

# Investigating Physical Properties & "Fair Test"

**Lesson Name:** Ball Bounce Experiment

**Grade Level:** K - 2

## Overview:

There are many different types of balls, designed for different purposes. Changes in design features including size and materials results in balls with varying properties. In this experiment students will explore these properties, and make predictions about why certain balls are best suited for certain activities.

Through this experiment students will engage in the **practices** of: *asking questions; planning and carrying out an investigation; analyzing and interpreting data; using mathematics; and constructing explanations.*

## Materials:

- Various different types of balls (super ball, tennis ball, basketball, ping pong ball, marble etc)
- A yardstick, measuring tape or other means of measuring height
- Data and graphing worksheets
- Optional: timer

## Lesson Outline:

- Ask students if they think it would be easy to play soccer with a bowling ball, tennis with a marble, soccer with a basketball etc. As students respond ask them to describe what characteristics of the balls they think make them well suited to their purpose. E.g. "Why is a basketball good for basketball, but not for tennis?" (Photos of various balls, or physical examples of balls can be used, for individual or small group discussion of various properties of balls, to develop speaking & listening CCELA skills.)
- At center, or in small groups, provide students with different balls being used in this experiment and ask students to fill out the characteristics of balls worksheet. Encourage them to investigate and think about all the different components of the ball – what is it made from, how well does it bounce, how large is it, etc. Alternately, have the class work as a group to list the characteristics of the balls. Create a chart on the board or a large piece of paper to record their observations.
- Now explain to the students that you want to create a fair test to determine which of the balls is most bouncy. A fair test means that you try to keep everything the same (controlled) such as the height from which ball is dropped, except for the one thing that you want to change (type of ball, or "independent variable"). This will allow you to compare the bounciness of the balls, which is the result of the experiment.
- Ask the students which things they think they should keep the same for each test in order to make it a fair test. The controlled variables for this experiment are the **height from which the ball is dropped, the surface** on which the ball bounces, and, if using a stopwatch, **the time** that the stopwatch begins timing.
- Split the students into groups. 3 per group is ideal because there will be a role for each student. If you are also using stopwatches then 4 per group is ideal. One student will be the dropper of the ball, one will measure the height that the ball bounces back to ("rebound height") and one student will record the data on the data sheet. If using stopwatches the fourth student will operate the stopwatch.

- f. TIP:* This experiment will be easiest for students if the measuring device is taped to a wall. This is a good opportunity to discuss measurement with students, and possibly give them the opportunity to make their own measuring device. You can tape pieces of 8.5" x 11" sheets of paper together and, using a ruler, you can have them make a 3-4 foot measure.
- g.* Make sure all students agree on the procedure for dropping the ball. It should always be dropped from the same height. If using a timer the timer should always start from the same point. Two ways this can be accomplished is by having the timer operator and the ball dropper count down from five. A second way is to have the ball dropper start the timer with one hand and start the timer with the other. If timing the bounce it should also be agreed upon that the timer should be stopped only when the ball has stopped bouncing completely (this is the "bounce time").
- h.* Have the students record the data about rebound height and bounce time on the data sheet. Explain that they should test each ball multiple times (at least 3). Scientists always replicate tests numerous times to be sure the results are consistent.
- i.* After the students have collected their data explain the procedure for finding the average for the three tests. Have each group find the average bounce time and rebound height for each of the balls and record this information on their data sheet. This can also be done as a class, using a board or large piece of paper.
- j.* Finally, have the students create bar graphs to display their results. The "Y" axis (the horizontal axis) should be labeled with the different types of balls. The "X" axis (the vertical axis) should be labeled with rebound height. Initially the scale for the rebound height should start at 0 and end, at the top point, at 3-4 feet, depending on the maximum height to which the balls bounced.
- k.* Have groups trade bar graphs with another group and attempt to interpret that group's results. Did they get similar results to the group they traded with? What was the average height to which each of the other group's balls bounced?
- l.* Have the students make predictions about why the different types of balls bounce the way that they do. What is the intended use for each ball? Would it work as well if it bounced more or less?

*Extensions:*

- For younger students all of this work can be completed as a group, on the board or chart paper. Students should all have an opportunity to let the ball drop and record the rebound height, but the teacher can be responsible for collecting and recording the data.
- For additional testing the surface on which the balls bounce can also be varied. Have groups repeat their test on different hard surfaces (wood, concrete) and softer surfaces (grass, carpet).
- Encourage students to look for connections between rebound height and bounce time. Did the balls that bounced the highest also bounce the longest?