Robogals Science Challenge

Minor Challenge Set #2
STEM Field: Environmental Science
Level: Junior
Challenge Name: Weather Science: Make A Tornado
Project Cost: 0-20 USD
Materials Required:

- 1 clear water bottle with a lid (a big water bottle can make it easier to see the tornado)
- Water
- Dish soap / dishwashing liquid
- Food colouring (optional, but makes it easier to see the tornado)

Safety:

- Adult assistance may be needed when making the tornado.

Duration:

- The challenge takes approximately 30 minutes to finish, however, the time guideline is an estimation only, and students and mentors can complete the tasks around their schedules.

Introduction:

A tornado is a violent rotating column of air that stretches from the clouds to the ground. It can destroy large buildings, bridges, cars, and more. It can also uproot trees or create flying debris.

Most tornadoes form from thunderstorms and a few other conditions. At an increasing height, a change in wind direction and wind speed causes

the air to spin horizontally. As this column of air sucks warm air from the ground, it grows longer and stretches toward the ground. When this column of air reaches the ground, it turns into a tornado.

Watch this video from TED to learn how a tornado form - https://www.youtube.com/watch?v=lmWh9jV_1ac

Instructions:

1) Fill the bottle about ¾ full with water.
2) Add a few squirts of dish soap / dishwashing liquid. Add a few drops of food colouring if you want to observe the tornado more easily.
3) Seal the bottle tightly.
4) Turn the bottle upside down and hold it by the neck. Spin the water quickly in a circular motion for about 10-20 seconds. Stop and look to see if you can see a mini tornado forming in the bottle. Take a photo of the tornado in the bottle to submit later!
5) Remove some water from the bottle.
6) Seal, turn the bottle upside down and spin in a circular motion again. Write down your observation of the size and speed of the tornado.
7) Remove some more water from the bottle. Repeat step 6.

Note: It may take some tries for the tornado to swirl properly.

Figure 1 - A small tornado forming in a water bottle

So, what happened?

When you are spinning the water bottle in a circular motion, you are applying a force. This force is directed towards the centre of the bottle. The water in the bottle responds to this force, and so, it spins in circular motion, creating a small tornado that you can observe.

Extension

Add some variations to this experiment by using water bottles of different sizes, or spin the water in a different direction. What do you notice about the shape and size of the tornado?

Reflection Questions:

- Are there any improvements you would make to this challenge?

- Write 2-4 observations of the tornado that you made in the water bottle. For example, the size and speed of the tornado as you change the amount of water.
- Do a quick research on tornadoes that have occurred in the city, state or country you are living in now. Is there a tornado season where you live, or a season when tornadoes occur more often? Is there any number of how many tornadoes are recorded a year?
- From your own research, or using the Learn More! Resources below, what are some 3-5 actions can you take before, during, and after a tornado?

Submission Guidelines:

- Submit a photo of the experiment setup. Include a short summary that addresses the reflection questions.

Note: Remember, if you want to upload pictures of your Minor Challenge that also include you, please check if it is OK with your parent or guardian first.

- The submission form is on the Minor Challenges page: https://sciencechallenge.org.au/index.php/minor-challenges/ Fill out the details and make sure you upload your submission.

Learn More! Resources:

- This article contains photos of tornadoes, actions to take before, during, and after a tornado - https://kids.nationalgeographic.com/science/article/tornado

- Learn more about characteristics and interesting facts about a tornado - https://www.ducksters.com/science/earth_science/tornadoes.php

Bibliography:

- *Earth Science for Kids: Weather - Tornadoes* (no date) *Ducksters*. Technological Solutions, Inc. (TSI). Available at: https://www.ducksters.com/science/earth_science/tornadoes.php (Accessed: April 9, 2023).
- *Tornado in a bottle* (no date) *CS mott children's Hospital*. Michigan Medicine. Available at: https://www.mottchildren.org/posts/camp-little-victors/tornado-bottle (Accessed: April 9, 2023).