Rollin' On

Summary

Gravity has different effects on the motion of an object rolling up or down a hill. The incline of the hill makes a difference in speed and distance.

Time Frame

1 class periods of 45 minutes each

Group Size

Small Groups

Life Skills

Communication

Materials

For each group (2-4) of students:

- One marble
- A piece of rain gutter OR a 6"x28" inch piece of poster board (cut from a piece of poster board (22" long x 28" long) and folded the long way to make a "track"
- Ruler or yardstick

For each student:

- One-half of a paper towel dispenser cut long ways
- Paper for charting experiment results

Background for Teachers

These investigations are enjoyable for students to try when learning about the effects of gravity on the motion of an object. This activity not only investigates a science principle, but requires the group to cooperate and communicate effectively to experience success. Working together will help students solve problems while learning about gravity.

Student Prior Knowledge

Students should understand that gravity is a force and that objects are pulled toward the Earth by gravity. They will find a working vocabulary of force and motion helpful in explaining the results of their experiments.

Intended Learning Outcomes

1. Conduct a simple investigation.
2. Explain science concepts and principles.

Instructional Procedures

Step 1. Divide students into small groups and pass out one marble to each group, and a tube to each student.

Step 2. Tell students that each group has the responsibility to work together and, using the tubes and every person in the group, get the marble from one wall of the room to the opposite wall. Remind the students that they will need to discuss their strategies to accomplish this objective. If, during their attempt to move from one wall to the other, the marble falls to the ground, (remember, gravity is very

powerful!) they will need to start over. The first team to reach their goal needs to stand in a line and yell "gravity" together.
Step 3. Have students sit with their group as you discuss what occurred.

- Did they marble roll slowly or quickly?
- What made a difference in the speed?
- What part does gravity have on the motion of an object?
- Did the incline (slope or slant) make a difference in your distance traveled by the marble? How about speed?
- Is there anything you can do to change the results?

Step 4. Tell students that they will now compare the motion of an object rolling up AND down a hill using a piece of rain gutter, and record their results.
Step 5. Have each group fold a piece of paper into eight squares, four horizontal boxes by two vertical boxes. Label each box across the top with one of the following:

- 6 inches high
- 12 inches high
- 18 inches high
- 24 inches high

On the side, they should create two columns, labeled "Up" and "Down". This will be their data sheet. They will record the distance traveled by each marble as it goes up and down the specified inclines.
Step 6. Each group will conduct experiments and record how far their marble rolls at each incline in the boxes on their page. They will need to set some criteria about the amount of force applied (push) to get the marble going, especially when they are rolling uphill. Remind them to keep the forces the same so their results are valid.
Step 7. At the end of the experiments, have each group share their results. You might want to post their charts to allow the class to view everyone's data.
Ask students questions about the activity:

- Which was easier to do: up or down the incline?
- What part did gravity play in this experiment?
- What types of activities do people do that are affected by gravity and incline?
- How do speed and distance fit into this picture?

Step 8. Have students record their observations in their science journals and use correct vocabulary to summarize.

Extensions

Students could design a rolling machine (not necessarily a car) that would compete in races. Limit the materials that can be used to such as erasers, index cards, paper clips, etc.

Assessment Plan

Ask students to fold a paper in half and then draw a picture of a person participating in some activity that requires them to go up or down an incline. (Up on one side, and down on the other.) Have them write one or two sentences that describe the effect of gravity on their activity. ("Hiking uphill makes me hot and tired." "Hiking downhill is fun because you almost run. Watch out or you might roll all the way down!")
Review data charts for experiments to see if students have grasped the principle of gravity making things easy or difficult.
Collect science journals and look for accurate observations and statements.

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