Twisting Tornados

Overview: Tornadoes can happen anywhere. Hurricanes make their way to the coast of Virginia almost every year. Help students see how a cyclone is formed that effects their weather.

Procedure:
1) Give students the writing prompt: *What is it like outside during severe weather like hurricanes and tornadoes.* Allow students to write their responses and then encourage them to share what they wrote with the class.
2) Fill one of the two liter bottles about two-thirds of the way with water. Add 3-4 drops of dish detergent and 3-4 drops of the food coloring.
3) Place the washer on top of the bottle opening. Place the second 2 liter bottle on top of the washer so that the two bottle necks face each other. Wrap duct tape around the bottle necks to hold them together.
4) Turn the bottles over so the water slowly drips down. Quickly rotate the bottles in a horizontal circle. A cyclone will appear.
5) Have students recor their observations.
6) Explain that real tornadoes are caused in the atmosphere when wind changes in pressure and force causes the circular motion, much like what is happening in the bottle.

SCIENCE

3S-ESS 1a: The student will investigate and understand basic types, changes and patterns in weather. Key concepts include identification of common storms and other weather phenomena

5S-SI 1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and investigations in which
a: distinctions are made among observations, conclusions, inferences, and predictions
l: models are constructed to clarify explanations, demonstrate relationships, and solve needs.

5S-SI 2 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and concluding investigations in which
d: hypotheses are formed from testable questions
i: inferences are made and conclusions are drawn
j: models are constructed to clarify explanations, demonstrate relationships, and solve needs

5S-FME 1a: The student will investigate and understand characteristics and interactions of moving objects. Key concepts include: motion is described by an object's direction and speed.

5S-ESS 1a: The student will investigate and understand how weather conditions and phenomena occur and can be predicted. Key concepts include weather phenomena.

8S-SI 2a: The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which data are organized into tables showing repeated trials and means

Extension idea:

Have the students try changing the amount of time they shake the container or the speed at which they do it to see how it could effect the length of their tornado.

8S-SI 3m: The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which models and simulations are constructed and used to illustrate and explain phenomena.

8S-ESS 4: The student will investigate and understand the properties of air and the structure and dynamics of Earth's atmosphere. Key concepts include:

b: pressure, temperature, and humidity

e: the relationship of atmospheric measures and weather conditions

HSS-ESS 3c: The student will investigate and understand that energy transfer between the sun and Earth and its atmosphere drives weather and climate on earth. Key concepts include severe weather occurrences, such as tornadoes, hurricanes, and major storms.

READING & WRITING

3E-RW 2a The student will use newly acquired vocabulary drawn from reading and other content areas.

b: demonstrate understanding of the meaning of newly acquired vocabulary.

3E-CN 1g: The student will sequence at least two steps in a procedure or ideas/incidents in an event.

4E-CN 1d: The student will interpret information presented visually and orally.

5E-RW 1f: The student will demonstrate understanding of content-specific words.

8E-RW 1e: The student will acquire and use content words and phrases.

8E-WP1a: The student will write to convey ideas and information including facts, details, and other information

d: The student will use content specific vocabulary when writing about a topic.

8E-WP 5b: The student will write to convey ideas and information clearly including facts, details and other information.

c: The student will produce writing that is appropriate for the task, purpose o audience.

HSE-WP1b: The student will write to convey ideas and information using clear organization and including facts, details, and other information as well as graphics and multimedia as needed.

d: The student will produce writing that is appropriate to a particular task, purpose, and audience.

HSE-RW2c: The student will acquire and use new words and phrases.

HSE RW3c: The student will demonstrate knowledge of the meaning of words and phrases from reading and other content areas by using content.

Extension Idea

Upon completion of this experiment, students will write a text that summarizes their experiences and findings. This can be a fun way for the students to demonstrate what they have learned. Particular attention may be given to content words, figurative language, and sequence of events. Encourage students to include illustrations, tables, graphs, and digital photographs. Texts might take the form of a PowerPoint presentation, book, journal entry, newsletter, or blog. These texts might make great additions to self-selected reading libraries.

Math

6M-NCSE 1a The student will demonstrate a simple ration relationship.
7M-NCSE 3a The student will use a ratio to model or describe a relationship.
8M-PSPFA 3a The student will graph a simple ratio by connecting the origin to a point representing the ration in the form of y/x. For example, when given a ratio in standard form (2:1), convert to 2/1, and plot the point (1,2).
HSM-FS 3a The student will given data, construct a simple graph (table, line, pie, bar, or picture) and answer questions about the data.

Extension Idea

Explore the ratios between the ingredients in the tornado, e.g. the amount of food coloring used to the amount of detergent. Set this up in a ratio using three different methods: food coloring to detergent, food coloring : detergent, food coloring / detergent. Then use a coordinate plane to plot the relationship. Lead a discussion with students regarding what other ratios can be set up and plotted in this manner.

Materials Needed:

-2 empty 2 liters bottles (per group)
- water
- dish soap
- food coloring
- metal washer
- duct tape
- data collection sheet for prompt responses and observations

Instructional Setting:

This activity can be done in the classroom as a whole group or small group activity.

Community Connections and/or Peer Interaction:

Students can work together in small groups.

Functional Activity/Routine:

This activity encourages functional skills such as turn-taking, following instructions, and cleaning up afterward.

Strategies to Collect Evidence:
For collection of evidence, be sure that each student records a hypothesis and data individually.

Specific Options for Differentiating this Activity:
-Shaking up the water can be difficult. Have students work with a peer that can complete this task. An old turn-table can be connected to an power link and switch. Place the bottle on top of the turn-table and the students can activate the switch, thus causing the turn-table to rotate the bottles.
-Allow students to use their preferred "pencil" when writing. This may include a writing utensil, keyboard, alternative pencil, or dictating to a scribe.
-A picture of a severe weather can be used as a writing prompt for students to predict what happens in severe weather.
-Prepare, as necessary, for each student to make choices and communicate with their preferred method. This may include using augmentative communication.