



Gravity

CONTENT TOPIC: Simple Machines/Technology

CONCEPT: Gravity is a force that can do work.

CONTENT OBJECTIVE: To understand the scientific meaning of work

INSTRUCTIONAL OBJECTIVES: The learner will:

- Define work as the movement of an object through a distance.
- Define gravity and identify work caused by gravity.
- Measure the distance an object is moved by a force.

OUTLINE OF CONTENT:

- I. Define and discuss work
- II. Define and discuss gravity
- III. Discuss how an object is moved by force

TIME REQUIRED: 30 minutes

MATERIALS:

One unbreakable object, pendulum made of thread, ruler, paper clips, tape, different sized weights, force-o-meter, rubber bands

SET:

Today class, we will define work as the movement of an object through a distance, define gravity and identify work caused by gravity. We will also measure the distance an object is moved by a force.

INSTRUCTION:

Work is done when the force applied to an object actually causes it to move.

Gravity is the force of one object pulling on another object. Isaac Newton began to take interest in gravity when he saw an apple fall from a tree. He concluded that the force that causes apples to fall must also be the pull on all bodies in the earth's sphere toward the earth's center.

Newton also studied force. Force is anything that causes a change in motion. Newton realized that the force applied must be greater than the resistance of an object to cause movement. To measure the distance caused by a force we use meters.

(The teacher will drop an unbreakable object. Ask ALL children to describe the direction in which it falls. Explain that the direction should be described as "toward the earth" instead of "down.") Work is done when a force moves



something. (Demonstrate pushes and pulls of various objects. The teacher will identify the force and distance involved.)

Gravity is a force which acts upon objects and systems. A pendulum is a system which can be used as a timing device such as in a clock. We can use it to investigate the relationship of forces acting upon objects in motion.

ACTIVE PARTICIPATION:

Plans to construct a pendulum:

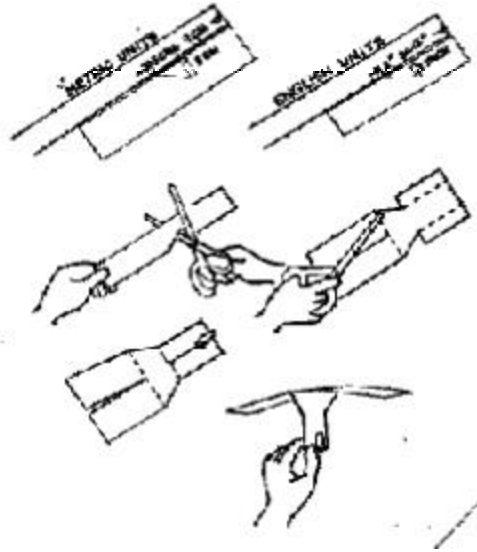
1. Cut lengths of string. Suggested lengths are 6", 12", 24" (or x , $2x$, $.5x$ cm) attach washer or other weight to one end of string. Attach other end to yard stick or stationary object (table top, etc.)
2. Collect data on the number of swings a pendulum makes in *10 seconds*.
 - a. Make a pendulum with one string (length x)
 - b. Measure and record the number of swings that are made. Repeat this process twice.
 - c. Construct pendulum with length $2x$.
 - d. Measure and record the number of swings that are made. Repeat this process twice.
 - f. Repeat step d, for a pendulum with the length $.5x$.
 - g. Predict the number of swings for a pendulum with a length of $3x$ and record.

Kindergarten Activity

Helicopter Model Directions

- Fold and cut one sheet of paper in half lengthwise.
- Take one of the halves and fold it in half lengthwise.
- Use a ruler to draw a triangle on one edge of the paper.

See the diagram:



- Cut out the triangle. Cut through both layers of the paper.
 - Open the paper and cut up the center fold to the point indicated on the diagram. This forms the wings.
 - Fold the tabs toward the center and attach a paper clip to the bottom.
 - Fold the wings in opposite directions.
 - Hold the helicopter above your head and drop it.
1. Create a helicopter within each group.
 2. Pass out helicopter materials to each group.
 3. Assign each group to a specific location.
 4. Drop helicopters from an agreed height and record time of landing in seconds on notebook paper.
 5. Repeat Step 4 with 1 paper clip, 5 paper clips, and 10 paper clips.

Closure:

Today, class, we have defined work as the movement of an object through a distance, defined gravity and identified work caused by gravity. We have measured the distance an object is moved by a force.

1. Have students use the letters in the term GRAVITY to name objects that are pulled toward the earth by gravity. Each object should begin with a different letter.
2. Introduce the vocabulary word, GRAVITY. Students can make a pendulum with thread, ruler, paper clips, and tape. Have the students experiment with a length of thread and a number of weights to see what affects speed of swing and what pulls the weight down. Before doing the experiment, have the students



predict how the length of the pendulum will affect the swing speed and how the amount of weight will affect the swing speed.)

Think of a chore that you are responsible for doing at your house. We will take turns acting out the job. The rest of the class will try to guess your job. Everyone will get a turn. (To save time, you could work in groups.)