Activity—Weighing In

Standard IV
Students will understand that objects near Earth are pulled toward Earth by gravity.

Objective 1
Demonstrate that gravity is a force.

Intended Learning Outcomes
1. Use Science Process and Thinking skills
2. Manifest Scientific Attitudes and Interests
3. Understand Science Concepts and Principles
4. Communicate Effectively Using Science Language and Reasoning

Standard IV

Objective 1

Connections

Background Information

The Earth's gravity pulls everything towards its center. Gravity gives objects their weight. The weight of an object is a measure of the pull of gravity on that object.

Invitation to Learn

Double Drop

1. Hold a sheet of paper and a ball at the same height.
2. Drop them (Aristotle's hypothesis predicts that the ball lands on the floor before the sheet of paper because the ball is heavier. And sure enough, the ball does land first, but not because of Aristotle's hypothesis).
3. Crumple the paper into a wad—the same size as the ball.
4. Hold the wad and the ball at the same height and drop them.
5. Discuss what is happening. The ball and the paper land at the same time. The paper hasn't gotten any heavier; it's just a different shape. A round wad of paper can push air out of the way more quickly than a flat sheet of paper. If there was no air to push out of the way (air resistance), even the sheet of paper would plummet at the same speed as the ball.

Materials
- golf ball
- one sheet of ditto paper
- Assorted Classroom Objects
- Spring Scale (0 – 2000 grams)

Instructional Procedures

1. Estimate the order of the weight of various classroom objects from lightest to heaviest.
2. Measure the weight of each object using the spring scale.
3. Compare the actual results with the estimates in step one.
4. Place the objects in the correct order from lightest to heaviest.

Curriculum Integration

Math/Science

Objective 1:3 Identify the relationship between whole numbers

1. Place the objects in sequence according to their weight from lightest to heaviest.
2. Order and compare the weights of the objects by plotting them on a number line.
3. Compare the relationship ("<", ">" and "=") between the weights of the objects.

Objective 3:2 Describe spatial relationships.

1. Make a grid of the floor tiles (flight path) and indicate where the paper airplane landed.

Possible Extensions/Adaptations:

Extension: Put one cup of various items (marshmallows, gravel, rice, beans, cereal, etc.) into individual sturdy cups. Have the students complete the instructional procedures above for these items.

Adaptation: The main activity and the extension can be investigated by the students individually or in small groups at a learning station, or cooperatively by the whole class.

Assessment Suggestion

Did the student(s) accurately read the spring scale?

Did the student(s) place the objects in the correct sequence from lightest to heaviest?

Possible Resources

Books

Gravity by Dan Greenberg (Newbridge Education Publishing)
The Magic School Bus Plays Ball by Joanna Cole (Scholastic Inc.)
Gravity: Simple Experiments for Young Scientists by Larry White (Millbrook Press)
Bowled Over: The Case of the Gravity Goof-Up by Chuck Harwood (McGraw Hill Trade)
Why Doesn't the Earth Fall Up? by Vicki Cobb (Lodestar Books)
Which Way Is Up? by Gail Kay Haines (Simon & Schuster)

Videos

Gravity is Attractive: What is Gravity?

Laser Discs

Windows on Science, Primary Vol. 3, Force and Motion Lessons 12 + 13

Websites

http://www.enc.org/weblinks/science/0,1578,1%2DGravity,00shtm
http://www.lessonplanspage.com/ScienceSSmars7

Homework & Family Connections

Defying Gravity

1. Challenge the students to design and make a paper airplane that will defy gravity, by flying in the straightest and furthest path.
2. Have the students bring their airplanes to school the next day for test flights.
3. Have one student at a time fly their airplane. This is best done in a hall with tile on the floor.
4. Record the results. To determine each student's result: Count how many tiles out from the starting line. Then, subtract the number of tiles off course (to the left or right).
5. Analyze which airplanes were the most successful in meeting the criteria and why.
6. Are there some variables in the experiment that could possible influence the results? How could we control those variables?