BOUNCE! (1 Hour)

Addresses NGSS
Level of Difficulty: 2
Grade Range: 3-5

OVERVIEW

In this activity, students drop rubber balls in order to observe and measure the effects of elasticity. They use graphs to make predictions for further trials.

Topic: Elasticity

Real World Science Topics:

- An exploration of how the height of a rebound is related to the height a ball is dropped from.
- An exploration of the elasticity of rubber balls.

Objective

Students will gain an understanding of how the height from which a ball is dropped affects how high it bounces. Students will also learn about averaging, graphing, and lines of best-fit in this exploration.

Materials Needed for Each Team of 2-4 students

rubber ball
meter stick or tape measure
graph paper
pencil

NGSS Three-Dimensions

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information • Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.	**PS2.A: Forces and Motion** • The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it.	**Patterns** • Patterns of change can be used to make predictions.

BOUNCE! BACKGROUND INFORMATION

What is elasticity?

When people think about something being elastic, they usually think of that object being able to be stretched. For example, rubber bands can be stretched well beyond their original length without breaking. However, this is not what makes them elastic. Scientifically speaking, a substance is elastic if it quickly returns to its original shape after it is stretched. Substances (such as putty) that stretch easily but do not return to their original shapes are said to be plastic, but not elastic.

How do scientists measure elasticity?

There are different ways to measure elasticity. One measure of elasticity is Young's modulus, which is essentially a ratio of the amount of force applied to the object to the amount of deformation the object experiences. Scientists measure Young's modulus by applying force to an object and observing how much the object is deformed under that force. The more the object deforms under stress, the smaller the Young's modulus is. Another way to measure elasticity is to measure the number of times an object can be stretched while maintaining its ability to return to its exact original shape. The more precisely the object returns to its original shape, the more elastic it is.

What are some real world uses of elastic materials?

Elastic materials have many real world uses. Many common objects, such as rubber bands, make use of elastic materials. Springs of all kinds are elastic. The elasticity of the spring comes primarily from its coiled shape. Elastic materials are used in many types of clothing, particularly those such as professional swimsuits, which are intended to closely hug the body. The elasticity of rubber allows the material to be used in many applications where a material must rebound from repeated stresses. These include car tires and running shoes.

key Vocabulary
Elastic: describes a material that can be stretched or squeezed and return to its original shape

TEACHER HANDOUT FOR *BOUNCE!*

Name _____ **date** _____

How do you think the original height of the ball will affect the height of the bounce? Do you think the ratio between the two will change with height?

[I think dropping the ball from higher will lead to a higher bounce. I do not think that dropping it from higher will change the ratio of the original height to the bounce height.]

Height	**Trial 1**	**Trial 2**	**Trial 3**	**Trial 4**	**Trial 5**	**Average**	**Original Height / Average Bounce**
20cm							
40cm							
60cm							
80cm							
100cm							

Based on the line of best-fit on your graph, what is your prediction for the height of the bounce for 80 cm and 100 cm?

Based on the ratio in your table, what is your prediction for the height of the bounce for 80 cm and 100 cm?

Did your observations support your hypothesis? Explain your answer.

[My data supported my hypothesis. The ball bounced higher when we dropped it from a greater height, and the ratio was about the same for all heights.]

STUDENT HANDOUT FOR *BOUNCE!*

Name _____ **date** _____

How do you think the original height of the ball will affect the height of the bounce? Do you think the ratio between the two will change with height?

Height	**Trial 1**	**Trial 2**	**Trial 3**	**Trial 4**	**Trial 5**	**Average**	**Original Height / Average Bounce**
20cm							
40cm							
60cm							
80cm							
100cm							

Based on the line of best-fit on your graph, what is your prediction for the height of the bounce for 80 cm and 100 cm?

Based on the ratio in your table, what is your prediction for the height of the bounce for 80 cm and 100 cm?

Did your observations support your hypothesis? Explain your answer.