



Gravity and Your Weight in the Solar System

Students learn about gravity, mass, and weight by traveling through the solar system after a teacher led demonstration.

Grades

- 3-6

Time

- 45-60 minutes

Next Generation Science Standards

- 5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.

Utah Science Standards

- 3.4 Students will understand that objects near Earth are pulled toward Earth by gravity.
- 6.1.2 Develop and use a model to describe the role of gravity and inertia in orbital motions of objects in our solar system.

Materials

- 1 ball from modeling Earth
- 1 much smaller ball for modeling the Moon
- 1 small stuffed animal from modeling how gravity attracts an individual
- 1-4 scales (optional)
- 8-12 calculators
- 1 Lab sheet for each student
- 1 image for each station

Do Ahead

- Gather all materials. For the activity place your students into four groups.

Key words to know

Gravity is a force which tries to pull two objects toward each other. Anything which has mass also has a gravitational pull. The more massive an object is, the stronger its gravitational pull is. Earth's gravity is what keeps you on the ground and what causes objects to fall.

Mass is a measure of the amount of matter in an object. Mass is usually measured in grams (g) or kilograms (kg). ... An object's mass is constant in all circumstances; contrast this with its **weight**, a force that depends on gravity.

Activity Introduction

The visual introduction for this lesson is modeled here:

<https://www.teachingchannel.org/video/teaching-mass-weight-gravity>

We recommend you watch the video link to visualize this demonstration.

1. Show students your large ball and tell them it represents the Earth. Now introduce your stuffed animal as astronaut ____ . For example if you have a small teddy bear, you can introduce your animal as Astro-bear.
2. Place your animal on your Earth and ask students if the animal were to jump where would it land? If they need help, ask them when they jump where do they land?
3. Place the stuffed animal on the side of the model Earth. Once again asked the students where this animal will land if it jumps? Go through this step in several locations until students understand that no matter where the animal is placed on our model Earth after jumping they will return to the same spot.
4. Ask students why this is. Hopefully they will bring up gravity. Explain to students the reason why our stuffed animal lands in the same place is because of the **force of gravity**. Gravity or **gravitational pull** is the force that attracts our stuffed animal back to our model Earth in the same place it jumped from.
5. Now show students your model Moon. Ask them if the force of gravity will be the same on the moon as it is on the Earth? If students say gravity will be less on the moon then ask why? You are looking for an answer that relates the fact that the Moon is smaller than the Earth and therefore has less gravity.
6. Keep asking directed questions until students hit on this answer. Make sure students are understanding that *the amount of the force of gravity or gravitational pull is relative to the size of the object*.
7. Show your stuffed animal on our model Earth and on our model Moon. Ask students how the stuffed animal will be affected by gravity on the Moon vs. the Earth?
8. Ask students why this is the case? Get them thinking by asking, “has our stuffed animal been on a crash diet before he went to the Moon?” Look for answers that state our bear weighs the same on both the Earth and the Moon, but the gravity is different in different places.
9. Introduce the concept of mass. **Mass** is a measure of the amount of matter in an object. Ask students if our stuffed animal has the same mass on the earth and on the moon. The answer is Yes! *The mass of an object remains the same as it travels through space, but the weight of an object will be different depending on the gravitational pull it encounters*.
10. Explain to students that the common way we use the term weight in everyday lives assumes we are weighing that object on the planet Earth. Ask students several questions to see if they are understanding these concepts of weight vs mass, and the connection to gravity and gravitational pull.

Now have students go on a journey through the solar system!

Activity Directions

Preparation: Before doing the activity each student will need to know their weight. You can either bring a scale to the classroom and allow each child to weigh themselves, or have them make the best guess for their weight and put it on their lab sheet. If you have access to 4 scales, place one at each station, and have students weigh themselves at the first station they go to.

Set up four stations in your classroom (An image download is available for each station).

You will need at least one calculator at each station, but 2-3 will work better.

Stations are:

1. Outer Space
2. Earth's Moon
3. Mercury- the solar system's smallest planet
4. Jupiter- the solar system's largest planet

Break students into four groups, each student will need a Lab Sheet.

Give students 5 minutes at each station.

Tell students at each station you would like for them to:

- A. Use the calculator to do the math and fill in how much they weigh in this part of the solar system.
- B. Discuss with their classmates what this weight would feel like.

Encourage students to use their imagination. Would they be able to jump 10 or 20 feet? Would they weigh so much just taking one step would be difficult? Would they feel like they were flying? Would it be fun to experience a different weight due to a different gravitational pull?

After concluding the activity, you can show students one of these very fun, engaging videos that shows what everyday life would be like in zero gravity. Prompt students ahead of time to look for the ways objects move on the International Space Station. What do they notice?

You will find all downloads and videos at www.greatbasinobservatory.org

Brushing your teeth in space- <https://www.youtube.com/watch?v=3bCoGC532p8>

Washing your hands in space- <https://www.youtube.com/watch?v=9Z2KNDGNnlc>

Sleeping in space- <https://www.youtube.com/watch?v=UyFYgeE32f0>