

THE BIG TOP: TEACHER GUIDE

Subject: Physical Science

Grade Level: Middle School 8th Grade

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Case Summary

The 'Big Top' Circus has come to town. It is opening night and during the final rehearsal things start to go wrong. Can you help the performers get everything back on track in time for tonight's curtain?

Credits

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Learning Objectives

1. Understand how simple machines are used to make work easier.
2. Be aware of the other forces, gravity, friction and air pressure and how they may affect the motion of objects.
3. Recognize how velocity, acceleration and forces work together to create motion in objects.
4. Describe balanced and unbalanced forces
5. Apply Newton's Laws of Motion to explain how certain
6. State Newton's three laws of motion and display an understanding of their applications.
7. Calculate the acceleration that results from a net force.
8. Use Newton's Second Law of Motion in solving problems when friction is ignored.
9. Use Newton's Second Law of Motion in solving problems when friction is included.
10. Use Newton's Second Law of Motion in solving problems dealing with tension.
11. Solve problems involving the incline plane.

Georgia Performance Standards

- S8P3. Students will investigate the relationship between force, mass, and the motion of objects.
- a) Determine the relationship between velocity and acceleration.
 - b) Demonstrate the effect of balanced and unbalanced forces on an object in terms of gravity.
 - c) Demonstrate the effect of simple machines (lever, inclined plane, pulley, wedge, screw, and wheel and axle on work.

S8P5. Students will recognize characteristics of gravity, electricity, and magnetism as major kinds of forces acting in nature.

a. Recognize that every object exerts gravitational force on every other object and that the force exerted depends on how much mass the objects have.

S8CS6. Communication

c. Organize scientific information in appropriate tables, charts, graphs, and identify relationships they reveal.

Assessment

- Box chart
- Lab: How can you measure speed?
- Tic-Tac-Toe Board (Force, mass and motion of objects)
- Graphic Organizers (Magnetism Pop-up Book, Simple Machines Cube, Newton's Laws Book and Electricity Comic Strip)
- Gismo
- Exit Tickets per activity: index card with activity question.

Ex. What is the relationship between velocity and acceleration?

Students will answer the question on the note card and turn it in as they leave the room.

- Lab: How does design affect speed?
- Activity: Simple Machines (Mechanical Advantage) K'nex Kits
- Acceleration and Slope
- Newton's Laws
- Friction in Air
- Simple Machines: Tiered Lesson

Implementation Strategy

Before beginning this case be sure students have become familiar with terminology.

Students will need this prior knowledge in order to develop investigations to determine how certain factors like, speed, mass and distance affect forces. Knowledge about the types of simple machines and how they affect work is needed. Students also need to understand basic concepts regarding electricity and magnetism.

Begin with reading the Scene and having students complete the Box Chart to identify important information given in the scenario and needed to solve the problem. Review information found with students.

Implement activities from suggested list or other resources to familiarize students with some of the results different forces have on objects, how simple machines work and the composition of electrical circuits and magnetism.

Continue with investigations until students are ready to begin going through the scenario and determining the steps needed to solve the problem. Problems can be solved in whole group

or each students group can solve a different problem which will be shared to solve the main problem in the scenario.

Case Notes

If case study is used to introduce material allow four days on a block schedule and two weeks using fifty-minute classes.

If using as a culminating activity allows for 2 days on a block, provided you have introduced major concepts regarding force, motion of objects and simple machines. This tool can be used to help students refine their knowledge of the standards.

Remember, if you are dealing with 8th grades, these students require more direction to keep them on task and need smaller chunks to ensure mastery. Constantly point out that the work is related to the standard and allow students to help make the connection by citing specific examples from the activity that relates to the standard and element.

Grouping works well, could be groups of 2, 3 or 4. Be sure to give each student in the group a specific activity or job to keep each student on task. Be careful when using groups of four, students tend to get lost if roles are not clearly defined.

Cooperative Group cards can be used to help define each student's role; a sample is included in the Facilitator's Guide

Create a rubric for grading the box chart to hold the students accountable for their work. Discuss the rubric prior to beginning box chart so students are aware of the expectations.

Add mini-labs in between scenes to help confirm and imbed concepts.

Keep students on track by utilizing the language of the standards and accountable talk.

Allow students to discuss activity in a group and then have them present their findings.

Resources

Mr.Fizix.com (n.d.). Mechanics. *Applications of Newton's Law of Motion*. Retrieved from.
http://www.mrfizix.com/home/applicationnewtonlaws.htm#_top