

About the Book

Text Type: Nonfiction/Informational Page Count: 24 Word Count: 2,183

Book Summary

Telescopes: Eyes on Space explains the history of telescopes, how they work, and how scientists and others use them to study distant objects in space. Readers also learn about advancements that astronomers and other scientists are working toward achieving.

About the Lesson

Targeted Reading Strategy

- Ask and answer questions

Objectives

- Ask and answer questions to understand text
- Identify main idea and details
- Identify and understand the use of hyphenated compound adjectives
- Identify abbreviations within text

Materials

Green text indicates resources available on the website

- Book—*Telescopes: Eyes on Space* (copy for each student)
- Chalkboard or dry-erase board
- KWL / ask and answer questions, main idea and details, hyphenated compound adjectives, abbreviations worksheets
- Discussion cards



Indicates an opportunity for students to mark in the book. (All activities may be demonstrated by projecting the book on an interactive whiteboard or completed with paper and pencil if the books are reused.)

Vocabulary

*Bold vocabulary words also appear in a pre-made lesson for this title on VocabularyA-Z.com.

- Content words:

Story critical: **amplifier** (n.), **concave** (adj.), **convex** (adj.), **distorted** (v.), **emitted** (v.), **observatories** (n.)

Enrichment: **focal point** (n.), **optical telescope** (n.), **radio telescope** (n.)

Before Reading

Build Background

- Have students discuss their experiences with telescopes in books, movies, or use. Encourage them to share personal stories about observations they made or would like to make through a telescope.
- Show students various photographs of our galaxy taken by telescopes, including comets, stars, constellations, and planets. Discuss the details in the photographs and how telescopes have been used over the past 400 years.

Lesson Plan *(continued)*

Telescopes: Eyes on Space

- Create a KWL chart on the board. Pass out and explain the [KWL / ask-and-answer-questions worksheet](#) to students. Review the meanings of K (What I Already Know), W (What I Would Like to Know) and L (What I Learned). As students share their experiences, write the information under the K heading of the KWL chart. Have students write the information under the same heading on their worksheet.

Preview the Book

Introduce the Book

- Give students their copy of the book. Guide them to the front and back covers and read the title. Have students discuss what they see on the covers. Encourage them to offer ideas as to what type of book it is and what it might be about.
- Show students the title page. Discuss the information on the page (title of book, authors' names).

Introduce the Reading Strategy: **Ask and answer questions**

- Discuss with students how asking and answering questions while reading can help them understand and remember the information in a book.
- Direct students to the table of contents. Remind them that the table of contents provides an overview of the information in a book and the way in which it is organized. After previewing the table of contents, use it to model asking questions.
- **Think-aloud:** *I can use the table of contents to help me think of questions I'd like to have answered about telescopes. For example, section 2 is titled "Early Light-Gathering Telescopes." I want to know whether this will explain who invented the early telescopes. I also want to know whether this section will tell me when the first telescope was invented. Section 3 is titled "How Telescopes Work." I know what a telescope looks like and what it does, but I'm not exactly sure how it works. How are we able to see objects in space that are so far away? What parts do telescopes have? As I read, I enjoy looking for answers to my questions, which often spark further curiosities and questions to answer as I continue to read. I will write these questions under the W section in the KWL chart.*
- Have students look at the other section titles. Invite them to share questions they have about telescopes that spark their curiosity based on the table of contents and the covers of the book. Invite them to share their questions aloud. Write their responses on the class chart and have them copy these questions on their KWL worksheet.
- Have students preview the rest of the book, including the photos, captions, and the glossary on page 24. Invite them to share any additional questions about the topic they might have. Write their responses on the class chart and have them copy the questions on their KWL worksheet.
- As students read, encourage them to use other reading strategies in addition to the targeted strategy presented in this section.

Introduce the Comprehension Skill: **Main idea and details**

- Write the following list of words on the board: *leash, collar, food, toys, and brush*. Ask students to tell what these words relate to (supplies needed to care for a dog). Show them how these words help identify the main idea. (Many supplies are needed to care for a dog.) The words *leash, collar, food, toys, and brush* are the supporting details of this main idea.
- Explain that sometimes there is so much information on a topic that it is grouped into sections, each section with its own main idea.
- Read pages 4 and 5 aloud to students. Model for students how to identify the main idea and details of the first section of the book.
Think-aloud: *As I read the first section of the book, most of the sentences are about how telescopes have helped people learn more about objects in space. I will underline the last sentence on page 4. The section also tells about two major types of telescopes: optical telescopes and radio telescopes. I will underline this information. Each telescope creates images of space objects in a specific way. On the basis of what I've read, I think the main idea of this first section of the book is: Telescopes, such as optical and radio telescopes, help people view and learn more about objects in space.*

Lesson Plan *(continued)*

Telescopes: Eyes on Space

- Write the main idea on the board. Ask students to identify the details from the book that support this main idea (telescopes are powerful tools for viewing stars, planets, and other objects in space; optical telescopes gather light from distant objects and magnify the images; and so on). Write these details on the board.

