

Teacher's Guide Grade 5: Light



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:

C) demonstrate that light travels in a straight line until it strikes an object or travels through one medium to another and demonstrate that light can be reflected such as the use of mirrors or other shiny surfaces and refracted such as the appearance of an object when observed through water.



Background Information: In this unit, students focus on the unique properties of light, specifically reflection and refraction.

They explore how light rays travel in straight lines. Students will investigate and demonstrate that when light strikes the surface of an object or a substance, its behavior depends on the properties of the materials the surface is made of. When light rays strike a smooth, shiny surface, such as a mirror, the reflected light rays leave the surface at the same angle at which they strike the mirror. This is similar to the movement of a ball when it is rolled against a wall and bounces off. When light rays strike a dull dark or uneven surface, the light rays may be absorbed or scattered.

Students also learn that when light travels from one medium to another, the light rays change speed. This causes them to bend, or refract. Refracted light rays create a distorted image of an object when the object is viewed through two different transparent materials, such as air and water, or air and curved glass. This is why looking through a hand lens or microscope magnifies the object being viewed and how curved mirrors allow us to see around corners.

Students learn that materials that absorb light and do not allow light to pass through are opaque. Materials that absorb some light and allow some light to pass through are translucent, while materials that allow all or most of the light rays to pass through are called transparent.

This unit reinforces the importance of identifying the physical properties of matter that help determine different ways matter can be changed and used.



Prerequisite Knowledge: Prior to this year, students have learned that energy, force and motion are related and are a part of everyday life. Students understand that light is a form of energy. They know that energy has the ability to cause change or to make things happen. Students have investigated and understand that light helps us see and that increasing and decreasing the amount of light affects how well we are able to see.

This is the first year students will experience the reflection and refraction of light and how light rays behave when they interact with different types of materials.



Common Misconceptions: Students are often unaware that reflected light is necessary for vision and for being able to see color. They may also find it difficult to understand that light rays travel at a certain speed in air and at a different speed when shining through other transparent materials, such as water or curved glass. They need many experiences investigating the properties of reflection and refraction using different materials. They should investigate smooth, shiny, flat and curved surfaces as well as rough, shiny surfaces, such as a ball of aluminum foil that has been crumpled and then straightened out. They also need to experience the refraction of light through different mediums and with curved mirrors and lenses.



Essential Questions:

1. How do light rays move?

Light rays move outward from the light source in straight lines.

2. What causes light to reflect from an object's surface?

When light strikes the surface of an object, some of the light bounces off the surface. The light rays that travel from the object to our eyes allows us to see the object. A smooth and shiny surface, like that of a mirror, reflects the most light.

3. What model or example could be used to demonstrate that light travels in a straight line?

(There are many answers that could be given.) Using an index card with a

pinhole, a flashlight and a dark colored sheet of paper, you can show that light rays travel in a straight line. Shine the flashlight straight at the index card with the dark sheet of paper placed behind it. The light rays that strike the surface of the card will be blocked from passing through it while those light rays that pass straight through the pinhole can be seen as a pinhole of light on the dark sheet of paper.

You can also turn off the lights in the room so it is dark. Then, shine a flashlight and sprinkle a fine powder in the path of the light rays. The powder will allow you to see the light rays as they travel in a straight line. An image of the Sun's rays shining through a break in the clouds will also demonstrate that light rays travel in a straight line.

4. How can the refraction of light be demonstrated?

Refraction occurs when light rays pass through one clear transparent material into another. The light rays change speed when this happens causing them to bend. Objects viewed through a clear, curved lens or objects placed behind or in a clear glass of water will be distorted. They will be magnified or appear smaller than actual size depending on the curve of the lens or glass. A prism and a flashlight or other light source can be used to demonstrate that white light, when refracted by the prism, is composed of many different colors.



Notes: