Waves!

FRAMEWORK

I. Scientific and Engineering Practices
- 1. Asking questions and defining problems

II. Cross-Cutting Concepts
- 1. Patterns
- 6. Structure and function

III. Disciplinary Core Ideas
- PS 1: Matter and its interaction
- PS 4: Waves and their applications

SKILLS/OBJECTIVES

- Learn the definition of wave
- Learn the different parts of a wave
- Explore creating different waves
- Think about the different waves that exist in interactions between matter

MATERIALS

- Corn Starch
- Water
- Speaker
- Long rolls of paper
- Different colored markers
- Standard Slinkys

NOTES

- In the third activity, the discussion of the different types of waves might be to complex for younger children, so it might be more appropriate to have them play with the slinkys and create any wave shapes that they can. You can also try to demonstrate the different types of waves to them.

BACKGROUND

- Ask the students:
  - what is a wave?
  - What kinds of waves are you familiar with? (Ocean waves, sound waves, waves in the bathtub, tv/radio waves)
  - What do waves look like? Draw an example of one.
    - Point out the different parts of the wave
      - Amplitude – the height of the wave from its mid point
      - Crest - the tallest peak of a wave
      - Trough - the lowest dip of a wave
      - Wavelength – the distance over which the wave's shape repeats
  - Explain that there are some waves that we can't necessarily see, but they are still there. Sound and light (partially) travel through the air as waves, to our ears and eyes.
- A wave is made up of a series of particles moving up and down and forward.

Activity #1	**Demonstration**
Materials	- Corn starch - Water - Speaker
Worksheet	No

Ooblek mixture on a speaker is really cool. [Check it out at: http://www.youtube.com/watch?v=NKxKVpHZe5Q].

1. To do the demo, first make ooblex by filling a bowl with 1.5 to 2 cups of corn starch and then slowly adding 1 cup of water until the mixture becomes wet but not too liquid.
2. Fill a speaker cavity with oobleck (should be quite viscous) and turn on the wave generator. You will have to fiddle with knobs to get the most interesting frequency/amplitude. The more bass the song has, the more effectively the oobleck dances. You can prod the oobleck with a pencil eraser but be careful not to puncture the speaker.

3. Explain that the oobleck is moving around as it comes in contact with sound waves. We can't see the sound waves but the oobleck is proof that they are sound waves that are traveling through the air.

Activity #2	**People making waves**
Materials	-long rolls of paper - different colored markers
Worksheet	No

This activity will give the students a feel of the mechanism behind the motion of a wave. Explain that a wave is a series of particles moving both up and down and forward. We will imagine that we are particles and we will be tracing out the path of the wave.

1. Give each student a different color marker
2. One by one, have each students move along the roll while moving up and down, tracing the motion of the wave with the marker. Remind them to that the goal is as smooth as possible, this will get them to actively concentrate on something and effectively slow down their movement. Also remind them that each wave should be different (ie, they shouldn't be tracing the wave of their friend who went before).
3. After each student has gone observe the differences in the waves.
4. Have each student label the following features of their own wave: amplitude, crest, trough, and wavelength.
5. If time permits, students can 'decorate' their wave in a realistic manner. For example, students may decide that they have made an ocean wave and thus want to draw fish, sand, etc. around their wave. Check with the Kids Korner staff to see if you can hang up their creation – if so, use this as extra motivation.

Activity #3	**Slinky Waves**
Materials	- standard slinkys (enough to be used in pairs)
Worksheet	Yes, sheet of different waves

1. Working in pairs kids should be given a slinky and a handout.
2. Instruct one to hold the end fixed and the other to experiment with creating waves.
3. Suggest: a) Pulling several coils toward body and then releasing (creates longitudinal waves), b) Moving slinky right and left (creates transverse waves), c) Looking for standing waves by adjusting speed of (b). Look for points of no motion. Demonstrate any of these types if the students have difficulties.

CONCLUSIONS

- Bring the group back together and recap by asking the following questions:

  - What is a wave?
  - Are all waves visible?
  - Draw a wave and have a student label the trough, crest, wavelength and magnitude.
  - Can anyone name a type of wave