

EQUIPMENT BUILD PLAN

AIR & WATER PRESSURE

Pascal Bottle

A 20 ounce bottle with five small, evenly sized holes drilled around its lower sides squirts five matching streams when it is squeezed, no matter where you squeeze or how you hold it. It shows Pascal's principle as clearly as a commercial version that costs around \$60, and it costs nothing.

Written from Bruce's original workshop handout. Bruce's final review of this plan is in progress.



DIFFICULTY	BUILD TIME
Beginner	15 minutes
COST	SAFETY
Free (recycled bottles)	Everyday care
GOOD FOR	
Teachers, Families	

What it shows

Label a water bottle 'Do Not Squeeze!' and wait for someone curious to find out why.

Key ideas: Pascal's principle, fluid pressure, pressure in all directions

Safety (Everyday care). An adult should do the drilling or hold the bottle steady while a push pin is used. Expect water on the floor and wipe it up.

CONSTRUCTION

Build it

Materials

☐ 20 ounce plastic bottle with cap · 1

- ☐ **2 liter soda bottle** · 1
Its bottom becomes a drip tray
- ☐ **Masking tape or a paper label** · 1 strip
For the 'Do Not Squeeze!' sign
- ☐ **Water** · to fill the bottle

Tools

Drill with a small bit

Or a push pin, ice pick or small nail

Scissors or utility knife (adult)

Marker

1

Mark the holes

Mark five spots spaced evenly around the lower sides of the 20 ounce bottle, all at the same height near the base.

2

Drill the holes

Drill a small hole at each mark, all with the same bit. A drill makes neat, uniform holes with clean edges, which gives matching streams.



3

Or poke them

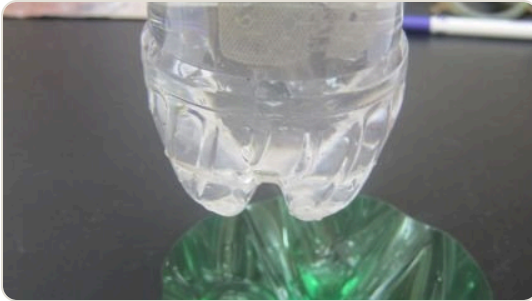
No drill? A push pin, ice pick or small nail also works, though the holes are not as neat. Use the same tool for every hole so they match.



4

Make a drip tray

Cut the bottom off a 2 liter bottle. The 20 ounce bottle sits neatly in the grooves of its base, and the tray catches stray drips.



5

Fill and label it

Fill the bottle with water and screw on the cap. Add a label reading 'Do Not Squeeze!' and set it out on the tray.

6

Squeeze it

Squeeze the bottle and five even streams shoot out in every direction. Try squeezing near the top, the middle and the bottom.



7

Turn it sideways

Hold the bottle on its side and squeeze again. The streams are still even, showing that the pressure rise is the same everywhere in the bottle.

**THE PHYSICS****How it works**

Pascal's principle says that when pressure is applied to a fluid in a closed container, the increase is felt equally throughout the fluid. Squeezing the bottle raises the pressure of all the water inside by the same amount.

Since every hole is the same size and sits at the same depth, each one feels the same pressure, so the streams are the same size and travel the same distance. It does not matter where you squeeze or which way the bottle points.

Squeezing a toothpaste tube is the same idea: pressure on the outside is passed through the paste, and with the cap off the paste flows out to equalize the pressure.

Using it

- Leave the labeled bottle out before the pressure lesson and let curiosity do the rest.
- Ask: does it matter where you squeeze, top, middle or bottom? Have students predict and explain before trying it.
- Ask what would change if one hole were bigger, or one were higher up the side.
- Follow up with Cartesian divers, Diving Dan and hydraulic syringe pairs.

GO FURTHER

Variations

- Add more holes wherever you like; the commercial version has 10.
- Drill holes at different heights and compare the streams with the cap off (depth pressure) and with the bottle squeezed (applied pressure).

IF IT DOESN'T WORK

Troubleshooting

IF THIS HAPPENS

The streams are uneven.

TRY THIS

The holes are different sizes or have ragged edges. Drill them all with the same bit, or start a new bottle.

IF THIS HAPPENS

Water dribbles out when nobody is squeezing.

TRY THIS

Make sure the cap is tight. A little leaking is normal; the drip tray handles it, and the drops help tempt the curious.

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