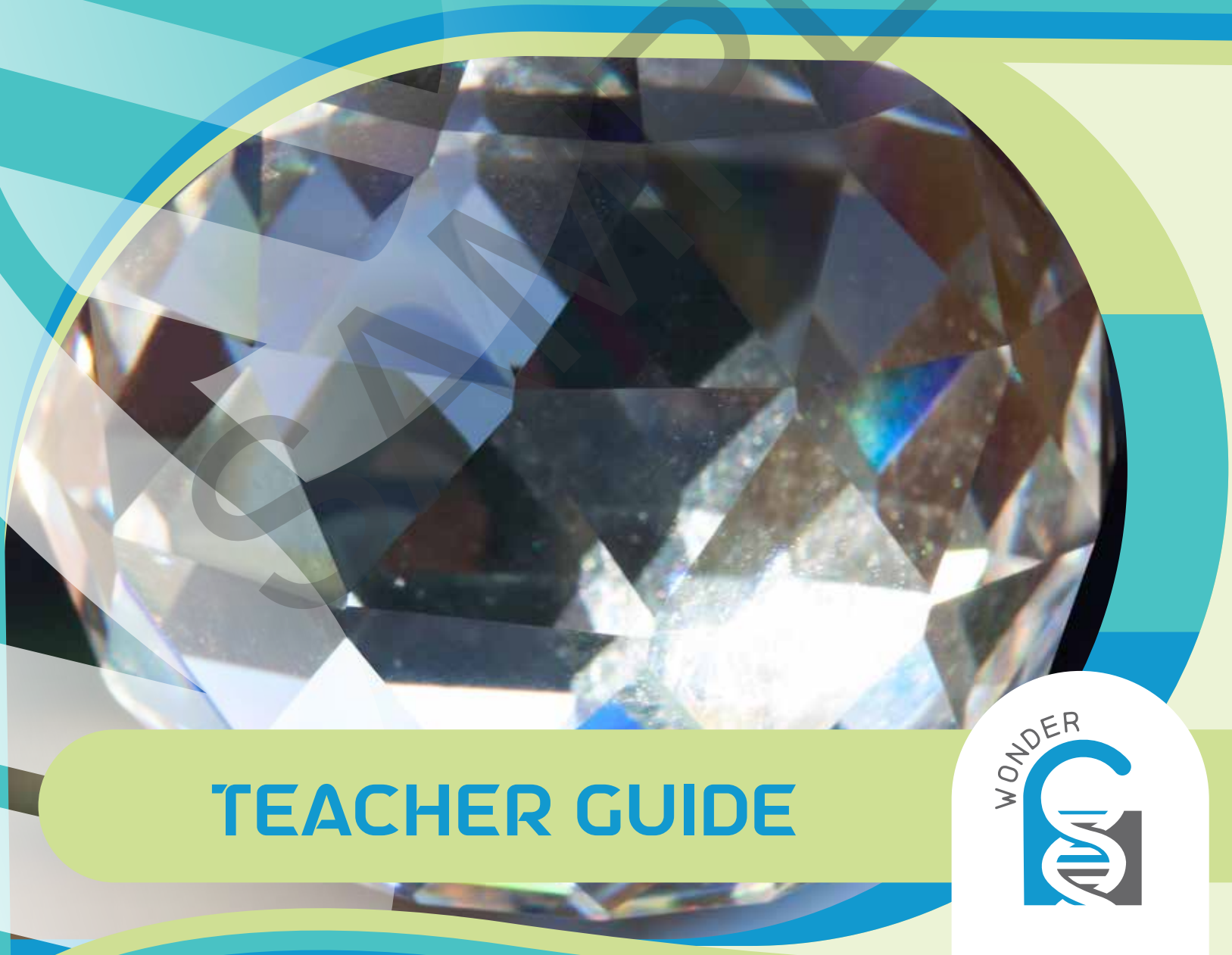


A-MAZE-ING MIRRORS



TEACHER GUIDE



PLANNING

In this a-MAZE-ing hands-on exploration, students will investigate the world of light and discover what happens when it hits different objects. A do-it-yourself periscope and a student-designed mirror maze will provide hours of interactive learning and fun.

ACTIVITY INFORMATION	SECTION (S)	TIME REQUIRED	DAY/ LESSON
ACTIVITY 1: SEE YOU AROUND (THE CORNER) Together, build a DIY periscope from the box the kit came in to see how light travels. Time required: 30 min	<input type="checkbox"/> Build Your Own Periscope	30 minutes	Day 1
ACTIVITY 2: WHAT IS LIGHT LIKE? Your student can read about the basics about light, separate light into a rainbow with a prism, and experiment with color filters. Time required: 1 h 30 min	<input type="checkbox"/> Light Helps Us See <input type="checkbox"/> Light is Energy <input type="checkbox"/> Straight Stack	60 minutes	Day 2
	<input type="checkbox"/> The Colors of Light	30 minutes	Day 3
ACTIVITY 3: WHAT DOES LIGHT DO WHEN IT HITS SOMETHING? It's time to explore how light can go through, bounce off, or get taken in by different materials. Time required: 1 h	<input type="checkbox"/> Letting Light Through	30 minutes	Day 4
	<input type="checkbox"/> Light and T Obi		Day 5

ACTIVITY 4: SOLVING A PROBLEM WITH LIGHT

Full schedule available with purchase

1

activity

SEE YOU AROUND (THE CORNER)

Have you ever wanted to spy around obstacles like fences and walls? In this first activity, you will build your own periscope. A periscope is a tool that uses mirrors to help you see over or around things.

✓ LEARNING GOALS:

I can make observations to show that objects must be lit up to be seen.

BUILD YOUR OWN PERISCOPE



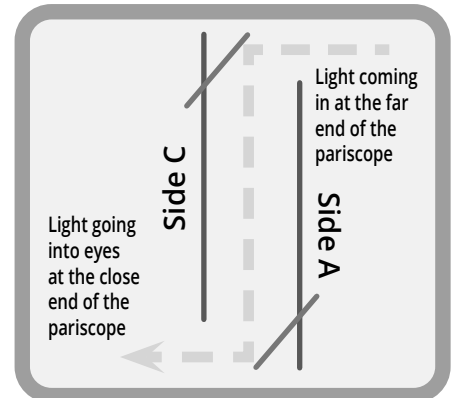
WARNING: Be careful with scissors. Always point them away from your body! An adult should help with cutting cardboard. - Never look at the sun directly or with mirrors.

CONTENT

- For readers: Direct the student to read the introduction to the activity and the materials list.
- For non-readers: Say, "We're going to do a hands-on activity and build our own periscope. A periscope is a tool that uses mirrors to help you see over or around things. We will need the box the kit came in, the mirrors and tape from the kit, and scissors."

✓ PREPARATION AND SUPERVISION

- Help the student gather the materials from the kit and be ready to use scissors for them as needed.
- Then, help the student make the periscope, providing assistance with cutting/taping/placing mirrors as needed. Refer to the photos in the Student Workbook.
- After Step 1, be sure to save the rest of the box because you will need it for a later activity (except for the two short flaps – you can discard them).
- In Step 2 (drawing a line down the middle of the cardboard flaps), you can use a ruler or you can simply use the straight edge of the other flap.
- Before your student can do Step 13, you will need to prepare the mirrors by carefully removing the clear plastic film from one side of each of two mirrors, taking care not to also strip the reflective coating.
- You may choose to let your student decorate the periscope with paper/paint/markers/etc. (not included).
- The key to a working periscope is mirrors that are placed at 45-degree angles. When the mirrors line up correctly, light bouncing off objects can travel from outside the periscope at the far end, to the bottom side of the mirror inserted in Side C, downward to the top of the mirror inserted in Side A, and to the user's eyes (see the labeled diagram).



Notice how light travels in a straight line from the opening in the top to the underside of the top mirror, bounces off in a straight line to hit the bottom mirror, and bounces off in a straight line to the viewer's eyes. You may or may not explain this to your student quite yet; they will learn more about it in Part 2.

How to Help: You may meet the student at their level by helping them place the first object (like the toy) in the drawing, then where the flashlight would have to be to shine on it and finally, where the eyes would have to be for the light to hit them. Encourage the student to draw light as an arrow, and if they do not draw it as a straight line, remind them that light can't bend or curve.

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WARNING: Be careful with scissors. Always point them away from your body! An adult should help with cutting cardboard.

CONTENT

- Your student will do a simple experiment to see that light travels in a straight line.



PREPARATION AND SUPERVISION

- They will need help with scissors, and they may also need help with folding and hole-punching (or cutting holes in) the cardstock.
- Make sure that when the cardstock pieces are set up, the holes are lined up so that light can travel through all the holes in a straight line and reach behind the last one onto a solid surface.



THINK ABOUT IT!

? **Question:** Did light travel in a straight line through the holes? How do you know?

Answer guidance: Light must have been traveling in straight line because the holes were in a straight line.

How to Help: You can explain that if light curved, it would have missed the holes.

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LIGHT IS ENERGY

CONTENT

- Your student will read a short text section, explore how light looks when it goes through a prism, and answer questions related to prisms and rainbows.
- The vocabulary terms light and energy are defined.
- They will read the information and try out the prism to separate the colors of sunlight.
- A prism separates white light into its component colors because different colors of light have different amounts of energy and therefore travel at different speeds through the prism, coming out at slightly different locations on the prism.
- Then, they will compare the photos of the prism and rainbow.
- Guide the student to noticing that the two types have the same colors in rows, but the rainbow looks blurry and not as bright. This is because a cloud causes more scattering of the light as it passes through the many tiny water droplets in the cloud.
- Part of this section presents the idea of only being able to see light and not the other types of energy.
 - o This concept can be confusing because we can see the results of other types of energy, but only because they give off visible light.
 - o For example, we can see the visible light from fire, which is a result of heat.

For non-readers, feel free to use the following script in place of the student reading the text.

WHAT DOES LIGHT DO WHEN IT HITS SOMETHING?

3

activity

Your student may have noticed that when light hits a mirror, it does something different than when it hits a wall. In this activity, they will find out about the different things light can do when it hits objects.

✓ **LEARNING GOALS:**

I can investigate what happens when objects are placed in the path of light.

LETTING LIGHT THROUGH CONTENT

- This text section will have your student thinking about what light does when it hits objects; it does different things depending on the characteristics of the objects.
- The student will learn the definitions of the following vocabulary words: reflection, scatter, transparent, translucent, and opaque.
- The biggest challenge will likely be the vocabulary, so it may be helpful to use repetition of the terms as they finish each paragraph.

For non-readers, you can use the following script in place of the reading selection.

Teacher: Do you remember what light did when it hit the mirrors in your periscope? [Pause for responses if desired.] That's right, it bounced off the mirrors. Light bouncing off something in one direction is called reflection. Some objects are better at reflection than others. Mirrors are good at reflecting, but cardboard is not. When light hits cardboard, it scatters or goes in many different directions.

[Pause to look at the Reflection and Scattering image. Use your finger to trace the path of light for each and encourage the student to do the same.]

Teacher: Light can do more than bounce off an object. Objects can also take in light, or they can let it through. Objects can even let different amounts of light through. An object that lets most or all light through is called transparent.

[Pause to show how all the light is going through the object in the first diagram in the set of three.]

Teacher: If an object lets a little light through, it's translucent.

[Pause to show how only a little light is going through in the second diagram.]

Teacher: If an object doesn't let any light through, it's called opaque.

[Pause to show how none of the light goes through the object in the third diagram.]

Teacher: So, let's review: a transparent object lets all light through, a translucent object lets a little light through, and an opaque object lets no light through.

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Kit	SU-AMZMIR
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