

Free Fall

Objective: To identify an object in free fall.

Grade Level: K-4
Subject(s): Physical Science
Prep Time: < 10 minutes
Duration: One class period
Materials Category: Classroom

National Education Standards	
Science	3b
Mathematics	
Technology (ISTE)	
Technology (ITEA)	
Geography	

Materials:

- Toy astronaut or any plastic figure
- Plastic jar
- Chair or stepladder
- Video camera, television, and video player (optional)

Related Links:

NASA Microgravity Teachers Guide
<http://spacelink.nasa.gov/Instructional.Materials/NASA.Educational.Products/Microgravity/Microgravity.Teachers.Guide.pdf>

Supporting NASAexplores Article(s):

Drop Everything!
http://www.nasaexplores.com/lessons/02-006/k-4_article.html

Free Fall

Teacher Sheets

Pre-lesson Instructions

- Part of this lesson uses a playground swing. Pick a day that the class can go outside for 15 to 20 minutes.
- Remind the class about playground safety. **Never jump out of a moving swing.**

Background

A microgravity environment is one in which the apparent weight of an object is less than its actual weight, or some of the effects of gravity are greatly reduced compared to those experienced on Earth.

In other words, it is a term describing apparent near-weightlessness or reduced weight. Apparent weight is the weight measured when an object is put on a scale in a given environment—you won't weigh the same on other planets or even at high elevations compared to sea level—and actual weight is the force of Earth's gravitational pull on an object.

Microgravity can be achieved regardless of the local force of gravity. It can occur where gravity is low, such as outside our solar system, but it also occurs whenever an object is in free fall, where the only (net) force acting on the object is gravity.

Scientists achieve a microgravity environment for different amounts of time in several ways: drop towers provide up to 10 seconds, research aircraft provide up to 20 seconds, rockets provide minutes, the Shuttle provides days, and the International Space Station provides days, weeks, and months.

In this lesson, students will observe a demonstration of objects in free fall, and will experience a brief moment of apparent near-weightlessness or reduced weight through a hands-on activity.

Guidelines

1. Read orally with the class the K-4 NASAexplores article, "Drop Everything!".
2. Stand on a chair. Hold a big heavy ball or book and a crumpled piece of paper. Ask the class, "If I drop these at the same time, which will hit the floor first?" The answer is that they'll both hit at the same time because the force of gravity is affecting them equally. The kids can't believe this until they see it.
3. Explain that the next demonstration is going to see if we can create microgravity. Remember that microgravity is when the effects of gravity are very small, like when an object is in free fall.



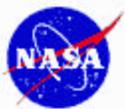
4. Perform the following demonstration for the class.
 - Stand on a chair, and drop a toy astronaut or any plastic figure. It falls to the floor.
 - Next, drop a plastic jar, and it also falls to the floor.
 - Ask the class, “If I drop the astronaut INTO the jar at the same moment that I drop the jar, will the astronaut hit the bottom of the jar?”
 - Allow the students to respond.
 - The astronaut does not hit the bottom of the jar before it hits the ground. Explain that he is in free fall. Repeat this demonstration several times to allow the students to observe the plastic figure in free fall. If available, video tape the demonstration. Show it in slow motion—frame by frame.
5. Explain to the class that when you talk about microgravity, near-weightlessness, and free fall, you are referring to, or meaning, the same thing.
6. Take the class outside to the swing set area on the playground. Explain that they are going to attempt to experience near-weightlessness. Have students take turns swinging and going as high as they can. When they are in the farthest point in the arch of the swing, they should lift off the seat for a brief moment. They are almost weightless!

Discussion / Wrap-up

- Once back inside the classroom, discuss other times that students have experienced microgravity. Many students might mention rides at amusement parks.
- Remind the class that microgravity is when some of the effects of gravity are greatly reduced compared to those experienced on Earth.

Extensions

- Have the class write and illustrate a story about their day in microgravity (space).



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Student Sheet(s)

No Student Sheets are necessary.



National Aeronautics and
Space Administration

Student Sheet (s)
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