Second Grade

Best Lesson: Friction - Balloon Rocket

Unit : Energy/Pushes and Pulls

Performance Standard(s) Covered:

S2P3. Students will demonstrate changes in speed and direction using pushes and pulls.

(S2CS3): Students will use tools and instruments for observing, measuring, and manipulating objects in scientific activities.

a. Use ordinary hand tools and instruments to construct, measure, and look at objects.

Essential Question:

What is friction? What is resistance? What types of objects have more friction? How does a ball or wheel reduce friction?

Objective:

The goal of my lesson is to give the children hands on experience with friction and resistance, then lead a fun activity in which the kids make a basic air-powered machine and measure the distance it can travel in different scenarios. The kids will understand difficult friction and resistance concepts and have fun!

Key Words and Terms:

Friction

Resistance

Ball-bearing.

Learning Activity

Kids learn about friction by experimenting with sandpaper a tennis balls. Then, the students will make balloon-powered boxes that travel different distances on carpet or a bed of straws. The students will measure and record their distances.

Materials Needed:

Two 1x1 inch pieces of sandpaper per student, with a rough and a smooth side.

One basketball or other large ball

One bottom half of a shoebox for every four students.

One balloon for every group, with extras in case some are destroyed.

Safety Concerns:

The kids could rub one another with the sandpaper.

Procedure:

1. The lesson will begin by asking the students to describe resistance. Ask "what is resistance?" and explain that resistance goes against the force of a push or a pull.
2. Bring up a student volunteer to arm wrestle you, and explain that you am pushing on his hand, and he is resisting my push.
3. The students will then each get two 1x1 inch sheets of sandpaper with one rough side and one smooth side. They will put the smooth sides of their sandpaper together and, using only their index fingers, attempt to rub the two sheets against each other as fast as they can for 10 seconds.
4. They will do the same experiment with the rough sides together and see that friction makes this very difficult, "resisting" their pushes and pulls.
5. Next, a few volunteer students will come up and give a basketball a small push across the floor. They will see that a small push can make the ball go pretty far.
6. Then ask them to try pushing the ball with your finger on the top, so that the ball cannot roll. This is very difficult. Explain that by rolling, a ball or wheel avoids friction because

it does not have to "skid" across the floor. This is how the brakes of a car work: they prevent the wheel from rolling so that friction can slow the car down.

7. Next, the students will get into groups of four to make balloon-powered box cars. You can make larger groups if you do not have enough good boxes - the boxes must be light and be large enough for a balloon to inflate well inside them. T
8. he groups will receive a box with a hole cut in the end (cereal boxes with a hole in the bottom), a balloon, and about 15 straws.
9. First, the kids will put their balloon through the hole with the opening of the balloon sticking out.
10. Then, they will blow up their balloons, twist the top a little, then let the box go on the carpet.
11. We'll measure the distances that our balloon boxes travel, and record them.
12. Then, we'll make a span of straws for the box to start on.
13. The kids will put their balloon-powered boxes on the straw bed, release them, and measure the distance. Explain that the box no longer has to skid across the floor and be resisted by friction, allowing the box to travel much farther.
14. Use the directions from the clip at 19:26 in this Bill Nye video to make your rocket:

    https://www.youtube.com/watch?v=nmnzLW6YoF0

Notes and Tips:

Sometimes the kids have difficulty inflating the balloon enough to make the box move. Most of the boxes moved about 6 inches on a table, but about 2 feet or more on a bed of straws.

References:

I got the idea from an old Bill Nye Video.
https://www.youtube.com/watch?v=nmnzLW6YoF0Balloon Rocket!

Worksheet To Use

Balloon Rocket! (Use complete sentences)

1. Which objects experience more friction? Rough objects or smooth objects?

2. How does a ball or a wheel avoid friction?

3. How does blowing your balloon up more affect your rocket?

4. How does moving across straws affect your rocket?

Trial #	Distance
1 (On carpet)	
2 (On straws)	
3 (Balloon filled)	