

Objective:

Students will learn about how the force of gravity works and understand the idea that the pull of gravity is stronger for bigger objects, resulting in a weight increase on other planets.

Arkansas State Standards Addressed:

Math

AR.Math.Content.4.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number

Science:

ESS.10.5.1 Compare the properties of planets in our solar system:

- Size
- Shape
- Density
- Atmosphere
- Distance from the Sun
- Orbital path
- Moons
- Surface
- Composition

ESS.10.5.5 Compare the human body's mass to weight on Earth, the moon, and other planets in our solar system.

ESS.10.8.2 Identify variables that affect the amount of gravitational force between two objects:

- Mass of the objects
- Distance between two objects

NS.1.4.8 Develop a *hypothesis* based on prior knowledge and observations

NS.1.4.11 Generate conclusions based on evidence

NS.1.4.13 Use simple equipment, age appropriate tools, technology, and mathematics in scientific investigations (e.g., balances, hand lenses, microscopes, rulers, thermometers, calculators, computers)

Speaking and Listening

SL.5.1 Engage effectively in a range of *collaborative conversations/discussions*

Activity:

What is gravity? Gravity is a force of attraction that exists between any two objects that have mass. But how does gravity work? Have students explore the force of gravity by dropping a pencil from their hands. Ask "Why does the pencil fall to the ground instead of stay in the air?" Explain

that our weight is caused by the Earth's gravitational pull on our body's mass.

In this activity, you will explore the different gravitational pulls of other planets in the solar system by having the students weigh themselves on a scale and multiplying their "Earth weight" by another planet's gravity. Since gravity is stronger for bigger objects, your weight will vary based on the planet's size. Which planet has the least gravitational pull? The most? Why?

You will need:

- A scale
- A pencil
- A calculator
- How Much Do I Weigh? Worksheet from the Space Center in Houston:
<https://spacecenter.org/docs/Activities-HowMuchDoIWeigh.pdf>

As an extension of this activity, students can graph and compare their findings.

Additional Resources at Bentonville Public Library:

The following are a selection of books and other resources about space and planets in our solar system which are available at the Bentonville Public Library. All items are available for checkout at the Bentonville Public Library; call numbers are included in brackets. Online resources are available through BPL's Student Portal: <http://www.bentonvillelibrary.org/student-portal/>

Books

- *Astronaut Academy* by Steve Martin. [JNF 629.4 MAR]
- *Beyond the Solar System: Exploring Galaxies, Black Holes, Alien Planets, and More—A History with 21 Activities* by Mary Kay Carson. [JNF 520.9 CAR]
- *Exploring Comets, Asteroids, and Other Objects in Space* by Nancy Dickmann. [JNF 523 DIC]
- *Little Kids First Big Book of Space* by Catherine D. Hughes. [JNF 520 HUG]
- *The Magic School Bus: Lost in the Solar System* by Joanna Cole and Bruce Degen. [JNF 523.3 COL]
- *Our Solar System* by Simon Seymour. [JNF 523.2 SIM]
- *Pluto's Secret: An Icy World's Tale of Discovery* by Margaret A. Weitekamp and David DeVorkin. [JNF 523.49 WEI]
- *Space Exploration: Primary Sources* by Peggy Saari. [JNF 629.4 SAA]
- *The Space Race* by Peter Benoit. [JNF 629.4 BEN]
- *Totally Wacky Facts About Exploring Space* by Emma Carson Berne. [JNF 629.13 BER]
- *Welcome to Mars: Making a Home on the Red Planet* by Buzz Aldrin. [JNF 523.43 ALD]

Online Resources

(K-4) PebbleGo

"The Planets" PebbleGo. www.pebblego.com January 13, 2017

"What Is The Solar System" PebbleGo. www.pebblego.com January 13, 2017

(K-4) PowerKnowledge Earth Space Science

"All About Gravity." *PowerKnowledge Earth & Space Science*, Rosen Publishing,

<http://www.pkearthandspace.com/article/594/all-about-gravity>. Accessed 12 January 2017.

(5-6) World Book Student

Domski, Mary. "Newton, Sir Isaac." *World Book Student*. World Book, 2017. Web. 13 Jan. 2017.

Learn More:

BBCiWonder: Isaac Newton—The Man Who Discovered Gravity:

<http://www.bbc.co.uk/timelines/zwwgcdm>

NASA has created a student website that helps kids explore space-based careers and topics:

<https://www.nasa.gov/audience/forstudents/k-4/index.html>

NASA International Space Station: https://www.nasa.gov/mission_pages/station/main/index.html

NASA Jet Propulsion Laboratory: <http://www.jpl.nasa.gov/>

NASA Kennedy Space Center: <https://www.nasa.gov/centers/kennedy/home/index.html>

Smithsonian Institution: National Air and Space Museum, *Exploring the Planets*:

<https://airandspace.si.edu/exhibitions/exploring-the-planets/online/solar-system/>

Explore Space Exhibit Information:

Explore Space: A Cosmic Journey, a traveling exhibition for libraries, is part of the STAR Library Education Network (STAR_Net) led by the National Center for Interactive Learning at the Space Science Institute. Exhibit partners include the American Library Association, the Lunar and Planetary Institute, and Afterschool Alliance. Explore Space is supported through a grant from the National Science Foundation.



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