

The Science of the Soar: Trampoline Physics

Lesson Overview

In this lesson, students will transform their backyard trampoline into a physics laboratory. By using their own bodies and simple household items, they will discover how energy changes forms, how gravity pulls us back to Earth, and how "elasticity" makes the big bounce possible.

Learning Objectives

By the end of this lesson, the student will be able to:

- **Define** Potential and Kinetic energy in their own words.
- **Explain** how a trampoline surface uses elasticity to create a bounce.
- **Predict** how adding weight (mass) changes the way objects bounce.
- **Demonstrate** the "transfer of energy" using a partner or a prop.

Materials Needed

- An outdoor trampoline (safety net highly recommended)
- 3-4 balls of different sizes (e.g., a tennis ball, a soccer ball, and a beach ball)
- A piece of sidewalk chalk (if the trampoline mat is dark) or painter's tape
- A stopwatch or phone timer
- A "Science Log" (notebook) and a pen/pencil

1. Introduction: The Hook (5 Minutes)

The Question: "If you jump off a chair onto the grass, you mostly just... thud. But if you jump on a trampoline, you fly back up. Why doesn't the trampoline just stay flat when you land on it?"

The Objective: Today, you aren't just a jumper; you are a **Kinetic Engineer**. We are going to figure out the secret code of the bounce: Potential Energy, Kinetic Energy, and Elasticity.

2. Body: Content & Practice (30 Minutes)

Part A: I Do - The Energy Rollercoaster

The Concept: Explain that energy is never lost; it just changes "outfits."

- **Potential Energy:** This is "stored" energy. When you are at the very highest point of your jump, for a tiny split second, you stop moving. That is 100% Potential Energy. You are a coiled spring ready to go!
- **Kinetic Energy:** This is "moving" energy. As you fall back down toward the mat, your potential energy turns into kinetic energy. The faster you fall, the more kinetic energy you have.
- **Elasticity:** This is the "Snap-Back." When you hit the mat, the springs stretch. They want to go

back to their original shape, so they push back against your feet, launching you upward again.

Part B: We Do - The Popcorn Experiment

Let's test how energy moves from one thing to another. This is called *Energy Transfer*.

1. Place a soccer ball in the middle of the trampoline.
2. The student stands near the edge.
3. **The Test:** Jump hard near the ball without touching it. What happens? (The ball should fly up).
4. **Discussion:** Your feet put energy into the mat. The mat moved that energy through the springs and "popped" it into the ball. You gave your energy to the soccer ball!

Part C: You Do - The Gravity Olympics

Now, the student will run three "trials" to see physics in action. Record the findings in the Science Log.

- **Trial 1: The Mass Test.** Drop a tennis ball from chest height. Measure how high it bounces using a mark on the safety net or a spot on the wall. Now, drop the soccer ball. Which has more "oomph"? (Heavier objects stretch the springs more, creating a different bounce).
- **Trial 2: The Hang-Time Challenge.** Use the stopwatch. Try to stay in the air as long as possible. To get more "Potential Energy," do you need to push harder (Force) or tuck your knees? Record your best time.
- **Trial 3: The Dead Bounce.** Try to land without bouncing back up. How do you do it? (You have to bend your knees to "absorb" the energy so the springs can't throw it back at you).

3. Conclusion: Recap & Reflection (10 Minutes)

Summary: Bring the student off the trampoline for a "Cool Down" chat.

- **What did we learn?** We learned that jumping up creates Potential Energy, falling down creates Kinetic Energy, and the springs use Elasticity to keep the cycle going.
- **The Big Takeaway:** Energy doesn't just disappear; it moves from your muscles, to the mat, to the springs, and back to you!

Check for Understanding: Ask the student: "If I replaced the trampoline springs with stiff wooden boards, would you still bounce? Why or why not?" (Answer: No, because there would be no elasticity to store and return the energy).

Success Criteria

The student has succeeded if they can:

1. Point to the highest part of a jump and identify it as "Potential Energy."
2. Identify the springs as the source of "Elasticity."
3. Complete the three trials in the Science Log with observations.

Differentiation & Adaptations

- **For Advanced Learners:** Introduce *Newton's Third Law* (For every action, there is an equal and

opposite reaction). Have them calculate the average "hang time" over 5 jumps.

- **For Struggling Learners:** Focus strictly on the "high/low" concept. Use a slinky toy to demonstrate how the trampoline springs stretch and relax to make the concept of elasticity visual.
- **For Group/Classroom:** Have students work in pairs. One person is the "Timer/Recorder" while the other is the "Jumper," then swap roles.

Assessment

- **Formative:** Ask the student to predict which ball will bounce higher before the "Popcorn Experiment."
- **Summative:** Have the student draw a diagram of a person jumping on a trampoline and label three points: Potential Energy, Kinetic Energy, and Elasticity.