Why Do Soccer Balls Get Flat Science Fair Project

Summary

Students work together as a class to generate a science fair project. The students use the steps of the scientific method to ask a question, form a hypothesis, design a test, collect data, and draw conclusions. Their findings are presented to the class and placed on a science fair project board for the school science fair. The topic of this project is to find out what happens to the circumference of a balloon when it is placed in dry ice, kept at room temperature and when it is warmed by a hair dryer.

Time Frame

1 class periods of 60 minutes each

Group Size

Small Groups

Materials

- 12" round balloons, one per group
- small cooler with dry ice inside, usually you can purchase dry ice from a grocery store
- hair dryer with a hot heat setting, one per group if possible
- tape measure
- several half sheets of paper per group
- one science fair presentation board
- headings made for the presentation board: why we did this, what we think will happen, how we did it, what we saw, what we learned

Background for Teachers

When soccer balls and basketballs are left out in the cold they go flat. When the gas in a balloon is cold, the molecules have less energy, move more slowly and don't collide as hard or as often with the side of the ball. The ball decreases slightly in size and it becomes flat. When the gas in a balloon is hot the molecules have more energy, move more quickly and collide hard against the side of the ball, this causes the ball to swell. A ball that is firm will bounce higher. Therefore, a gas that is cooled will contract and the balloon becomes smaller, while a gas that is heated will expand and the balloon becomes larger. This explains why a hot air balloon rises.

Intended Learning Outcomes

- Framing questions. Designing investigations. Conducting investigations. Collecting data. Drawing conclusions.
- Developing social interaction skills with peers. Sharing ideas with peers. Connecting ideas with reasons. Using multiple methods of communicating reasons/evidence.
- Ideas are supported by reasons. Differences in conclusions are best settled through additional observations and investigations. Communication of ideas in science is important for helpiing to check the reasons for ideas.

Instructional Procedures

Pre-lab Discussion:
Bounce a basketball that is flat on the ground. Ask the students why it doesn't bounce back very well. Have students predict when a ball becomes flat more often: summer or winter. Discuss why that may be the case and begin a discussion on gases and how the volume of a gas changes with

temperature. Discuss with the students what a science fair is and tell them that they will complete a science fair project today in the classroom.

Instructional Procedure:

I. Experiment: Complete the experiment first and then work on writing the assigned sections for the project board.

- Blow up a balloon to a circumference, at its widest point, of about 17 inches. This will be your room temperature data point.
- Place the balloon into a cooler of dry ice, being careful not to touch the dry ice with your hands. Have the measuring tape wrapped around the balloon so that when you lift the lid you can quickly get the temperature reading. Close the lid and leave it for 2 minutes. Lift the lid and very quickly measure the circumference of the balloon. This is your dry ice data point.
- With a hair dryer on high heat setting, warm up the balloon. Measure the circumference of the balloon after about one minute of warming up the balloon. This is your hot data point.
- Place these data points in a data table. Make a graph that plots the three temperature points on the x-axis and the circumference in centimeters on the y-axis.

II. Science fair display board: Assign each group a different section of the class science fair display board. Each group can decide what to write and then help the students take turns writing the different words on a half sheet of paper. Students will write up their section and then place it in the appropriate area on the display board. If you take pictures of the students working on the project you can put them on the board as well.

- Why we did the project -- In a couple of sentences, write the purpose of the experiment. For example, we want to find out why our soccer balls are flat in the winter if left outside.
- What we think will happen -- Students can predict as a group which balloon they think will be the smallest. For example, we think the balloon will be the smallest when placed in a cooler with dry ice. If they predict a different outcome then use their hypothesis.
- How we did our project -- Simplify the experiment. Put it in number format of no more than 3 steps.
- Title -- Make a title that is catchy and describes the experiment.
- What we saw -- Place each group's data table and graph on the project board. Students can also draw some pictures to add to the board.
- What we learned -- In a few sentences, explain whether the student's prediction was correct. Explain what this tells them about why their soccer balls go flat if they leave them outside in the winter.

Left Panel	Center Panel	Right Panel
Why we did the project	Title	What we learned
What we think will happen	Tables, pictures	
How we did our project	drawings	Name of teacher

Bibliography

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