Teacher Resource Sheet

Gravity Lesson Plan

**Standards**

**MS-PS2-4** Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

**MS-PS2-5** Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

**Other standards this could align to:
MS-ESS2-4** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

**MS-ESS1-1** Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

**Science and Engineering Practices**

**Engaging in argument from evidence**

Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem

**Planning and Carrying out Investigations:**

Conduct an experiment and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation

**Objective**

SWBAT investigate and describe the attractive force of gravity on interacting objects

SWBAT use evidence from the investigation to design and conduct an experiment to reduce the motion of objects affected by Earth’s gravity

**Engage:**

* + - * Students and teachers will activate prior knowledge by anchoring in a phenomenon of things falling to the ground.
* Teacher and students can jump and discuss how there’s a mysterious force pulling them towards the center of the earth.

**Explore**

* Teacher poses the question: Do all objects get pulled to the earth at the same way?
* Teachers and students will select two objects with differing masses and drop them from a height.
* Teacher notes: mass is the amount of matter in an object. Mass and weight are not the same. Weight has something to do with the force of Gravity acting on a mass
* Drop 2 objects at the same time
* Students observe and explore which object hits the ground first

**Explain**

* Sir Isaac Newton mid-1600’s, watched an apple fall from the tree
* Force: a push or pull that can change the motion of an object
* Gravity is the force pulling objects towards the Earth
* Gravity is always a pull, never a push
* Gravitational force definition: a force of attraction between two masses
* All objects with masses have an attractive force towards each other
* *Teacher asks:* I have an attractive force with this table but why can’t I use my attractive force or super powers to bring it towards me?
* The gravity between a human and an object is relatively weak due to our small masses
* This supports the observation why the two objects hit fell at the same time

**Elaborate**

* Large masses like the Earth have a noticeable and measurable mass
* The Earth’s gravitational force is so powerful, it pulls all objects towards the center of its giant large mass.
* The Earth and humans have an attractive force on each other, but because humans are much smaller than the earth, my force on the earth isn’t very strong at all.
* Gravitational force is very hard to measure in objects that are small, but it is still present.
* In fact, the Earth’s force on my mass is called my weight.
* If the mass of an object is even bigger than earth, then it’s pull will be stronger which would mean my weight would be MORE on larger planets such as Jupiter, Saturn or even the SUN!
* Gravitational fields are typically studied on a larger scale like the planet and stars in our solar system
* Gravitational force is the reason why the moon orbits the earth and the planets orbit the sun.

**Evaluate**

 In summary,

* Gravity is an attractive force between two objects with a mass
* Objects with smaller masses, have a small attractive force
* Earth’s Gravity has the same attractive force on all objects on earth

**Science Spotlight**

* **Aerospace Engineer:** Aerospace engineers use their knowledge of gravity to design objects that defy gravity such as balloons, airplanes, vehicles such as the rovers that go into outer space! Evaluate: Parachute Design:

Teacher says:

We’ve already investigated the effects of gravity on objects with a mass.

What if you were an aerospace engineer designing a parachute for skydivers that have to land on a specific target?

How would they land safely?

Can we slow down the motion of the person due to the force of gravity?

Turns out we can. It’s called *air resistance.* When designing a parachute, you want to increase air resistance and just like the name entails, air resistance is the opposite force of gravity.

How will you design your parachute?

Here’s how you get started.

1. Plan your design and consider some materials you’d like to test for a parachute.
2. Grab a small figurine. I have a little lego but you can use any small object, that will be brave enough to take this small flight
3. You can use some recycled newspaper, aluminum foil and paper towels or anything you think would be suitable that you could find around the house
4. To attach and build the parachute, use a pair of scissors, some tape and string
5. Find a safe place with a reasonable height to drop the skydiver.
6. Test how long it takes for him to hit the target on the ground (that’ll be the control to compare your results)
7. Attach and test the parachute.
8. After testing, and evaluating the design, go back and redesign it.

Now, go ahead and try it!

1. Just remember to think about which variable will you test? The parachute material? The size of the parachute or the shape of the parachute? Whatever it is, let us know how it goes!

**Additional Resources:**

 Additional resources for this lesson and other lessons available [www.wtulocal6.net](http://www.wtulocal6.net)

 #KeoScience to show your designs

<https://phet.colorado.edu/en/simulation/gravity-force-lab>

https://www.teachengineering.org/activities/view/design\_a\_parachute

https://www.sciencebuddies.org/science-fair-projects/project-ideas/Aero\_p017/aerodynamics-hydrodynamics/parachutes-does-size-matter#summary