Introduce the Vocabulary

- Write the following content vocabulary words on the board: *concave* and *convex*. Read the words aloud with students. Ask them to share what they might know about the meaning of each word.
- Model how students can use the glossary or a dictionary to find a word's meaning. Have students locate the glossary at the back of the book. Invite a volunteer to read the definition for *concave* in the glossary. Have students compare the definition with their prior knowledge of the word. Then have them follow along on page 11 as you read the sentence in which the word *concave* appears to confirm the meaning of the word. Repeat the exercise with the word *convex* on the next page.
- Divide students into pairs. Have each pair use what they learned about the meanings of *concave* and *convex* to draw pictures on a separate piece of paper that represent each word.

Set the Purpose

- Have students read the book to find out more about telescopes. Encourage them to ask and answer questions while reading. Remind students to also think about the main idea and details of each section as they read.

During Reading


Student Reading

- **Guide the reading:** Have students read from page 4 to the end of page 9. Remind them to look for information about telescopes that will answer their questions on their KWL worksheet. Encourage students who finish early to go back and reread.
- When students have finished reading, have them circle any questions on their KWL worksheet that were answered in the text and add any new questions that were generated.
- Model answering a question and filling in the second section of the KWL worksheet.
Think-aloud: I wanted to know who some of the early inventors of telescopes were and when they invented them. I found out that Hans Lippershey is credited with combining lenses to make distant objects appear clearer in the early 1600s. I predicted that after some time, someone new would try to further develop the telescope. I found out that Galileo Galilei greatly improved Lippershey's model and became known as the Father of Astronomy. I also wanted to know whether there were larger telescopes than those everyday people use to see the stars. I learned that there are two major types of telescopes. The first type, the optical telescope, gathers light from distant objects and magnifies images formed by that light. The second type, the radio telescope, collects radio waves from space. I will write these answers in the L section "What I Learned" on my KWL worksheet. Before I finished reading the second section, I thought of a new question to add to the W section of my KWL worksheet. Hans Lippershey combined lenses with his invention. I want to know whether today's telescopes follow his model.
- Invite students to share the information they learned as they read the book. Write shared responses on the class chart on the board.
- Model identifying the main idea and details.
Think-aloud: As I read the section titled "Early Light-Gathering Telescopes," I noticed that its focus is on the history of telescopes. I read about the early inventors who created and modified telescopes. The information on page 6 explains the advancement of the telescope's lens by Italian and Dutch lens makers. The book mentions that the Dutch used the telescope as a military tool, and page 7 explains how Galileo Galilei used it to make observations in space. I will underline the two main uses for telescopes in the 1600s. After reading the first section, I think the main idea of this section is: Telescopes were used as important military tools as well as for observing objects in space.

Lesson Plan *(continued)*

Telescopes: Eyes on Space

- Write the main idea on the board. Ask students to look back in the section and identify the details that support the main idea (the telescope allowed armies to watch enemy troops, Galileo and others improved the telescope to reveal more about objects in space, and so on). Write these details on the board.
- **Check for understanding:** Ask students to read the section “How Telescopes Work.” Invite them to share the information they felt was important about the section. Write these details on the board. Have students work in pairs to decide the main idea and details of this section. Ask volunteers to share their information and write it on the board.
- Have students circle any questions on their KWL worksheet that were answered. Ask them to write answers to any circled questions and to write additional questions they raised on their worksheet. Invite them to share the information they learned and the questions they generated while reading.

 Have students make a question mark in their book beside any word they do not understand or cannot pronounce. Encourage them to use the strategies they have learned to read each word and figure out its meaning.

After Reading

- Ask students what words, if any, they marked in their book. Use this opportunity to model how they can read these words using decoding strategies and context clues.

Reflect on the Reading Strategy

- Reinforce that asking questions before and during reading, and looking for the answers while reading, keeps readers interested in the topic. It also encourages them to keep reading to find answers to their questions and helps them understand and remember what they have read.
- **Think-aloud:** *I wanted to know whether today’s telescopes are built according to Lippershey’s model. I found out that many people over the course of many years further developed the telescope to improve their ability to view objects in space. I’m curious to know what scientists will discover in space as they continue to improve the telescope.*
- Remind students that all of their questions may not have been answered in this text. Discuss as a class other sources they might use to locate additional information about telescopes.
- Review with students Galileo’s Dilemma on page 8. Discuss with them the hardships and criticism that he faced because of the sun-centered theory he supported. Remind students that because his theory was thought of as obscure and outlandish, he was belittled and placed under house arrest until he died. Ask students to share their thoughts about the importance of standing up for your beliefs like Galileo did.
- **Independent practice:** Ask students to fill in the L section (“What I Learned”) of their KWL worksheet. Ask them to share their responses.


