

LESSON PLAN

LIGHT WAVES

by David A. Adler, illustrated by Anna Raff

*Learn about the waves that make up light and create different colors.
Participate in hands-on activities making text-to-world connections!*

Learning Objectives: Students will be able to read for purpose and understanding, identify text type, explain how specific images contribute to and clarify a text, describe how reasons support specific points the author makes in a text, and understand the concept of light waves as it applies to real world experiences.

Guided Reading Level: Q

Grade Level: 4

Interest Level: 2–5

Instructional Standards

Reading Informational Text: RI.2–4. 1,2,3,4,5,7,8

Reading Foundation Skills: RF.2–4.3,4

Writing: W.2–4.2,3,4,7,8,9,10

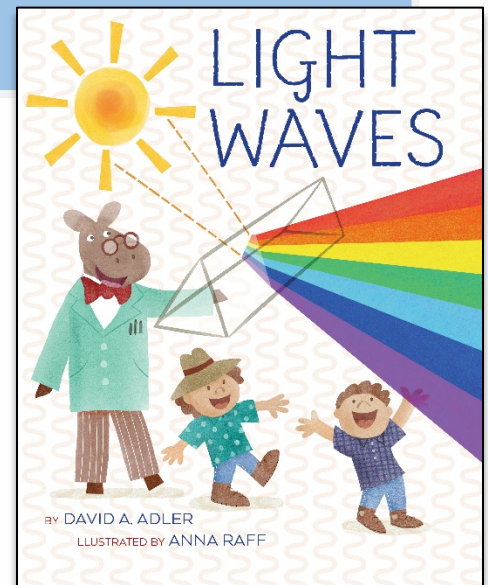
Speaking and Listening: SL.2–4.1,2,3,4

Language: L.2–4.1,2,3,4,6

Next Generation Science Standards: 4–PS3: Energy/4–PS4: Waves and Their Applications in Technologies for Information Transfer

BEFORE READING

1. Discuss the front-and-back cover illustrations and the book title.
2. Invite students to discuss light and light waves.
3. What do you already know about light?
4. Create a KWL chart with the class. What I **K**now, what I **W**ant to know, and what I **L**earned after reading *Light Waves* by David A. Adler.
5. Identify the author and illustrator. Discuss each role.
6. Display *Magnets Push, Magnets Pull; Simple Machines; and Things That Float and Things That Don't*, written by David A. Adler and illustrated by Anna Raff.
7. Discuss the science-content connections of the David A. Adler books.
8. Have students skim the book to identify if it is fiction or nonfiction.
9. Why is it important to think about the text type before reading?
10. What text features does David A. Adler use in *Light Waves*?
11. How are these features helpful in understanding the content?
12. Why do you think David A. Adler uses many detailed illustrations and captions in *Light Waves*?
13. Write the quote on the board and discuss with the class: "Light is nature's way of transferring energy through space."



9780823436828 • Ages 6–9 • E-book available



Nonfiction vs. Fiction

Nonfiction texts:

- give us information that is true
- is organized around a specific idea or topic
- teaches facts through reading

Essential Questions/Big Ideas

Think about and discuss:

- What is light? What is a light wave?
- How is light important to our survival?
- What is energy (energy is power)?
- How are light and energy different?
- Where does most of our light come from?
- How is energy transferred and transformed as it flows through a food chain?
- How can energy be transferred from one material to another?
- What happens to a material when energy is transferred to it?
- How does light travel?
- What is the visible spectrum?
- What are the characteristics and properties of waves and how can they be used?
- What happens when light strikes a surface?
- How does light affect the colors we see?
- What aspects of light change as light passes from one medium to another?
- How do flat versus curved mirrors and lenses reflect or transmit light, and what are the characteristics of the images formed?

DURING READING

First reading/shared: Teacher reads aloud and models as students read along.

Second reading/independent: Students read silently or with a partner.

Think about and identify . . .

1. Which vocabulary words are challenging? Predict their meanings based on context clues.
2. How does David A. Adler introduce the story?
3. How do the specific illustrations and diagrams clarify information?
4. How does David A. Adler use reasons and evidence in the book?
5. Jot down new information on your **KWL** chart.

For each activity, create a journal explaining what you are trying to prove, what you think will happen, and what you observed.

AFTER READING

Make connections:

1. Check the inferred meaning of challenging words and phrases in the glossary or dictionary.
2. In your own words, explain light waves.
3. Create a True or False quiz for the class using ten facts from the book.
4. Describe how one of the hands-on activities helped you understand something new.
5. What did you find interesting about *Light Waves*?
6. Choose another David A. Adler science title (from above). Compare and contrast how he presents information, the book's structure, and the style of his writing.



7. Now that you have read the book, go back and answer the Essential Questions. Use evidence from the book.
8. Create a PowerPoint presentation on one of the waves of energy beyond the "Visible Spectrum," including ultraviolet, infrared, X-rays, gamma rays, and radio waves. Explain the history, use, and future.
9. How does light sustain our world? What would life be like without light?

STEM EXPERIMENT

Glow in the Dark Water

What you need:

- Tonic water
- Clear, plastic, disposable cup
- Medicine dropper
- Optional: Measuring cup
- Bleach
- Ultraviolet "black light"

What to do:

1. Pour about one cup of tonic water into a clear, plastic, disposable cup
2. In a darkened room, turn on the ultraviolet black light and shine it on the cup.

Q: What happens to the tonic water in the cup when the black light shines on it?

- Use the medicine dropper to carefully add two drops of bleach to the tonic water.
- Shine the black light on the cup of tonic water and carefully mix the bleach in with the tonic water.

Q: What happens when the bleach is added to the tonic water? What happens after the bleach is mixed in with the tonic water?

- If you do not see a change in the tonic water, try adding and mixing in a few more drops of bleach. What happens?
- If you have some left, under the black light you can compare the glow of the tonic water in the original bottle to the tonic water that had bleach mixed with it.

Q: Do they look very different? Overall, how did adding bleach to the tonic water change its glow under the black light? You should have clearly seen that the tonic water glowed a brilliant, bright-blue color when you put it under the ultraviolet black light (before adding bleach). This is because the tonic water contains a chemical called quinine, which can *absorb* the ultraviolet light from the black light and then release blue light. After adding and mixing in a few drops of bleach with the tonic water, however, it should have stopped glowing.

Q: What is going on? Bleach is an *oxidizing agent*. As an oxidizing agent, bleach can disrupt and break certain chemical bonds. These chemical bonds in the quinine are the ones that absorb the ultraviolet light. This means that by adding bleach to the tonic water, the quinine becomes unable to absorb ultraviolet light anymore, and so it can no longer emit blue light.

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