

Learning Guide



The Sun

We hope you enjoyed learning all about our closest star—the Sun. Extend your learning with this print-ready Learning Guide!



What's in this Learning Guide?

Get Set to Listen

Answer TRUE or FALSE statements before and after listening to the episode.

Vocabulary

Discussion Questions

CCSS.ELA-Literacy.SL.3-8.1, SL.3-8.3

Writing Prompts and Extension Projects

CCSS.ELA-Literacy.W.3-8.1, W.3-8.2, W.3-8.3, W.3-8.4, W.3-8.7, W.3-8.8

Build a Sun Model

NGSS: MS-ESS1-1, MS-ESS1-2, MS-ESS1-3; CCSS.ELA-LITERACY.RI.3-5.7; VA:Cn10.1.3-5

Human Solar System: Role-Play Activity

NGSS: MS-ESS1-2; CCSS.ELA-LITERACY.RI.3-5.3;

Telescope Team Role-Play

NGSS: MS-ETS1-1; CCSS.ELA-LITERACY.SL.3-5.1; CASEL: Relationship Skills & Responsible Decision-Making

Solar Math

NGSS: MS-ESS1-1; CCSS.MATH.CONTENT.4.MD.A.2, 5.NBT.B.7, 6.RP.A.3

Solar Songwriting

CCSS.ELA-LITERACY.W.3-5.3, SL.3-5.5; NGSS: MS-ESS1-2, MS-ESS1-3; National Core Arts Standards: MU:Cr1.1.3-5, MU:Cr2.1.3-5, MU:Re7.2.3-5

Additional Resources & Book List



The Children's Hour
kids public radio

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<https://www.childrenshour.org/the-sun/>



Get Set to Listen

1. Before listening!

Read each statement and write TRUE or FALSE based on what you already know.



2. After listening!

Based on what the experts said in the episode, write TRUE or FALSE.



Before Listening	TRUE or FALSE?	After Listening
	1. The Sun is the closest star to Earth.	
	2. The Sun is made mostly of helium.	
	3. Solar flares can affect Earth's power systems.	
	4. The Sun is about halfway through its life cycle.	
	5. Scientists completely understand why the Sun's corona is millions of degrees hotter than the surface.	
	6. Earth is protected from many solar eruptions by its magnetic field.	
	7. All the elements found on the periodic table can also be found in the Sun.	

What did you learn?



Get Set to Listen

Answer key

1. TRUE
2. FALSE. The Sun is mostly hydrogen (about 75%) and about 24% helium.
3. TRUE. Strong solar flares can disrupt power grids and even cause blackouts.
4. TRUE. The Sun is about 4.5 billion years old and has roughly another 5 billion years left.
5. FALSE. This is still a mystery scientists have not fully solved. Maybe *you* will figure it out someday!
6. TRUE. Earth's magnetic field shields us from much of the Sun's discharged energy.
7. TRUE. Less than 1% of the Sun is made of all the other elements in the universe.



Vocabulary

Listening for Words

1. Make a four-column chart and label the columns “I don’t know,” “I’ve seen or heard, but don’t know the meaning,” “I think I know the meaning,” and “I know the meaning.”
2. Write the vocabulary word in the column that describes how well you know the meaning of the word.
3. Listen to [the episode](#). Note how the speaker uses the words.

Matching Words with Definitions

1. Print and cut apart the word and definition cards.
2. Spread out the word cards so you can see them all. One by one, attach a definition card to each word card.

Writing with New Words

After working with the words and definitions, write a one-page essay or story that uses at least three of the words.

observatory

A place where scientists study space and the sky.

nuclear fusion

The process where atoms join together and release energy. The Sun shines because of nuclear fusion.



Vocabulary

sunspot

A cooler, dark area on the Sun's surface. Scientists study sun spots to learn about the solar flares.

solar flare

A sudden burst of energy from the Sun.

magnetic field

An invisible force around magnets or a planet. Earth's magnetic field protects us from solar radiation.

radiation

Energy traveling through space. UV radiation from the Sun can cause sunburns and other damage to living things.



