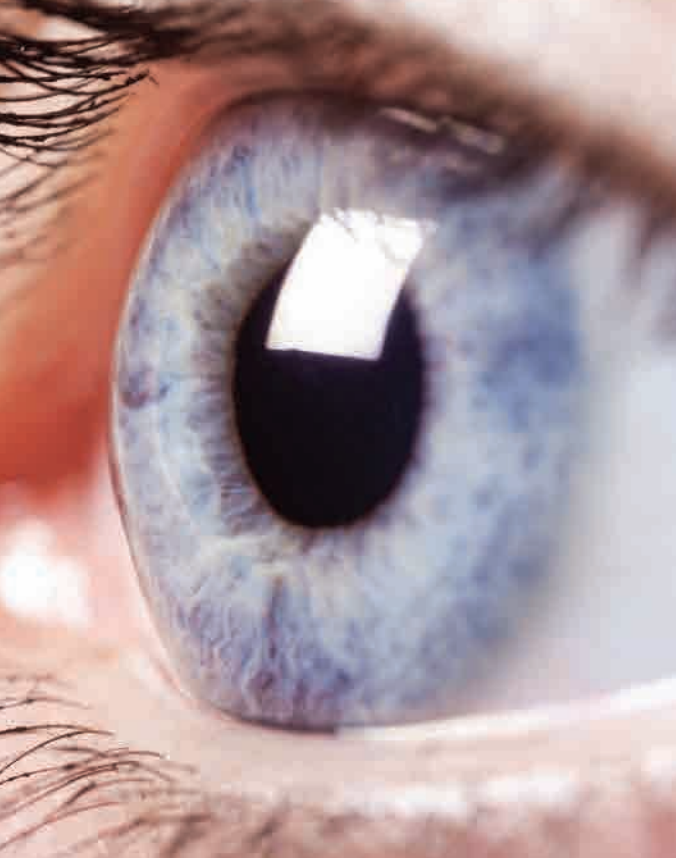


STEM Home Activities

Engaging students in learning during the winter break

STEMscopes™

THE LEADER IN STEM EDUCATION

Winter is Here

Every student looks forward to the winter holiday break—time with family and friends, presents, and a change in the seasons! Although the winter school break is much shorter than summer break, students can still experience learning loss if they don't stay engaged with science content. Parents and family members alike are invaluable resources who can help keep their students engaged during the weeks away from school. With testing season around the corner, why not help your child revisit some often-misunderstood scientific concepts by exploring the phenomena and bringing them to life?

Immerse your child in a hands-on experience to help them see and touch science directly. We've gathered three Connecting with Your Child hands-on activities that are easy for parents, family members, and children to do together at home. These three activities focus on some of the most commonly misunderstood elementary school scientific concepts: the behavior of light (K-1st grade), changes from heat (2nd-3rd grade), and information technologies (4th-5th grade).

Each activity is coupled with a link to the STEMscopedia, a brief student-friendly text that parents can read online to help their students understand the science behind the Connecting with Your Child activity. Help your child get the most out of this holiday break by sharing interesting activities, scientific literacy, and hands-on exploration—make it a winter break to remember!

"When schools... [and] families... work together to support learning, students tend to earn higher grades, attend school more regularly, stay in school longer, and enroll in higher level programs."

National Education Association. (2008). Parent, Family, Community Involvment in Educaiton. Retrieved from https://www.nea.org/assets/docs/PB11_ParentInvolvement08.pdf

Behavior of Light – K / 1st Grade

Exploring Light

Building a periscope is a fun activity to share with your child as a way to continue investigating the behavior of light, but he or she will need help. A periscope is a tool with several mirrors at opposite ends of a long tube, allowing the viewer to see around objects. Designing and building a periscope is an excellent way to learn about the fundamental laws of reflection.

Remember that light travels in straight lines and that the angle of incidence equals the angle of reflection. In other words, the angle at which a light ray approaches a mirror is the same as the angle at which the light ray bounces off the mirror. Plans and instructional videos for building a periscope can be easily found on the internet. Use search terms such as “periscope plans.”

