**Crushing the Can**

**Curriculum Links:**

[AW2.1](https://www.edonline.sk.ca/webapps/moe-curriculum-BBLEARN/index.jsp?view=indicators&lang=en&subj=science&level=2&outcome=4.1)

Investigate properties of air and water (in all three states of matter) within their environment. [SI, TPS]

[SM3.2](https://www.edonline.sk.ca/webapps/moe-curriculum-BBLEARN/index.jsp?view=indicators&lang=en&subj=science&level=3&outcome=2.2)

Assess the function and characteristics of strong, stable, and balanced natural and human-built structures. [CP, TPS]

[MC5.1](https://www.edonline.sk.ca/webapps/moe-curriculum-BBLEARN/index.jsp?view=indicators&lang=en&subj=science&level=5&outcome=2.1)

Investigate the characteristics and physical properties of materials in solid, liquid, and gaseous states of matter. [CP, SI]

[MC5.2](https://www.edonline.sk.ca/webapps/moe-curriculum-BBLEARN/index.jsp?view=indicators&lang=en&subj=science&level=5&outcome=2.2)

Investigate how reversible and non-reversible changes, including changes of state, alter materials. [SI]

[FM5.1](https://www.edonline.sk.ca/webapps/moe-curriculum-BBLEARN/index.jsp?view=indicators&lang=en&subj=science&level=5&outcome=3.1)

Analyze the effects of gravitational, magnetic, and mechanical forces, including friction, on the movement of objects. [CP, SI]

[HT7.2](https://www.edonline.sk.ca/webapps/moe-curriculum-BBLEARN/index.jsp?view=indicators&lang=en&subj=science&level=7&outcome=3.2)

Explain how understanding differences between states of matter and the effect of heat on changes in state provide evidence for the particle theory. [SI]

[FD8.1](https://www.edonline.sk.ca/webapps/moe-curriculum-BBLEARN/index.jsp?view=indicators&lang=en&subj=science&level=8&outcome=3.1)

Investigate and represent the density of solids, liquids, and gases based on the particle theory of matter. [SI, TPS]

[FD8.2](https://www.edonline.sk.ca/webapps/moe-curriculum-BBLEARN/index.jsp?view=indicators&lang=en&subj=science&level=8&outcome=3.2)

Examine the effects of forces in and on objects in fluids, including the buoyant force. [CP,SI,TPS]

[FD8.3](https://www.edonline.sk.ca/webapps/moe-curriculum-BBLEARN/index.jsp?view=indicators&lang=en&subj=science&level=8&outcome=3.3)

Investigate and describe physical properties of fluids (liquids and gases), including viscosity and compressibility. [SI]

[AE9.1](https://www.edonline.sk.ca/webapps/moe-curriculum-BBLEARN/index.jsp?view=indicators&lang=en&subj=science&level=9&outcome=2.1)

Distinguish between physical and chemical properties of common substances, including those found in household, commercial, industrial, and agricultural applications. [SI]

**Science Background:**

* Inside the can at room temperature (with the water inside) is at the same air pressure as the air outside the can
* Water expands to about 600 times its liquid volume when heated above its boiling point (100 degrees)
* Water expands and pushes almost all of the air outside of the can. The water vapor inside the can has the same pressure as the air outside the can
* Hot water vapor condenses into liquid water when cooled
* The volume of the condensed water is approximately 600 times less than the previous hot water vapor volume
* Atmospheric pressure outside is now much greater and immediately squashes the can while simultaneously forcing water up into it

**Materials:** Empty soft drink cans, hot plate, cold water, bowl, tongs, oven mitt

**Directions:**

1. Fill a bowl or jar almost to the brim with cold (if possible, refrigerated) water. Note: tap water works fine but colder water yields more spectacular results – use refrigerated or icy water if possible
2. Optional: add several ice cubes to the water if available – the results is more spectacular with colder water
3. Add four or five tablespoons of water to the empty soft drink can.
4. Place can on the hot plate. Keep boiling the water for approximately 15 seconds.
5. Turn off the hot plate, bring the can above the bowl of water, then turn it upside down submerge the hole into the cold water. Note: don’t turn the can over until it is over the bowl because the remaining water will spill – you will hear loud fizzing as the water inside the can runs down onto the hotter parts of the cane - you don’t need to submerge the whole can in the water
6. CRUNCH!!! The result is instantaneous! Note: the can will more than likely be ‘pulled’ out of the tongs and into the water – a few drops of cold water may spray out of the bowl
7. Hold the can up so students can observe the dramatic result. Note: the can will be cold enough to touch almost immediately

**Inquiry Questions:**

**Source:** <http://www.abc.net.au/science/surfingscientist/pdf/teachdemo18.pdf>