Vocabulary

atmosphere

The layer of gases around Earth. Earth's atmosphere helps protect us from harmful rays.

ozone layer

A layer in Earth's atmosphere that blocks harmful UV rays.

plasma

Superheated gas found in stars like the Sun.

photosphere

The visible surface layer of the Sun.



Vocabulary

chromosphere

A layer of the Sun above the photosphere.
This is where solar flares happen.

corona

The outer layer of the Sun's atmosphere.
This can be seen during a solar eclipse.

Write your own vocabulary word.

Define your vocabulary word.

Write your own vocabulary word.

Define your vocabulary word.



Discussion Questions

1. Could life exist without the Sun?
2. What are some ways the Sun helps Earth every day?
3. What do you think would happen if the Sun suddenly disappeared?
4. Why is it dangerous to look directly at the Sun?
5. How has our knowledge and understanding of the Sun changed and grown over time? Why do you think science is always changing and growing, even about something familiar like the Sun?
6. What did you learn about the Sun that surprised you the most? Why?
7. What mysteries about the Sun or space would you like solved?
8. Would you want to work at a solar observatory? Why or why not?
9. What skills do you think a telescope team member needs to have?

Group Discussion Strategies

Think Pair Share:

1. Individually, student writes down their answer to a question.
2. Students pair up and tell each other their answers.
3. Teacher calls for volunteers to share with the whole class their answer (and/or their partner's answer). Teacher notes key words/phrases on board.

Round Robin:

1. Teacher poses one question (written on top of a large page) to students, who are assembled into small groups of 3 or 4.
2. Students take turns brainstorming the answers. The recorder of the group writes down all answers.
3. The leader reads the group's ideas to the entire class. Teacher moderates.



Writing Prompts

Informative Narrative Prompts

1. Pretend you are traveling safely through the layers of the Sun. Describe your journey from the photosphere to the corona.

Extension: *Illustrate each layer and label what happens there.*

2. Imagine you work with Sarah Jeffries operating the giant telescope. Describe a challenging day studying sunspots and solar flares.

Extension: *Include a problem that the team must solve during a thunderstorm or equipment failure.*

3. Write a creative story about a tiny particle of stardust that eventually becomes part of a planet, a plant, or even a person. Continue the story into the far future when the Sun reaches the end of its life cycle.

4. Pretend you are part of the Kids Crew. Write 5–10 interview questions you would ask a solar scientist, an astronaut, or a telescope engineer.

Extension: *Role-play the interview with a partner.*

5. Write a first-person story from the Sun's point of view. Include how the Sun formed, what it sees, how it helps Earth, and what happens during solar flares.

Extension: *Illustrate your story as a picture book.*

6. Explain how the Sun changes hydrogen into helium through nuclear fusion and why this creates light and heat.

7. Explain how the telescope at Sunspot Solar Observatory worked and why it was built on top of a mountain.

Extension: *Design your own imaginary solar telescope and describe its special features.*

Opinion/Persuasive Prompts

1. Should governments continue funding space research? Write a persuasive essay explaining whether studying the Sun and space is worth the cost.

Extension: *Debate the topic with a partner using evidence from the episode and your own research.*

2. Do you think the Sunspot Solar Observatory should have been preserved instead of demolished? Explain your opinion with reasons and evidence.



Build a Sun Model

Listen

to [The Children's Hour, "The Sun" episode](#)

- "The Stuff of Stars" (segment 32:27-38:11)
- "Observing the Sun" (segment 23:20-27:26)

Watch

- [The Sun](#): Learn about what the Sun is, what it's made of, and its different layers in 8 minutes.
- [Inside the Sun: A Journey Through Its Layers](#): In less than 1 minute!

Diagram the Sun

Describe the different layers of the Sun, including the core, photosphere, chromosphere, and corona.

Build a Sun Model

Create a labeled diagram or model of the Sun showing its layers:

- *Core*
- *Radiative zone*
- *Convection zone*
- *Photosphere*
- *Chromosphere*
- *Corona*

Possible Materials

- *Clay*
- *Paper plates*
- *Cardboard*
- *Digital drawing tools*



Extension

Create a model or infographic showing the temperature differences between the layers.

Art Extension

Make a collage of the Sun and its layers using a variety of materials (e.g. magazine clippings, tissue paper, paint, foil, yarn, etc.)

Show: *heat, light, plasma, sunspots, solar flares*



Human Solar System

Listen

to [*The Children's Hour*, "The Sun" episode](#)

- "Formation of the Sun and Our Solar System" (segment 8:52-11:03)
- "The Stuff of Stars" (segment 32:27-38:11)

Materials

- Signs or name tags for each of the roles
- Streamers or ribbons for solar flares
- Magnet or hula hoop (optional for magnetic field demonstration)

Roles

- the Sun
- planets
- Earth's moon
- solar flare particles (optional)
- Earth's magnetic field (optional)



Act It Out

Rotation

The "Sun" stands in the center. Each "planet" spins slowly in place.

Discuss

- Rotation means spinning on an axis.
- Earth's rotation causes day and night.
- *What would happen if Earth stopped rotating?*

Orbit

"Planets" walk in circles around the "Sun." The "Moon" orbits "Earth" while "Earth" orbits the "Sun."

Discuss

- Gravity keeps planets in orbit.
- The Sun's gravity holds the solar system together.

Solar Flares

Choose students to be "solar flare particles." The "Sun" sends streamers or students outward.

Discuss

- Solar flares release energy into space.
- *How can solar flares affect Earth?*

Earth's Magnetic Field

One student uses a hula hoop or stretched arms around "Earth." Solar flare particles try to reach Earth but get redirected.

Discuss

- Earth's magnetic field protects us from harmful solar radiation.

Reflect

- *What is the difference between rotation and orbit?*
- *How does Earth stay protected from solar flares?*



Telescope Team Role-Play

Operating a sun telescope is a big job, and it takes a team of specialized scientists to make it happen. Learn all about it with this telescope team role-play activity!

Listen

to [The Children's Hour, "The Sun" episode](#)

- "Operating Sun Telescopes" (segment 42:55-46:29)
- "Observing the Sun" (segment 23:20-27:26)

Watch

[Meet a Solar Telescope: A Virtual Field Trip to Hawaii](#)

Act It Out

Roles

The Telescope Operator helps run the telescope. They point it at stars, planets, or the Sun and make sure all the equipment is working safely. If something breaks or stops working, they help fix the problem.

The Researcher (Astronomer) is the scientist who studies space. They ask questions about the universe, collect information from telescopes, and use what they learn to make discoveries. They also share their findings with other scientists and the public.

The Weather Monitor checks the weather conditions around the observatory. They watch for clouds, wind, rain, or ice to make sure it is safe to use the telescope. If the weather is dangerous, they may stop telescope observations.

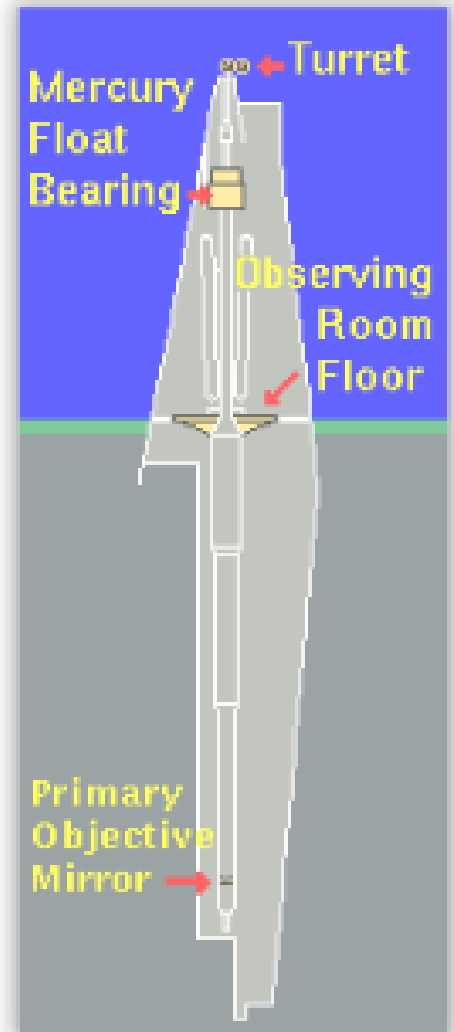
The Data Analyst works with the pictures and information collected by the telescope. They use computers to organize and clean up the data so scientists can study it more easily and make discoveries about space.

Challenge Events

Pause the activity and announce events like:

- "Strong winds are approaching!"
- "The telescope camera stopped working!"
- "A solar flare has been detected!"
- "Clouds are blocking the Sun!"
- "New data shows the sunspot is growing!"

Work together to solve the problems!



Learn more about this sun telescope in Sunspot, NM [here](#).

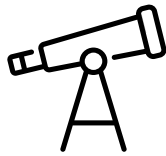
Learn about one of the newest high-resolution sun telescopes [here](#).

Reflect

- Which job seemed the hardest?
- Why is teamwork important at an observatory?
- How do scientists learn about the Sun safely?
- Why do people study solar flares?



Telescope Team Role-Play



Telescope Operator

- Point the telescope toward the sunspot.
- Make sure cameras and computers are working.
- Tell the team when the telescope is ready.
- Respond if “equipment problems” happen during the mission.



Researcher (Astronomer)

- Decide what information the team should collect.
- Ask questions such as:
 - Will the sunspot produce a solar flare?
 - How could it affect Earth?
- Explain discoveries to the group at the end.



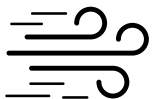
Weather Monitor

- Check “weather cards” or teacher announcements.
- Decide if it is safe to keep the telescope open.
- Warn the team about clouds, wind, rain, or storms.



Data Analyst

- Record observations from the telescope team.
- Organize the information into charts or notes.
- Look for patterns in the sunspot activity.



High Winds



Snow Storm



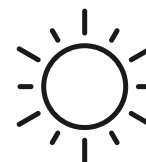
Fog



Light Drizzle



Partial Cloud Cover



Clear Skies



Solar Math

Comparing Space Objects

Use the information in the chart to help you answer the following questions:

space object	volume (km ³)	diameter (km)
Sun	1.41×10^{18}	1,392,700
Earth	1.08×10^{12}	12,742
Moon	2.20×10^{10}	3,474

1. How many Earths could fit inside the Sun?

2. How many moons could fit inside the Sun?

3. How many Earths could line up across the Sun?



Solar Math

1. The volume of the Sun is about $1.41 \times 10^{18} \text{ km}^3$.
The volume of Earth is about $1.08 \times 10^{12} \text{ km}^3$.

Divide the Sun's volume by the Earth's volume:

$$\frac{1.41 \times 10^{18} \text{ km}^3}{1.08 \times 10^{12} \text{ km}^3} \approx 1.31 \times 10^6$$

Answer: About 1.3 million Earths could fit inside the Sun.

2. The volume of the Sun is about $1.41 \times 10^{18} \text{ km}^3$.
The volume of the Moon is about $2.20 \times 10^{10} \text{ km}^3$.

Divide the Sun's volume by the Moon's volume:

$$\frac{1.41 \times 10^{18} \text{ km}^3}{2.20 \times 10^{10} \text{ km}^3} \approx 6.4 \times 10^7$$

Answer: About 64 million moons could fit inside the Sun.