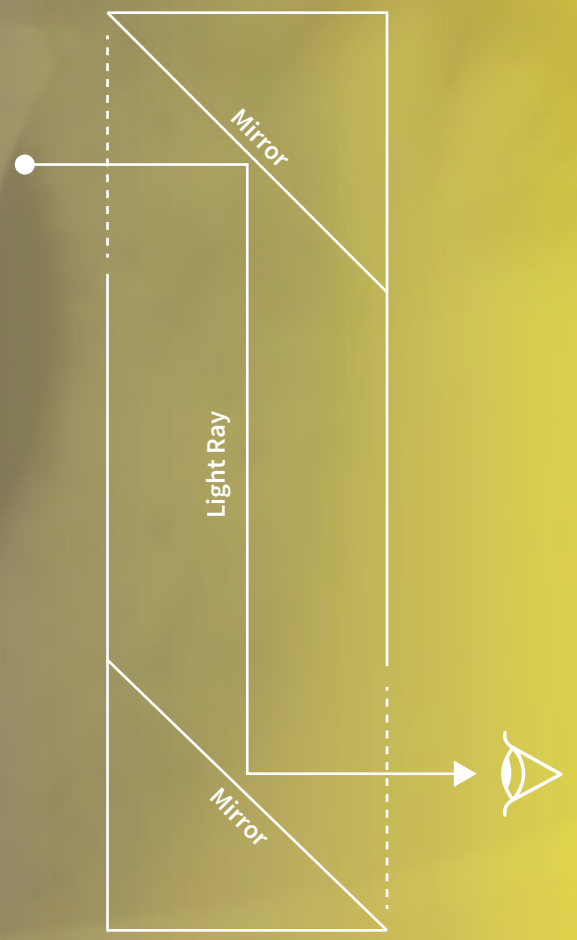
For most designs, you will need these items:

- A long, square box
- Two small pocket mirrors
- A protractor
- A sharp knife (to be used only by an adult)
- Duct tape

As you and your child position the mirrors at either end of the box, explain to your child the importance of the angles at which the mirrors are set. The first mirror must reflect the light entering the periscope toward the mirror at the other end of the periscope. The second mirror must then reflect light toward the eyepiece of the periscope.

It may help to watch videos together to see how a periscope is used aboard a submarine. Encourage your child to find other uses for the periscope. For example, a periscope can let someone look around a corner or above a couch.

Simple Periscope



Behavior of Light - K / 1st Grade

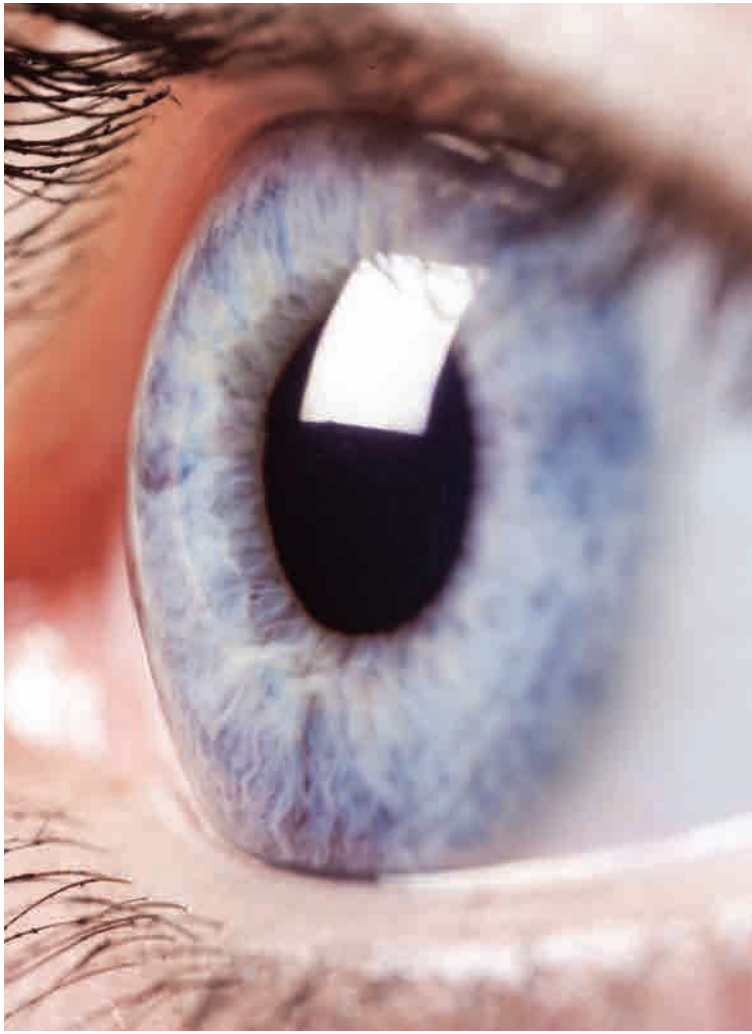
Exploring Light

Why Is This Important?

Without light, we would not be able to see. Whether it's our reflection in a mirror or the bright colors in a bouquet of flowers, light's ability to reflect (bounce) off surfaces and objects affects how we see the world around us. The objects light bounces off can be opaque, transparent, or somewhere in between—what we call "translucent." Can you name an example of each kind of reflective object in your home?

Did You Know?

Our eyes are amazing organs. Inside of our eyes are specialized groups of cells called rods and cones. Rods are very good at reacting to light intensity (bright or dark), while cones specialize in distinguishing colors. Still, our eyes don't actually "see" anything—our brain does the work by interpreting the way rods and cones react to light. What would the world look like if we only had cones in our eyes and no rods?



▶ **Ready to Read More?**
Access the STEMscopedia and dive deeper at:
https://bit.ly/2Ej99Q2

Changes from Heat – 2nd / 3rd Grade

Exploring Thermal Energy

In this investigation, you and your child will study the way that air can expand and contract when heat is added or removed. You will need these materials: an empty plastic water or soda bottle (about 1 pint); the freezer compartment of a refrigerator; and a hot water tap. The less rigid the bottle is, the better.

Begin by explaining that the empty bottle is not really empty because it is full of air. Explain that air is made of extremely small moving particles. As these particles are heated, they move faster. As they are cooled, they slow down.

Follow this procedure to complete the investigation:

1. Put the cap on the bottle and ask your child to squeeze it. Your child won't be able to crush the bottle because it is full of air.
2. With the cap still on, turn on the hot-water tap and hold the bottle under it for 1 minute. Ask your child to try to squeeze the bottle again. It will be even harder to squeeze the bottle because the air inside expands when you add heat to it. (That is, the particles move more quickly and, therefore, are farther apart.) For further proof, undo the cap and listen to the air rushing out.

- Put the cap back on the bottle and put the bottle in the freezer. Ask your child to predict what will happen to the bottle in the freezer.
- Remove the bottle after 30 minutes and ask your child to explain why it changed shape. (Air contracts when heat is removed. The particles slow down and, therefore, they cannot move as far apart.)
- Finally, have your child hold out his or her hands, palms up. Explain that you are going to pour cold air onto them. Remove the bottle cap and tip the bottle as you would when pouring water into someone's hands. Your child will feel the cold air on his or her palms. Explain that you were able to "pour" the air because cold air is heavier than warm air.

Here are some questions to discuss with your child:

1. Can you name something else that changes size when heat is added or removed?
2. What do you think would happen if we filled the bottle with water and put it in the freezer? (Explain that water, like air, is made up of extremely small, moving particles. Although things usually shrink when they cool, water is unique in that the particles align to make a larger volume overall when it becomes solid. This is more detail than you need to provide to your child, but you can discuss that water is different from other materials for that reason.)

Changes from Heat - 2nd / 3rd Grade

Exploring Thermal Energy

Why Is This Important?

Heat is a form of energy—thermal energy. By adding heat and taking away heat we can change the nature of the world around us. Some of these changes can be reversed, which means they can change something's form and then return it to whatever state it was before; others are irreversible. Popping popcorn requires adding heat and is irreversible, for example. Turning water into ice is an example of a change by heat caused by taking away (absorbing) thermal energy.

Did You know?

Ever wonder how refrigerators work? Refrigerators compress a special gas and push it through a series of tubes. As it moves through these tubes, the hot gas cools and becomes a liquid, which absorbs heat from what's inside the refrigerator (just as your hand absorbs heat from a cup of hot chocolate, causing your drink to cool down as heat moves from it to your hand). This liquid is then forced to evaporate, becoming a gas again and restarting the cycle in the compressor over and over.

▶ **Ready to Read More?**
Access the STEMscopedia and dive deeper at:
https://bit.ly/2G8KKPD

Information Technologies – 4th / 5th Grade

Data Communication

How do remote control devices communicate?
This activity helps your child investigate the different devices and methods that use technology to transmit and receive information every day.

Materials:

- Television remote
- Garage door opener
- Any other remote-control devices
- Cell phone
- Access to the internet

Experiment Procedure:

1. Start with the device of your choice. Discover what happens when the device is used.
   Is any light emitted?
   Does it have to be "pointed" at a specific spot?
   What powers the device?
2. Go online and research the device and how it works.
3. Repeat the process with the other devices.
4. If you have apps on your phone or computer that control different devices in your home—such as the lights, locks, or thermostat—investigate how they work.

Here are some questions to discuss with your child:

1. From what distance can each device still work accurately? Which remote works from the greatest distance? Why do you think that is?
2. How have these devices improved the way we live and communicate?
3. Before the development of these remotes, how were the different activities done?
4. What is your favorite piece of this kind of technology? Why?

Information Technologies – 4th / 5th Grade

Data Communication

Why Is This Important?

Information technology is all around us—televisions, phones, computers. However, long before modern technologies were invented to transmit information, communication relied on less sophisticated systems, such as drums, smoke signals, semaphore (flag movements), and Morse code. What does the future of information technology look like?

Did You Know?

Morse code, a kind of information communication technology, was invented in the late 1830s as a way to communicate over long distances before telephone and digital technologies existed. Using a spring-loaded "arm" mounted over a paper tape, Morse code users could send a series of signals—short, long, and silence—called dots and dashes (and blanks) by interrupting an electrical current between themselves and another user by closing and opening the circuit for different amounts of time. As the arm moved up and down with each signal, it would create a pattern of dots and dashes with blanks between that could be deciphered with a chart.

▶ **Ready to Read More?**
Access the STEMscopedia and dive deeper at:
https://bit.ly/2Qsf7Fw