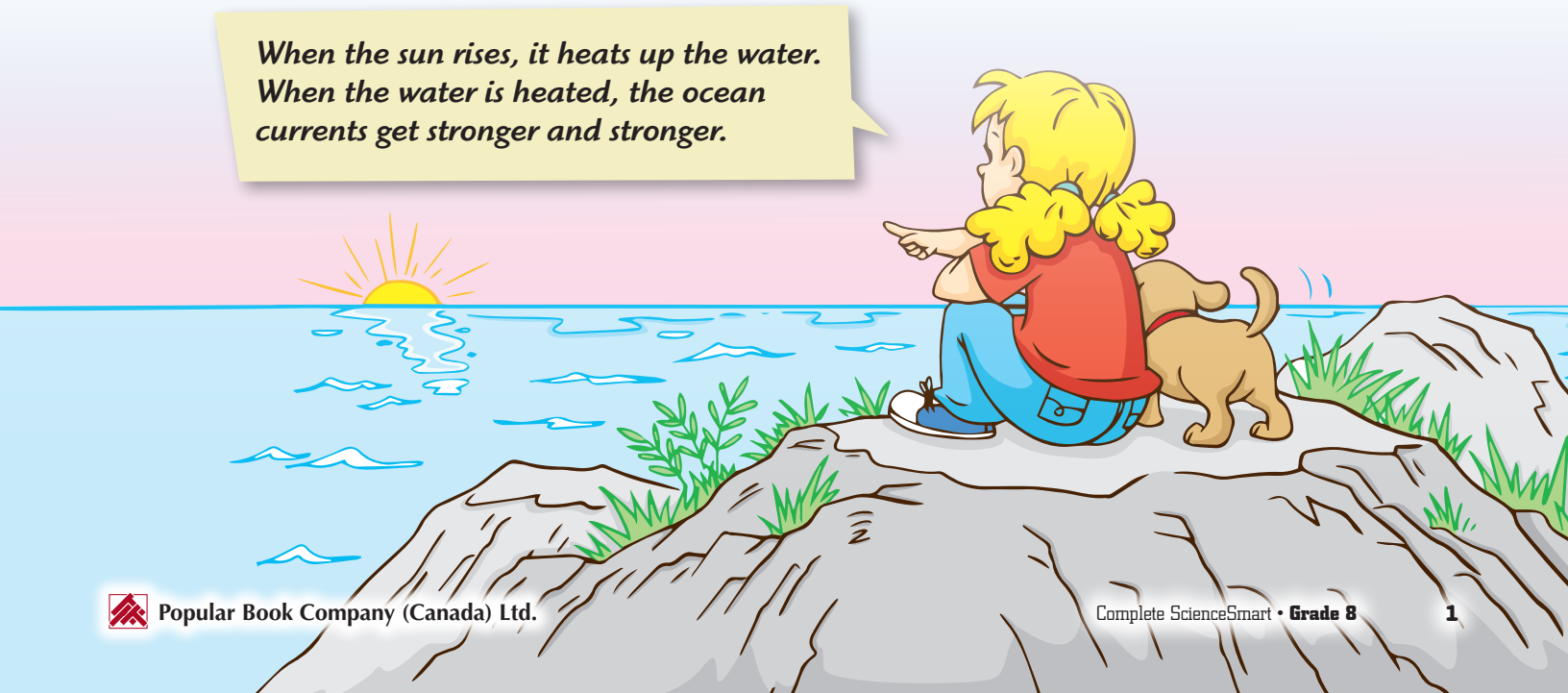
EXPLORATION 2

What happens when hot water mixes with cold water?

Discover how water with different temperatures and densities mix.

Did you know that there is a density difference between hot and cold water? When water is heated, its molecules speed up and bounce farther apart, occupying a greater volume that results in a decrease in density. But when water is cooled, its molecules slow down and move closer together, occupying a smaller volume that results in an increase in density. Therefore, hot water is always less dense than cold water.

If you visit the ocean, you will quickly notice that water movement is everywhere – and is often intense. Apart from the wind and the effect of the moon on tides, water itself plays an important role in creating ocean currents. Because warm water is less dense, when warm water and cold water meet, warm water rises to the top, creating a phenomenon called "convection". The water at the surface of the ocean is heated during the day. It then cools and sinks at night, creating a slow and continual convection current from the bottom to the surface and back again. Water convection in the ocean creates currents in a circular motion and moves water around the globe. However, water convection sometimes does not happen peacefully. When strong ocean currents move warm tropical water up to meet the polar water, the result is a storm or even a hurricane.



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The salinity of water is also an important factor in creating a huge water circulation system in the deep ocean. Salty water is denser than fresh water. Therefore, when these two factors, heat and salinity, are present, the effects of the variations in water density are enhanced. This may create an even more powerful and destructive storm or hurricane.

This phenomenon can be seen in action in the Gulf Stream. There, the strong ocean current moves warm tropical water from the Gulf of Mexico all the way up the Norwegian Sea. It also shows the impacts of convection currents on hurricanes and storms. Many areas through which the Gulf Stream travels, such as North Carolina in the U.S., can experience intensified storms and hurricanes from the transfer of heat through water. In fact, Cape Hatteras, N.C. is located at a significant convection point between warm and cold waters, resulting in infamously dangerous storms.

In 2005, Hurricane Katrina devastated the lives of many along the Gulf Coast. A storm with strong, fast-moving winds, known as a "tropical depression", began to form. Because of convection, the tropical depression then turned into a massive hurricane that destroyed many parts of the southern United States, particularly Louisiana.

Luckily, these waters are not a huge mystery to us. Scientists use the Gulf Stream to make predictions about incoming hurricanes and storms, which is very important for the safety of the people in affected regions.

Do some research with your friends or family to find out more about Hurricane Katrina and how it started.