



Drexel-SDP GK-12 ACTIVITY

Subject Area(s): Physical Science

Associated Unit: None

Associated Lesson: None

Activity Title: Newton's Laws in Action

Grade Level: 7 and 8 (7-9)

Activity Dependency: None

Time Required: 45 minutes

Group Size: 1 students

Expendable Cost per Group: US \$0

Summary

Using common household or classroom items, let the students creative abilities to demonstrate Newton's three laws on motion. The students are asked to explain what they are doing verbally, draw a diagram of how they demonstrated the law and write it in paragraph form.

Engineering Connection

Understanding key concepts like Newton's laws of motion, law of conservation of mass, law of conservation of energy, law of universal gravitation is crucial to being able to understand more complicated engineering principles. This is a building block of an engineering education. Engineers also need to be creative, think out side of the box and be able to apply things they read in a textbook – this is a first attempt at that for many students.

Keywords Newton's first law of motion, Newton's second law of motion, Newton's third law of motion

Educational Standards

- Science: 3.1.10, 3.4.7, 3.4.10
- Math: None.

Learning Objectives

After this lesson, students should be able to:

- State Newton's three laws of motion and give examples of how they work.

Materials List

Each group needs:

- Worksheet
- Things to demonstrate the laws such as: balls, spools, marbles, string, etc...

Vocabulary / Definitions

Word	Definition
Newton's First Law of Motion	State that an object at rest remains at rest and an object in motion remains in motion at constant speed and in a straight line unless acted on by an unbalanced force.
Newton's Second Law of Motion	States that the acceleration of an object depends on the mass of the object and the amount of force applied.
Newton's Third Law of Motion	States that whenever one object exerts a force on a second object, the second object exerts an equal and opposite force on the first.

Procedure

Background

Newton's First Law of Motion: The first part of the first law explains why a football remains on a tee until it is kicked off, or a gust of wind blows it off. The second part of the first law explains why a bike rider will continue moving forward after the bike comes to an abrupt stop. Gravity and friction of the sidewalk will eventually stop the rider.

Newton's Second Law of Motion: The first part explains why the acceleration of a medium weight bowling ball will be greater than the acceleration of a larger bowling ball if the same force is applied to both balls. The second part of the law explains why the acceleration of the bowling ball will be larger if a larger force is applied to the bowling ball. The relationship of acceleration (a) to mass (m) and force (F) can be expressed by the following equation:

$$acceleration = \frac{force}{mass} \text{ or } a = \frac{F}{m}$$

Newton's Third Law of Motion: This law explains that a runner is able to move forward because of the equal and opposite force that the ground exerts on the runner's foot after each step.

Before the Activity

- Print out the handouts for each student
- Set out the materials to demonstrate the laws – balls, spools, marbles, etc...

With the Students

1. Give out the copies of the handouts.
2. Break the students into groups of 3.
3. Give the students a selection of materials to demonstrate the laws (balls, spools, etc.).
4. Let the students start trying to demonstrate the first law of motion.
5. Have them show you what they are doing to make sure they are on the right track.
6. Continue with the second and third laws.
7. Collect the in class worksheets from the students when they finish.

Safety Issues

- None

Troubleshooting Tips

There are no common issues with this activity.

Assessment

Pre-Activity Assessment

Class Discussion:

- Discuss Newton's three laws of motion.

Activity Embedded Assessment

Handout: Have the students fill out the handout and review their answers as a measure of the concept comprehension.

Post-Activity Assessment

None

References

Holt Science & Technology, Sound and Light Teacher's Edition, Holt, Rinehart and Winston, Austin.

Owner

Drexel University GK-12 Program

Contributors

Valerie R. Binetti, MSE Department, Drexel University

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Name _____

Date _____

Newton's Laws in Action!

What is Newton's first law of motion?

How can you demonstrate it with the materials provided? First demonstrate, then draw and write up what you did.

What is Newton's second law of motion?

How can you demonstrate it with the materials provided? First demonstrate, then draw and write up what you did.

What is Newton's third law of motion?

How can you demonstrate it with the materials provided? First demonstrate, then draw and write up what you did.