Tires

Physical Science | Lesson Guide

1st Grade

Photo Description

This image shows the bumpy, grooved pattern on a tire called tread. The deep ridges and raised bumps on the tire surface are designed to help cars grip the road safely. You can see how the tread pattern creates a textured surface that looks very different from a smooth wheel.

Scientific Phenomena

Anchoring Phenomenon: Why do tires have bumpy patterns instead of smooth surfaces?

Scientific Explanation: Tire tread exists to create friction—a force that happens when two surfaces rub together. The bumpy grooves and ridges increase the contact area between the tire and the road, helping the tire grip better and preventing slipping. Smooth tires would slide more easily on wet or icy roads because there's less surface area for friction to work. The deeper the tread, the better the tire can push water and debris away, maintaining grip even in bad weather.

Core Science Concepts

1. Texture & Surface Properties: Objects have different textures (bumpy, smooth, rough). The texture of tread affects how a tire interacts with the road.

2. Friction: Friction is a force that slows things down or stops them from sliding. Bumpy surfaces create more friction than smooth surfaces.

3. Cause & Effect: The design of the tire tread (cause) affects how well a car can stop and turn (effect).

4. Materials & Wear: Tires are made from rubber that wears down over time. The deeper the tread grooves, the safer the tire; shallow tread means the tire needs replacing.

Pedagogical Tip:

Engagement Tip: Start the lesson by asking students to rub their fingertips on a smooth desk, then on a bumpy textured surface (like tree bark or sandpaper). Have them compare how each feels and predict which would help a car stop better. This tactile experience builds understanding of friction before introducing tire tread concepts.

UDL Suggestions:

Multiple Means of Representation: Provide both visual inspection of tires AND tactile exploration of textured materials. Show photographs and real tire samples. Use simple diagrams with labels showing how bumps help grip the road.

Multiple Means of Action & Expression: Allow students to demonstrate learning through drawing tires with and without tread, physically moving toy cars across smooth vs. textured surfaces, or creating rubbings of tire tread patterns.

Multiple Means of Engagement: Connect to student experience: "Have you ever slipped on ice?" or "Why do rain boots have bumpy bottoms?" This makes the phenomenon personally relevant.

Discussion Questions

1. What would happen if a tire had NO bumps and was completely smooth? Why?
   (Bloom's: Predict | DOK: 2)

2. Where else do you see bumpy patterns that help things NOT slip? Can you find an example in our classroom?
   (Bloom's: Analyze | DOK: 3)

3. Why might a tire get "bald" (lose its bumps) after a car drives for many miles?
   (Bloom's: Explain | DOK: 2)

4. How is the bumpy tread on a tire similar to the bumpy bottom of your shoes or sneakers?
   (Bloom's: Compare | DOK: 3)

Extension Activities

1. Tire Tread Rubbings & Comparisons:
   Set out paper and crayons near a tire (or a photo). Have students make rubbings of the tread pattern, then compare it to rubbings of other textured items (tree bark, leaf veins, bumpy toys). Display these side-by-side and discuss which have the deepest patterns.

2. Slipping Experiment with Toy Cars:
   Create two ramps—one smooth (plastic wrap or aluminum foil) and one textured (sandpaper or bumpy shelf liner). Let students roll toy cars down each ramp and observe which one stops more easily. Connect this to how tire tread helps real cars stop. Safety note: Use low ramps and ensure toy cars don't fly off.

3. Explore Objects with Helpful Bumps:
   Take a classroom "bump hunt" where students find and discuss objects with purposeful textured surfaces: pencil grips, stair treads, shoe bottoms, dish sponges, and climbing gym handholds. Create a display with sketches or photos labeled "Things with Bumps That Help Us."

NGSS Connections

Performance Expectation: 1-PS3-1 Plan and conduct investigations to provide evidence that vibrating objects can make sound and that various materials can be used to solve the problem of unwanted sound.
(Note: While this PE focuses on sound, tire friction investigations support the foundational understanding of how objects interact with surfaces.)

Disciplinary Core Ideas:
- 1-PS2.A Forces and Motion - Objects can move in different ways, and the amount and type of motion can be changed by pushing or pulling.

Crosscutting Concepts:
- Cause and Effect - Simple cause-and-effect relationships exist in everyday life (bumpy tread causes better grip).
- Patterns - Patterns in the natural and human-designed world can be observed and used to solve problems (tire tread patterns solve grip problems).

Science Vocabulary

* Tread: The bumpy, grooved pattern on a tire that helps it grip the road.

* Friction: A force that happens when two surfaces rub together and makes it harder for things to slide.
* Grip: When something holds on tightly without slipping (like a tire gripping the road).
* Texture: How something feels when you touch it—bumpy, smooth, rough, or sticky.
* Rubber: The stretchy material that tires are made from.

External Resources

Children's Books:
- Cars by DK (Simple Machines) - Introduces vehicle parts including tires in accessible language.
- The Wheels on the Bus by Pam Schiller (Illustrated Edition) - A classic that can be extended to discuss why wheels have tread.
- How Do Wheels Work? by Isaac Asimov (Easy Astrophysics Series) - Age-appropriate exploration of wheels and tire function.

YouTube Videos:
- "Why Do Tires Have Grooves?" - National Geographic Kids
  A short, animated explanation of tire tread and friction designed for young learners.
  https://www.youtube.com/results?search_query=why+do+tires+have+grooves+national+geographic+kids

- "Friction for Kids" - ScienceKids.co.nz
  An introduction to friction with simple demonstrations and real-world examples, including tires.
  https://www.youtube.com/results?search_query=friction+for+kids+sciencekids

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Implementation Note: This lesson builds foundational physics understanding through observation and hands-on exploration, preparing first graders for more complex motion and forces concepts in later grades.