

Water Forces		Grade 3: Forces Causing Movement	
Lesson Plan		<b>Safety Notes</b>	Ask an adult for help with poking holes in the bottle and using scissors
<b>Description</b> Students will learn about the forces found in the environment while experimenting with water.			
<b>Materials</b>			
<u><b>Spinning Water Bottle</b></u> <ul style="list-style-type: none"> <li>● 3 Straws (Preferably bendy ones)</li> <li>● Empty plastic bottle</li> <li>● Screw or something pointy</li> <li>● Scissors</li> <li>● Modelling clay (or playdough)</li> <li>● String</li> <li>● Water</li> <li>● Big bowl or a large bassin (sink or tub)</li> </ul>		<u><b>Water Wheel</b></u> <ul style="list-style-type: none"> <li>● Skewer</li> <li>● 2 paper clips</li> <li>● Tape</li> <li>● 2L bottle or large bowl</li> <li>● Scissors</li> <li>● Long Cork or empty spool of string</li> <li>● 2 Index Cards</li> <li>● Mod Podge *Optional</li> <li>● Paint Brush *Optional</li> </ul>	
<b>Science Background</b>			
<u><b>What is a Force?</b></u>			
<p>A force is something that causes a push or pull action on an object as a result of its interaction with something else. If you have ever seen something moving, you have watched “force” in action. For example, when you walk you are pushing yourself off the ground with your feet or when you eat, you are pulling the food towards you. Forces can either be contact forces, where the moving object was physically touched by another object, or non-contact forces, where a force moves an object without technically touching the object. An example of a contact force would be you pushing a desk across the room; a non-contact force is gravity forcing an object to fall to earth.</p>			
<u><b>Forces in the Environment</b></u>			
<p>Some of the forces that we experience are the result of the environment around us such as wind and water. The force of the wind can blow over objects, such as garbage bins and laundry. In events such as tornadoes and hurricanes, the winds are extremely strong, and cause a lot of damage to houses and other large structures. Wind and water can also cause erosion, on mountains and river banks, causing them to gradually wear away. Even though it happens so slowly that we cannot watch it happening, erosion changes the landscape slightly every year. The faster water moves, the faster the sand and soil are removed or eroded away from the shore. Just like wind, water can cause a lot of damage when events such as floods or tsunamis occur. While these forces resulting from nature can be strong</p>			

and dangerous, they can also be fun! We use wind to fly our kites and water helps us do activities like canoeing, kayaking, and paddle boarding. When we do these activities, we use our paddle to “push” us through the water by pulling the paddle towards us, through the water, which causes us to move forward. But, why are we able to do this on water but not on land? It is because of friction. There is low friction between a paddle board and water so it glides easily. While there is very high friction between land and a paddle board, making it very hard to move.

## Activity Procedure

### Spinning Water Bottle

1. *Ask for adult assistance for this step.* Make 3 holes in the bottle evenly spaced. You can make the holes by pushing your sharp object through the side of the bottle and then using your scissors to make the holes large (If using a smaller bottle, make the holes about 3 cm from the bottom, if using a large bottle make them about 6 cm from the bottom.)
2. Cut your straws so that there is about 4 cm on either side of the bendy section. To use straight straws, just cut 3 pieces about 6 cm long and cut one end on a 45° angle (make sure all ends are cut in the same direction).
3. Place one end of the straw into the holes in the bottle and secure it using your modelling clay and make sure to cover any holes (when we fill the bottle with water, we only want it to come out of the straws). \*Note: make sure all the straws are pointing in the same direction - if using straight straws, make sure the 45° angle side is sticking out and all facing the same direction before securing them with the clay.
4. Remove the lid of the water bottle and tie your string tightly around the top of the bottle so that you will be able to hold up the weight of the bottle when filled with water. \*Note: you can also poke two holes at the top of the bottle and push the string through if the other way does not work.
5. Plug the ends of your straws with your fingers or extra modelling clay and fill the bottle with water.
6. Holding the bottle by the string, make sure it is above a large container or a sink then unplug the straws and watch what happens!!



### **Water Wheel**

1. Take your skewer and push it through your cork or empty spool. Set aside.
2. *\*Ask an adult for help for this step.* If using a 2L bottle: cut it in half and then take the bottom half and poke about 6 holes 3cm from the bottom (the same way we did in the previous activity).  
*\*you can also use a bowl but you will have to empty out the water occasionally.*
3. Cut up index cards into 6 rectangular pieces that will fit onto your cork or spool.  
*\*If you wanted to use the water wheel more than once, make it waterproof with some mod podge.*
4. *\*Ask an adult for help with this step.* Using hot glue or white glue so that it looks like a waterwheel, try to space them out evenly.
5. Tape your two paper clips to either side of your 2L bottle
6. Slide one end of your skewer through one paper clip and the other through the opposite paperclip on the opposite side of the bowl/2L bottle.
7. Place into a basin (such as a sink) under a stream of water (such as a tap) and watch what happens!

### **Debrief**

#### **Spinning Water Bottle**

The water bottle spins because the force of gravity is pushing down on the water. Since the bottle is sealed except for the straws, the water is forced through the straw, and because the straws are angled the water is pushed out in a specific direction (counterclockwise) forcing the bottle to spin in the opposite direction (clockwise). The bottle continues to spin until the water is below the straws. Some sprinkler systems work in a similar way, however they have a continuous water flow and will stop when the water is shut off.

#### **Water Wheel**

The wheel spun and kept spinning because of the force of the water continuing to push on the different sections of the water wheel. Water wheels have been used for thousands of years; using water wheels humans have been able to use one of nature's natural forces to help with farming, blacksmithing and many other tasks. After a couple of thousand years we invented hydroelectric dams, which provides Canadians with over 25% of our electricity (over 40% in Ontario).

Water Forces!

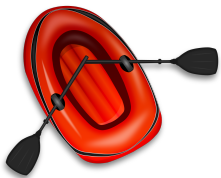
Grade 3: Forces Causing Movement

Fill in the blanks to complete the sentences using the word bank below.

wind	electricity	Water	friction
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- \_\_\_\_\_ and \_\_\_\_\_ are two forces in nature that are very good at causing things to move, change speed, or change direction.
- The surface of water has less \_\_\_\_\_ than the surface of the ground, allowing us to glide things over water with ease.
- We can use the forces of water or wind to generate \_\_\_\_\_; we can use this to power things like lights and machines.

Look at the following pictures, and write **Water** if the driving force is water, or **Wind** if the driving force is wind:



\_\_\_\_\_

In the space below, draw 3 different ways you use water in your everyday life:

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Water Forces!

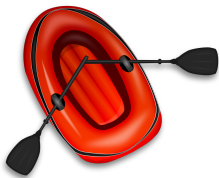
Grade 3: Forces Causing Movement

Fill in the blanks to complete the sentences using the word bank below.

wind	electricity	Water	friction
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1. Water and wind are two forces in nature that are very good at causing things to move, change speed, or change direction.
2. The surface of water has less friction than the surface of the ground, allowing us to glide things over water with ease.
3. We can use the forces of water or wind to generate electricity ; we can use this to power things like lights and machines.

Look at the following pictures, and write **Water** if the driving force is water, or **Wind** if the driving force of nature is wind:



water



wind



wind



water

In the space below, draw 3 different ways you use water in your everyday life:

<p>Example:</p> <p>washing your hands</p>	<p>Example:</p> <p>taking a bath</p>	<p>Example:</p> <p>doing the dishes</p>
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