

Pendulum Painting

Date: _____

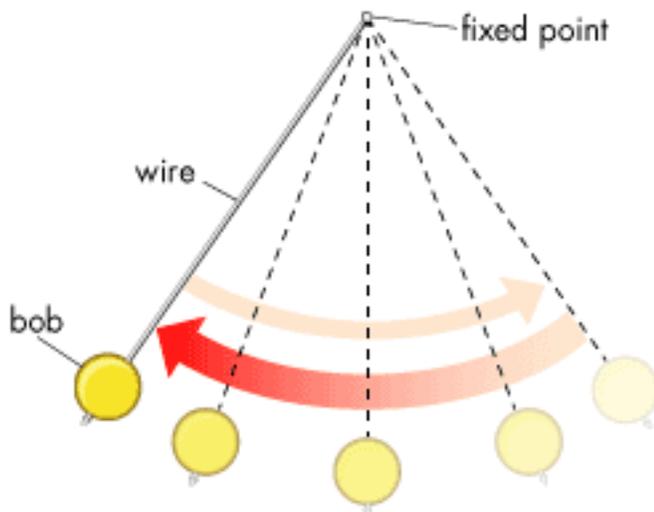
What needs to be prepared **BEFORE** lesson:

Cut off the bottom of the plastic water bottles, enough that each group can do their own painting. Also, use a hole punch and put three holes in the bottom of the bottle (the students will tie twine on this later)

- Maybe you can give the group enough bottles to have all colors:
 - Red, orange, yellow, green, blue, purple, black, brown
 - So each group would have eight colors and eight water bottles to pick and choose what colors they want to use.

Poster on chart paper:

A pendulum is a weight that hangs from the end of a wire or a string. One end of the wire is attached to a fixed point. The weight, called the bob, hangs at the other end. If a person pulls the bob back and lets go, the pendulum swings freely. Once a pendulum is moving, it never twists or spins. (Add picture on chart)



Vocabulary on another chart paper:

1. Pendulum- a weight hung from a fixed point so that it can swing freely backward and forward.
2. Pendulum bob- any object that hangs on the pendulum string.
3. Oscillation- back and forth motion from the bob.
4. Period-amount of time it takes the bob to make one round trip.
5. Velocity- tells the rate of change of position.
6. Acceleration: the rate of change of velocity.
7. Force - strength or energy as an attribute of physical action or movement.
8. Gravity -the force that attracts a body toward the center of the earth, or toward any other physical body having mass.
9. Rotation-If the position of an object changes along a circular path, the object is said to rotate along that circle
10. Work -the distance that an object is moved, multiplied by the force that pushed it along that distance ($W = F \times D$)
11. tripod- a three-legged stand for supporting a camera or other apparatus.

Questions to ask students after reviewing vocabulary (chart paper)

1. How would you define a pendulum?
2. What is the period of a pendulum?
3. What variables can you think of that might affect the rate of a pendulum's swing?

“Now we’re going to do a use our knowledge of a pendulum and make art!”

Materials to make pendulums:

- dowels (these dowels need to be around 3-4 feet in length each)
- twine
- hot glue gun (to reinforce the bottle and the glue lid)
- rubber feet (for the dowels) If inside, these help! If you’re outside, the grass should be able to hold them in place.
- plastic water bottles (pre-cut)
- lids from Elmer’s glue bottles

- hole punch
- tempera paint (all colors)
- water
- ziploc bags
- paper clips
- tape measures (I have tons of tape measures at school I can grab from when we did an after school math club!)

For **each group**, you will need:

1. Three dowels
2. three rubber feet (if inside)
3. twine
4. plastic water bottle (enough for each student)
5. lid from glue bottle (enough for each student)
6. choice of tempera paint
7. Ziploc bag (enough for each student)
8. water
9. tape measure

Step by Step Instructions:

1. Take the three dowels and form a tripod at the top. Wrap twine and weave around the dowels. Attach rubber feet to the bottom. Tie a piece of twine in a loop for the pendulum to hang onto when they are ready to “paint”. In that loop, place a large paperclip.
2. With the bottles pre-cut and pre-hole punched, have students measure out twine to tie to their bottles. Experiment within groups: make some string longer than others and make observations (chart paper after experiment)
 - Have students think what will happen
3. After the twine has been measure and tied, place the glue top on the bottle with hot glue to secure in place.
4. Place and tie all twine together in a big loop at the bottom from the bottle and thread it

onto a large paperclip on the tripod. Place a large piece of paper below the tripod. The glue top should be at least 1 inch away from the paper.

5. Figure out what color you would like to paint with. When you are ready, you should mix one part tempera paint with one part water in a ziplock bag. Pour into the bottle and make sure the glue lid is **CLOSED**.
6. Pull the pendulum off to the side of the paper and open the lid. Let go of the pendulum and let it swing!
7. When you are satisfied, grab the pendulum and close the lid.
8. If there is time, you can hook on another color that someone else has used to make a multicolored work of art!
9. Try starting your pendulum on the opposite side with a new color!

Questions after experiment:

1. What did you notice about the pendulum?
2. What did you notice about the different lengths of twine on your pendulum versus others in your group?