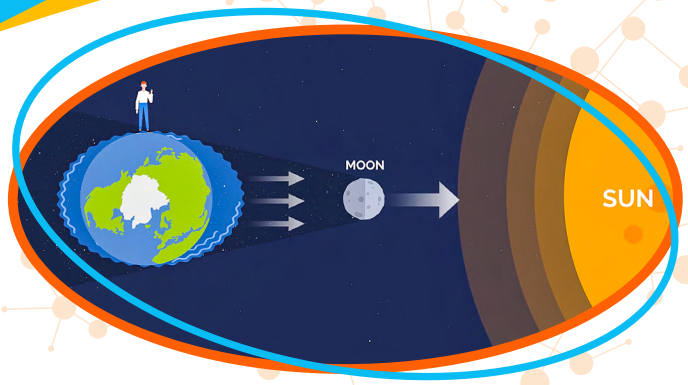
GENERATIONGENIUS
ALWAYS QUESTION. ALWAYS WONDER.



TEACHER GUIDE

GRAVITATIONAL FORCE
GRADES 6-8

COMMON MISCONCEPTIONS

- **Gravity pulls objects down to the Earth.**
  Gravity pulls objects toward the center of Earth. That is why no matter where you are on Earth, gravity will continue to pull you toward the center. For example, if you are walking on Earth and step on a huge hole, you will fall into the hole because gravity will continue to pull you toward the center of Earth.

- **Mass and weight are the same thing.**
  Mass is how much space an object takes up (amount of matter). Mass is measured by using a balance that compares a known amount of matter to an unknown amount. Weight is the measurement of the pull of gravity on an object and is measured using a scale.

- **A force affects objects only when they are touching.**
  A force is a push or a pull on an object. An unopposed force can make an object move or change the direction of movement. Force does not have to be applied directly, and there are several forces that can cause an object to move without touching it (e.g., magnetic force, electrical force, and gravity).

GRAVITY

Gravity is the force that pulls objects toward the center of Earth. Gravitational force is also responsible for keeping the planets in orbit around the Sun and the Moon in orbit around Earth. Gravitational force can also be found between any two objects and depends on the size of the objects and their distance from each other.

RESISTANCE

Resistance is a force that acts in opposition to gravity or another force. As the gravitational force accelerates an object downward toward Earth's center, the upward force of air resistance will cause the falling object to slow down.

DIFFERENCE BETWEEN MASS AND WEIGHT

Mass is how much matter something has. An object's mass does not change based on location. Weight is measured by how much gravitational force is applied to an object. Weight can change based on location. For example, a person weighing 150 pounds on Earth would weigh about 25 pounds on the Moon because the gravitational force is weaker on the Moon.

TEACHER TIPS

Many students have heard of gravity but do not really know what it means or how to explain it. It is important that you listen to discussion to draw out common misconceptions and then give students opportunities make sense of the concept of gravity and gravitational forces in order to shift their thinking and grow their understanding.

ABOUT THIS LESSON

This lesson was created by the National Science Teaching Association (NSTA) to pair with the Generation Genius video and support *NGSS*.

They have requested we provide the following background with this lesson:

The Next Generation Science Standards (NGSS) are the national standards on how students learn science, and they are based on contemporary research presented in *A Framework for K–12 Science Education (the Framework).* The shift in science teaching and learning required by the Framework is summarized in this infographic: A New Vision for Science Education.

At the start of each Generation Genius lesson, students are presented with a phenomenon, then they try to explain it. Students will notice they have gaps in their knowledge and ask questions, which motivates them to build ownership of science ideas they need in order to explain how or why the phenomenon occurred. The way students build ownership of science and engineering ideas is through active engagement in the science and engineering practices (SEPs). This process of sensemaking, or doing science to figure out how the world works, is one of the major shifts the *Framework* encourages.

To engage in the SEPs, students should be part of a learning community that allows them to share their ideas, evaluate competing ideas, give and receive critiques, and reach consensus. Students can start by sharing ideas with a partner, then with a small group, and finally, with the whole class. This strategy creates opportunities for all students to be heard, build confidence, and have something to contribute to whole-class discussions. Each Generation Genius lesson provides conversational supports to facilitate such productive student discussions to contribute to sensemaking.

Excited to continue your shift toward the new vision for science education? Check out the Generation Genius Teacher Guide page on the NSTA website for resources and strategies to engage every student in your classroom in **doing** science.