

Teacher's Guide Grade 5: Effects of Force



TEKS 5.6 Force, Motion, and Energy: The student knows that energy occurs in many forms and can be observed in cycles, patterns, and systems. The student is expected to:

D) design an experiment that tests the effect of force on an object.



Background Information: In this unit students continue to explore the effects of force on an object. The unit reinforces the understanding that force is measured using a spring scale in units called Newtons. Students learn about speed and acceleration and observe how changes in the motion of an object depend on the amount of force applied and the mass of the object.

Students also learn that although there is a relationship between weight and mass, they do not measure the same thing. Mass measures the amount of matter in an object, while weight measures the force of the pull of gravity on an object's mass. This reinforces students' understanding that the greater an object's mass, the more it weighs.

Students continue to explore the force of friction on objects and understand that the force of friction depends on the texture of the surfaces in contact.

As in the previous year, students are expected to design their own experiment where they apply knowledge of forces to test the effect of force on an object. They should be given opportunities to test the effect of different types of force on objects.



Prerequisite Knowledge: Prior to this year, students have observed and described the way that objects move, such as in a straight line, zigzag, up and down, back and forth, round and round, and fast and slow. They are also able to demonstrate and record the way in which objects move and have compared the patterns of movement of objects, such as sliding, rolling and spinning.

Students have observed forces such as gravity, friction and magnetism

acting on objects. They also have experience collecting and recording data using the metric system and tools, such as spring scales, balance scales and metric rulers.

In the previous year, they were required to design experiments to test the effect of force on an object, such as push or pull, gravity, friction or magnetism.



Common Misconceptions: Students often believe that large objects exert a greater force than do smaller ones. It is important for students to understand that the amount of force exerted by an object is related to its mass and its speed, not necessarily its size. Students may also think that if an object is at rest, no forces are acting on it. If an object is at rest, it means the forces acting on it, namely gravity and friction, are balanced.

Students confuse weight and mass and what they measure. Although related, they do not measure the same thing. Mass measures the amount of matter in an object, while weight measures the force of the pull of gravity on an object's mass. Mass is constant no matter where you are in the Universe. Weight is not constant. It depends on the pull of gravity.



Essential Questions:

1. What causes a change in motion?

Force can cause an object to change motion. All movement is based on a push or a pull. A push moves an object away, while a pull moves the object closer. Force can start and stop motion, change the direction, or even change the shape of an object. An object's motion is always in the direction of the force exerted on it.

2. What does a spring scale measure?

A spring scale can be used to measure the force of the Earth's gravity pulling down on the mass of an object, also known as the object's weight. Weight is the measurement of the force of gravity between two objects. It is measured in units called newtons. (N)

3. How are mass, gravity and the distance between objects related?

The force of gravity between two objects depends on the masses of the two objects, and the distance between them.

The closer objects are to one another, the stronger the force of gravity. Likewise, the greater the masses of the objects, the stronger the pull of gravity is between them.

4. If a person is riding a bike in one direction at a constant speed, why is the bike not accelerating?

Acceleration is the rate at which an object changes its speed or direction. If a bike is travelling at a constant speed and in the same direction, then the bike's speed and direction are not changing, so it is not accelerating.

5. What factors affect the force of friction between two objects?

The force of friction is greater between rough surfaces than between surfaces that are smooth. The amount of friction depends on the texture of the surfaces in contact and on how much of the surfaces are in contact. The rougher the surfaces and the larger the surfaces in contact, the greater the force of friction between them.



Notes: