

Investigation Four – Roller Coaster Fun

Standard IV Students will understand that objects near Earth are pulled toward Earth by gravity.
Objective 2 Identify the effect of gravity on the motion of an object.
Intended Learning Outcomes <ol style="list-style-type: none">1. Use science process and thinking skills2. Manifest science attitudes and interests3. Understand science concepts and principles4. Communicate effectively using science language and reasoning

Standard IV

Objective 2

Teacher Background

Gravity is the force that pulls objects toward Earth. Gravity pulls you down when you jump off the chair, but you're fighting gravity when you jump back up. Gravity is pulling the ball/marble down the track, but the ball/marble is fighting Gravity when it goes uphill. The speed of the ball has to be great enough to get the ball down a hill and back up to the top of the next hill.

Invitation to Learn

Chair Jumping

1. Stand on the seat of the chair.
2. Jump off the chair.
3. Jump back up onto the seat of the chair.
4. Discuss which was easier: jumping off or jumping back up onto the seat of the chair.

Instructional Procedure

Preparation

Tape the two halves of the pipe insulator together.

Activity

1. Divide the class into cooperative learning groups of 2-4 students per group.
2. Design a roller coaster and tape the design to the wall.
3. Place on ball at the beginning of the track.
4. Let go of the ball and observe what happens as the ball rolls up and down.
5. Repeat steps 3 and 4 with different balls and marbles.
6. Modify your track and repeat steps 3 through 5.
7. Analyze the results – Which ball worked best? Why? Which track design worked best? Why

Materials

- Sturdy chair
- One pipe insulator (split in half length wise) (per group of 2-4 students)
- Balls of various masses (e.g., steel, glass, cork, wood, rubber) (per group of 2-4 students)
- Masking tape (one roll per group of 2-4 students)

Curriculum Extensions

Math –

- Draw a line segment illustrating the shape of your roller coaster. Identify the starting and ending point. (*Standard III, Objective 1*)

Science –

- Challenge the students to put two 20 ft. lengths of pipe insulator together and construct a successful roller coaster design. (*ILO 1*)

Art –

- Make mazes or ramps out of cardboard tubing. (*Standard III, Objective 2*)

Assessment Suggestion

- In their journals, have the students draw a picture of the roller coaster built by their group. Have the students write about their design and why it works relating to the force of gravity.
Did the student(s) work cooperatively in their group(s)?
Were the students able to analyze any defect(s) in their design and come up with a proper solution(s)?
Were the students able to construct a successful roller coaster?

Resources

Books:

- *Looking Inside Sports Aerodynamics (X-Ray Vision)* by Ron Schultz (Larousse Kingfisher Chambers)
- *Experiments with Gravity (True Books)* by Savatore Tocci, Tovert Gardner, Nancy R. Vargus (Scholastic Library Publishing)
- *The Science Book of Gravity* by Neil Ardley (Bulliver Books)

Videos:

- Roller Coaster!

Laser Discs:

- Windows on Science, Primary Vol. 3, Force and Motion Lesson 11

Websites:

- <http://www.enc.org/weblinks/science/0.1578.1%2DGravity.00shtm>
- <http://www.lessonplanspage.com/ScienceSSmars7>

Homework & Family Connections

Have the students design and build OR make an illustration of a roller coaster, ramp, or maze at home. Have the students bring the roller coaster, ramps, and mazes to school and set-up an amusement park.