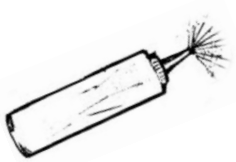
A STEM in the Park Take Home Activity

STEM in the PARK

Science, Technology, Engineering, and Mathematics



Squeeze Bottle Hydraulics

(Big Machine Science)

Ages 6-12

Warning: Do this outside. It is messy.

What You Need

A variety of different shaped and sized, washed and cleaned squeeze bottles such as:

- Kool-Aid Burst juice bottle, ketchup bottle, yellow mustard bottle, squeeze top water bottle or dishwashing detergent bottle
- A water source
- Some friends and/or parents to help you
- A paper target and some tape
- Food coloring

What To Do

1. Make sure all of your bottles are clean and empty of food debris.
2. Fill each bottle about half full of water and use three drops of food coloring (a different color in each bottle) and take the bottles outside.
3. Stand facing the target (make sure it's taped on something you don't mind getting wet).
4. On the count of three, squeeze one bottle as hard as you can, aiming at the target, and see if the water in your bottle reaches the target.
5. Try again with different bottles and different colors of food coloring.

Continued on back

Observe...

- Did the size and/or shape of the bottle make any difference in how far the water shot out?
- Were some bottles easier to squeeze than others?
- Did that make a difference in how far the water went?

Investigate...

- Try again with the same bottles but this time, add more or less water to each bottle.
- Does the amount of water in the bottle make a difference in successfully reaching the target?

Learn...

The Science of Hydraulics – You can't squash a liquid!

If you've ever thought much about it, you've noted that gases are easy to squash. Just about everyone can squeeze the air out of an open balloon. And we know that solids are just the opposite. If you've tried squeezing a hard block of wood with your hands, you'll know it's impossible to squash it. Liquids, however, are an in-between state. Since liquids easily flow from place to place, you might think they'd behave like gases when you try to squeeze them. In reality, liquids aren't compressible—much like that block of wood that can't be squashed. This is the why a belly flop in a swimming pool hurts so much. When your body smacks into the pool, the water can't squeeze downwards (like a mattress or a trampoline) or move out of the way quickly enough. Unless you dive correctly, jumping off a bridge into a river can be almost like jumping onto concrete—it's very dangerous to do.

If you've ever fired a water pistol, you've used this idea already. You've probably noticed that it takes some effort to press the trigger of a water pistol (or to squeeze water from a squeeze bottle). When you press the trigger (or squeeze the bottle), you have to press hard to force the water out through a narrow nozzle. Because you are putting pressure on the water, it squirts out at a much higher speed and with greater force than if you just poured it out. If water weren't incompressible, when you squeezed the trigger or bottle the water inside would simply squeeze itself up into a smaller space. It wouldn't shoot out of the nozzle.

Since water pistols and squeeze bottles can change force and speed, they work just like tools and machines. In fact, the same science that powers water pistols also powers some of the world's biggest machines like cranes, tipper trucks, and diggers—the **science of hydraulics.**

Visit: http://science.howstuffworks.com/transport/engines-equipment/hydraulic.htm

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