Reflect on the Comprehension Skill

- **Discussion:** Review with students the inventors of the telescope, the main types, and the advancements and discoveries made possible by telescopes over the years. Discuss how stopping to review the important details helped students remember the facts and better understand the information in the book.
- **Independent practice:** Divide students into groups. Assign each group one of the remaining sections of the book. Introduce, explain, and have students complete the [main-idea-and-details worksheet](#) using their assigned section of the book. Challenge students to use the main idea and details to write a summary of their section. Discuss as a class what they learned.
- **Enduring understanding:** Telescopes have undergone extreme advancements over the years and have helped scientists discover many new things. Now that you know this information, how does technology help us better understand our universe? Why do you think we need to better understand the universe?

Build Skills

Grammar and Mechanics: Hyphenated compound adjectives


- Write the following sentence on the board: *Mr. Smith is a honorable and respected man.* Have students tell you the adjectives in the sentence (*honorable and respected*). Have them identify the noun described by the adjectives (*man*). Explain that both adjectives modify the noun Mr. Smith. Review with them that *adjectives* describe nouns and pronouns.
- Write the following phrase on the board: *well-chosen words.* Explain to students that a *hyphenated compound adjective* is made up of two or more words joined together by a hyphen. Point out how the word *well* modifies the word *chosen*, and the word *chosen* modifies the noun (*words*).
- Explain to students that they can check whether adjectives need a hyphen between them by putting the word *and* between the adjectives. If the meaning of the adjective-noun phrase changes with the word *and*, the adjectives require a hyphen between them.
- Write the words *first aid kit* on the board. Ask students to identify which words *and* would go between (*first* and *aid*). Point out that since the phrase *first and aid kit* doesn't make sense, the phrase needs to be written as *first-aid kit*.
- Write the following sentence on the board: *They saw a close up view of Mars through their telescope.* Ask a volunteer to explain which two words need to be hyphenated and which noun is being described (*close-up, view*). Have students check the response by putting the word *and* between the adjectives. Point out that since the phrase *close and up view* doesn't make sense, the phrase needs to be written as *close-up view*.

 **Check for understanding:** Ask students to turn to page 5 in their book. Point out the following sentence: *It is called an optical telescope, or a light-gathering telescope.* Have students underline the hyphenated compound adjective and circle the noun it describes. Discuss their responses.

- **Independent practice:** Introduce, explain, and have students complete the [hyphenated-compound-adjectives worksheet](#). If time allows, discuss their responses.

Word Work: Abbreviations

- Write the following words on the board: *Doctor, Mister, January, Monday, feet, and inches.* Then write the abbreviation for each word on the board (*Dr., Mr., Jan., Mon., ft., in.*). Ask students to explain what happened to each word (it was shortened).
- Explain to students that *abbreviations* are shortened forms of words and that most abbreviations are followed by a period.
- Ask students to turn to page 12. Ask them to identify the abbreviations on the page (*in.* and *mi.*). Ask students to name the word each abbreviation represents (*inches* and *miles*).

 Have students turn to page 13 and find the abbreviations on the page (*mi./miles, sec./second, and ft./feet*). Have them write each abbreviation and the word it represents at the bottom of the page. Ask volunteers to share their answers. Write their responses on the board.

- **Check for understanding:** Have students turn to pages 14, 15, and 16, and work with a partner to identify the abbreviations and words that represent them (page 14: *in./inches, ft./feet, m/meters*; page 15: *ft./feet*; page 16: *ft./feet*). Ask volunteers to write the abbreviations and the words they represent on the board.
- **Independent practice:** Introduce, explain, and have students complete the [abbreviations worksheet](#). If time allows, discuss their responses.

Build Fluency

Independent Reading

- Invite students to read their book independently. Additionally, invite partners to take turns reading parts of the book to each other.

Home Connection

- Give students their book to take home to read with parents, caregivers, siblings, or friends. Have them discuss their questions about telescopes and objects in space with someone at home.

Extend the Reading

Informational Report Writing Connection

Provide students with additional print and Internet resources to research celestial navigation. Explain that the stars were useful to early explorers, as well as astronomers, because they helped explorers navigate. Have students research other navigational tools used by early explorers and compare them to the satellite-dependent global positioning systems that we use today.

Elements of Nonfiction Connection

Review with students the photographs throughout the book. Read the caption under each photograph. Discuss the function of captions (to provide clarification and elaboration of the photograph and information on the page; to draw conclusions about information presented in the main body of the text). Ask students to explain why it might be beneficial to examine and understand these elements of nonfiction text as they read.

Skill Review

Discussion cards covering comprehension skills and strategies not explicitly taught with the book are provided as an extension activity. The following is a list of some ways these cards can be used with students:

- Use as discussion starters for literature circles.
- Have students choose one or more cards and write a response, either as an essay or as a journal entry.
- Distribute before reading the book and have students use one of the questions as a purpose for reading.
- Conduct a class discussion as a review before the book quiz.

Assessment

Monitor students to determine if they can:

- consistently ask relevant questions about a topic prior to and during reading; locate answers to questions and write them on a worksheet
- accurately identify and use main ideas and details to summarize text during discussion and on a worksheet
- correctly identify hyphenated compound adjectives and understand their use in text during discussion and on a worksheet
- accurately identify abbreviations and the words represented by them during discussion and on a worksheet

Comprehension Checks

- **Book Quiz**
- **Retelling Rubric**