

FUN WITH FRICTION

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Tennessee 4-H Youth Development

Fun with Friction

Skill Level
Beginner

Learner Outcomes

The Learner will be able to:

Conduct an experiment that shows how friction and surface texture can increase and decrease motion.

Educational Standard(s) Supported

- 5PS2.2: Make observations and measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
- 5PS2.4: Explain the cause and effect relationship of two factors (mass and distance) that affect gravity.

Success Indicator

Learners will:

- Complete lab and show their results in a table with correct units of measurement.
- Explain how friction works and what results from friction.
- Identify the two factors that affect the amount of friction that exists and describe how each affects the motion of an object.

Time Needed
20 Minutes

Materials List

1 ball or matchbox car, 1 grooved or flat ruler, 1 meter stick, textbooks, *Fun with Friction* Supplemental Handout

Introduction to Content

Friction is the resistance that a moving object meets when it is in contact with another object. It could be said to be a gripping force between two surfaces. Friction slows movement. It can also generate heat. The amount of friction will depend upon what the two contacting surfaces are made of and how hard they are pressed together.

Introduction to Methodology

Students will complete a hands-on experiment in order to learn about friction and the forces affecting it. Students will create a ramp and roll an object on two different surface types.

Students will work in groups and record their findings on a supplemental handout.

Author

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Prepared using research-based practices in youth development and experiential learning.

Terms and Concepts Introduction

Friction — the resistance that a moving object meets when it is in contact with another object or surface.

Setting the Stage

- Review the concept of friction with students.
 - **Friction is the resistance that a moving object meets when it is in contact with another object.**
- Discuss the two factors that affect the amount of friction there will be:
 - **How hard the two surfaces are pressed together?**
 - **What the two contacting surfaces are made of?**

Opening Questions

Ask the students: **Have you ever wondered why a rolling object comes to stop and doesn't just keep rolling?**

Possible follow-up questions or discussion points include:

Matchbox Cars rolling on hard wood vs. carpet

Begin experience by sharing learner outcomes with group as found on page 1.

Experience

Begin by having students make an initial class hypothesis as to which type of surface they think the ball will roll farther on, making sure everyone's opinion is expressed.

1. On a tile floor, place one end of the ruler on a book as shown in the supplemental handout to make a slide.
2. Have a student place the ball or matchbox car at the top of the ruler and let it go. Do not push it. Use a grooved ruler for the ball or a flat ruler for the matchbox car.
3. Help students measure how far the car/ball rolls from the end of the ruler on the tile floor and record the distance with correct units of measurement in the chart below.
4. Repeat steps 2-3 above three more times.
5. Move experiment to a carpeted area. (If room doesn't have carpet, you could bring a blanket to use as your surface.)
6. Repeat steps 1-4 on a carpeted floor. Record your measurements with correct units of measurement in the chart below.
7. Have students average the distances from each of the four trials for each surface type. Compare the two averages obtained (tile vs carpet) to the class hypothesis to determine whether the class hypothesis was correct.

	Distance the Ball Rolled			
	Trial 1	Trial 2	Trial 3	Trial 4
Ball Roll on Tile Floor				
Ball Roll on Carpeted Floor				

Tips for Engagement

Demonstrate examples of friction with students.

- When a ball flies through the air, it rubs against air molecules. The air molecules and the molecules on the ball catch on each other. This contact is friction, and it slows down the movement of the ball.
- When you have larger groups of students, break them into groups of three or four so all students feel engaged.

Share

On which surface did the ball roll farther? (Tile Floor)

Process

- Take a poll of students to determine their answer to: **Which surface applied more friction to the ball/car?** (Carpeted Floor)
- Ask students: **What would happen if you placed the ruler on two books?** (The ball should go farther on both the carpet and tile. The ball at the top of two books has more potential energy than the ball on one book. However, the ball will always travel farther on tile than on the carpet due to less friction.)
- Discuss with students: **What effect does the weight of the ball have? Would a heavier ball roll farther?** (The heavier the ball, the more friction there is. Even though there is more friction with a heavier ball, the weight of the ball will cause the heavier ball to travel farther.)

Generalize

- Have students **define friction in their own words.** (Ex: It is when two surfaces come into contact with each other and cause a gripping to occur between the two surfaces.)

Apply

- Ask the students for real-life examples of friction and how we use it.
 - Give students this example to get them thinking:
How do we slow down or come to a complete stop in our vehicles? (The brake pads use friction by rubbing together on the rotor to slow or stop the car.)
- Ask students: **Can you think of any situations in which friction is not helpful to us?**
- Using supplies found in this classroom, have students create their own experiment to demonstrate the force of friction. Students cannot copy the experiment they did today.

References

Erin Barnes. *The Force of Friction*. Retrieved August 3, 2016.
lessonplanspage.com/scienceforceoffriction4-htm

The NEED Project. (2009). *Energy in Motion*. Manassas, VA: United States Department of Energy.

Life Skill(s) from TIPP for 4-H

5th Grade

Participate in 4-H club meetings by saying pledges, completing activities, and being engaged. (Head)

Select at least one project area in which to focus future 4-H participation. (Head)

Communicate information learned from a specific project area to the larger 4-H club. (Head)

Identify at least one goal as an individual and the tasks or steps necessary to meet that goal. (Head)

Supplemental Material

Friction is the resistance that a moving object meets when it is in contact with another object. It could be said to be a gripping force between two surfaces. Friction slows movement. It can also generate heat. The amount of friction will depend upon what the two, contacting surfaces are made of and how hard they are pressed together.

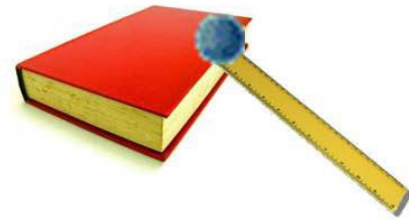


What You Will Need For this Experiment:

1 ball or matchbox car, 1 grooved or flat ruler, 1 meter stick, textbooks

Procedure:

1. On a tile floor, place one end of the ruler on a book as shown in the picture to make a slide.
2. Place the ball or matchbox car at the top of the ruler and let it go. Do not push it.
3. Measure how far it rolls from the end of the ruler and record in the chart below.
4. Repeat Steps 2-3 three times.
5. Repeat Steps 1-4 on a carpeted floor. Record your measurements in the chart below.



	Vs.	Distance the Ball Rolled			
		Trial 1	Trial 2	Trial 3	Trial 4
					
Ball Roll on Tile Floor					
					
Ball Roll on Carpeted Floor					

Conclusions:

1. On which surface did the ball roll farther? _____
2. Which surface applied more friction to the ball? _____
3. Define FRICTION in your own words. _____
4. What do you think would happen if you placed the ruler on two books? _____
5. What affect does the weight of the ball have? Would a heavier ball roll farther? _____

