Teacher resource:

Here's a beginning sample activity that can be used with this Applet. Although the site http://coastal.udel.edu/faculty/rad/superplot.html is intended primarily for wave superposition exploration our example activity has students look at the wave speed vs. depth relationship for shallow waves. Answers are in bold.

Ocean Waves and Wave Speed vs. Depth

Learning objectives:

- To see how wavelength and period are related to wave speed
- To see how wave speed depends of ocean depth
- To become familiar with the JAVA on-line learning environment located at:

http://coastal.udel.edu/faculty/rad/superplot.html

Procedure: Go to to the above URL and after the JAVA applet loads set:

Wave 1 (1,10,1) (height, period, +1/-1)
waves 2,3,&4 to (0,0,+1) (assume all distances are in meters and times are in seconds)

- Set local depth to 3.0 , "superpose", and the plot length to 200 m.
- Click Calculate and then click Stop.

1. Estimate the wavelength from the distances on the screen and the horizontal screen scale (200m). **Ans: ~54 m**

2. Estimate the wave speed by distances and time given on the screen. That is, using the **Calculate Stop** buttons, measure the time it takes a wave crest to travel across the screen (distance=200m) and the speed =distance/time **Ans: ~5.4 m/s**

3. How does this wave speed compare to the ratio **wavelength/period ?**

4. Sketch this wave pattern on a separate sheet of paper.

Repeat 1 and 2 for depths of 5 7 and 9 meters. **Approximate answers:**

d=5.0 m : wavelength= 67 m ; speed=6.7 m/s
d=7.0 m :wavelength= 80 m ; speed=8.0 m/s
d=9.0 m :wavelength= 87 m ; speed=8.7 m/s

Use 3.0 meters (do) and the corresponding speed Vo as references. For each depth compare the ratio V/Vo to the ratios of depths suggested in the Table below.

	$\frac{V}{V_0}$	$\frac{d}{d_0}$	$\frac{d^2}{d_0^2}$	$\frac{\sqrt{d}}{\sqrt{d_0}}$	$\frac{d_0^2}{d^2}$	$\frac{\sqrt{d_0}}{\sqrt{d}}$
$d = 5$						
$d = 7$						
$d = 9$						

How does the speed of a wave change with increasing depth? **Increases or Decreases** with increasing depth?

Which formula best describes how the wave speed v is related to the depth d?

a. V=constant*d
b. V=constant*$\sqrt{d}$
c. V=constant*d^2
d. V=constant/d
e. V=constant/$\sqrt{d}$
f. V=constant/d^2 **answer: b**

Using your values for V and d calculate an average value for the constant (you can calculate the constant 4 times with your 4 data pairs). **constant is about 3.0 sqrt(m)/s**