



GRACE Education Curriculum Gravity	
Teachers	Grades 3-5
Science	

Free Fall

Background Information: Students will learn that gravity is the force of attraction between bodies of matter in the universe. Without gravity the atmosphere and oceans would have floated away into outer space. Students will understand Sir Isaac Newton’s Universal Law of Gravity, which states that everybody and everything no matter how large or small, possesses gravity. He worked this theory out and was able to explain why apples fall to the ground. This law states that everything has a gravitational pull towards something else. The only difference is the size of the pull. If an object is larger, the pull is larger. The Earth has a very strong pull because it is so large. Students will understand that gravitational pull keeps people on the ground, planets in the Sun’s orbit, and the Moon in orbit around the Earth. They will understand that free fall is when an object falls to Earth without any aid aside from the influence of gravity.

- Objectives:** At the end of the lesson, students will be able to:
- Define gravity as the force of attraction between bodies of matter.
 - State the Universal Law of Gravity.
 - Define free fall and describe free fall’s effect on a falling object.

Standards: Science: unifying concepts and processes; earth and space science; science as inquiry; and physical science.

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| Materials: | Plastic cup | Scissors |
| | Trash Can | Water |

Directions to the Teacher:

1. Review the background information included on gravity.
2. Have students break into lab groups or get together with lab partners.
3. Have students complete the following lab prediction questions on their lab sheet.

Prediction #1: What do you think will happen if you fill the cup up with water and poke a hole in the bottom of the cup?

Have students poke a hole in their cup and pour water in the cup. Ask students to write what happened (the water flowed out of the hole).

Prediction #2: What do you think will happen if you drop the cup from a greater height and let it free fall into the bowl?

In the beginning of the experiment the gravitational pull pulled the water through the hole. Now ask the students to cover the hole with their fingers and fill up the cup. Then have the students raise the cup above their heads or stand on a chair to drop their cup. Count to three and drop the cup into the trash can. Ask students to describe what happened? (No water came out of the hole). Discuss why this happened?

Explain to the students that the cup was free falling. It had no aid except for gravity. The water stayed in the cup because the cup and the water each had an equal amount of gravity. When you see pictures of the astronauts in the Space Shuttle or on board the International Space Station are they weightless or free falling? Astronauts are free falling – the Space Shuttle and the International Space Station is free falling around the Earth and the astronauts are falling around the Earth at the same rate as the Space Shuttle or ISS.

Extensions:

Make a hero can: <http://quest.arc.nasa.gov/space/teachers/rockets/act1.html> and identify which Newton's law of motion it supports.

References / Resources:

Ardley, Neil. Dictionary of Science. Dorling Kindersley Books, NY:NY, 1994.

The Kingfisher First Science Encyclopedia. Kingfisher, NY:NY, 1997.

Walker, Niki. Satellites and Space Probes. Crabtree: NY, 1990.

Webster, Vera B. Science Experiments. Children's Press, Chicago, Illinois, 1982.

Websites: www.ronkurtus.com/phycien/gravity.htm

Free Fall Data Sheet

Define the following terms using your notes:

Gravity: _____

Universal Law of Gravity: _____

Gravitational pull: _____

Free fall: _____

Prediction #1: What do you think will happen if you fill the cup up with water and poke a hole in the bottom of the cup?

What happened to the water in the cup? Why do you think this happened?

Prediction #2: What do you think will happen if you drop the cup filled with water from a greater height allowing it to free fall into the bowl?

What happened when the cup was dropped or was in free fall? Why do you think this happened?
