back and forth quickly in the 'y' direction near point A
Sketch the shape of the spring showing points A and B.

These types of pulses and waves are called transverse.

4. Create a single disturbance on the spring by pulling back on the spring in the 'x' direction near point A. This will create a different type of pulse along the spring.

What direction does the pulse move in?

What direction was the disturbance in (what direction did you pull back on the spring?)

What happens to the pulse at point B?

Draw a sketch of a snap shot picture of the pulse between points A and B.

These types of pulses and waves are called longitudinal.

Handout – wave simulation station

<http://www.nationalgeographic.com/volvoceanrace/interactives/waves/index.html>

1. Take a minute or two to create different wave scenarios in the simulator by adjusting the three slides which change the
 - Wave height
 - Wave length
 - Wave period
2. Read the short article about why waves do not push boats forward.
3. Read the glossary terms and copy down the definitions for
 - Wave height
 - Wave length
 - Wave period
4. Move the wave height and wave period to maximum and wavelength to minimum. Stop the motion and sketch the outline of the top of the wave labeling the crest, trough and wavelength.
5. How is the simulation similar to you being in a Wave pool like the one at Sea Breeze?

Handout- earthquake simulation

Go to the following website address

<http://dsc.discovery.com/anthology/unsolvedhistory/earthquake/interactive/interactive.html>

Click on the Make a Quake tab on the left

Wait for the program to load

Select Ground (short summary):

Select Prevention (short summary):

Select Magnitude of quake (short summary):

Observations/sketch:

Aftermath short summary:

When you have completed and written down your information above, try selecting different variations and observe the results.

Evaluation Rubric:

The students will be evaluated by a rubric which is similar to below.

5 points	3 to 4 points	1 to 2 points
Student completes entire worksheet with full responses to all questions and comparisons. Student is active with in the group sharing information and contributing	Student completes approximately 75 % of the worksheet with partial answers to all questions. Student is at least communicating with the group with possibly less interaction.	Student completes approximately 25 % of the worksheet with minimal answers to questions. Student is not engaged with their work group.