3. The Sun's diameter is about 1,392,700 km.
Earth's diameter is about 12,742 km.

Divide the Sun's diameter by Earth's diameter:

$$\frac{1,392,700 \text{ km}}{12,742 \text{ km}} \approx 109 \text{ km}$$

Answer: About 109 Earths could line up across the diameter of the Sun.



Solar Songwriting

[The Children's Hour, "The Sun" episode](#) is full of great songs that teach us all about the Sun. Take a listen to a few, then use what you've learned to write your own!

Listen

- ["Why Does the Sun Shine?" by They Might Be Giants on Here Comes Science](#)
- ["The Sun Song" by The Chromatics on AstroCappella 2.0](#)
- ["93 Million Miles Away \(The Sun Song\)" by The Singing Planets on My Fantastic Field Trip to the Planets](#)

Write a Sun Song

After hearing songs in the episode, write your own short song or rap about:

- nuclear fusion
- stars
- solar flares
- sunlight

Extension

Perform your song for classmates or family members.

Create a Space Soundtrack

Use classroom instruments or household items to create sounds for:

- solar flares
- stars forming
- planets orbiting
- exploding supernovas

Extension

Record your soundtrack and narrate a short "space documentary."



Additional Resources

[Outreach Resources about Solar Flares](#)

A collection of resources from FLARECAST for public engagement activities about solar flare forecasting and materials related to the wider field of solar research.

[Straw Painting the Sun](#)

This hands-on art activity from The University of Alaska highlights the dynamic nature of coronal loops and solar flares. It includes step-by-step instructions as well as a 1-page informational passage.

[Modeling Solar Storms](#)

In this activity from the Great Basin Observatory, students explore how the Sun's electromagnetic properties interact with Earth's magnetic sphere, including the effect of solar storms on Earth. Grades 5-8.

[Our Solar Connection: A Themed Set of Activities for Grades 5-12](#)

From the Astronomical Society of the Pacific.

Videos

[NASA: X-Class: A Guide to Solar Flares](#)

This 3-minute video explains powerful x-class solar flares, which produce auroras and can impact the Earth in other ways.

[NASA: The Difference Between CMEs and Solar Flares](#)

This 2-minute video highlights specific differences.

[The Sun](#)

Learn about what the Sun is, what it's made of, and its different layers in 8 minutes.

[Inside the Sun: A Journey Through Its Layers](#)

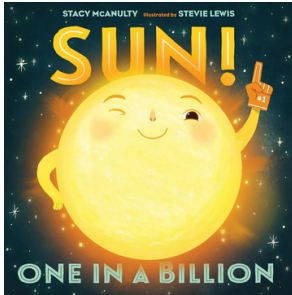
In less than 1 minute!

[Meet a Solar Telescope: A Virtual Field Trip to Hawaii](#)

Learn all about the Daniel K. Inouye Solar Telescope and how it is used to study the Sun's magnetic fields, which helps us understand solar activity and predict future solar behavior as well as the unique ways the sun is honored and understood in Hawaiian culture in this excellent 30-minute virtual tour developed by the NSF.



Book List



Sun! One in a Billion

by Stacy McAnulty, illustrated by Stevie Lewis

This funny, fact-filled book explains the sun's role in the solar system, its importance for life on Earth, and is filled kid-friendly facts—told from the perspective of the Sun itself!

ages 4-8

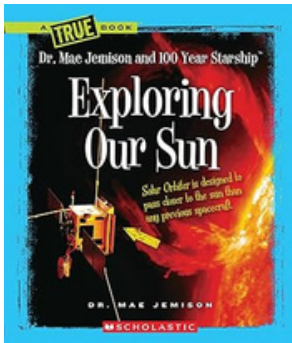


The Sun is Kind of a Big Deal

by Nick Seluk

This hilarious comic-book style nonfiction book is filled with facts and cute planets alike. It will make learning all about our closest star a blast!

ages 4-8



Exploring Our Sun

by Mae Jemison and Dana Meachen Rau

This book was co-authored by astronaut Mae Jemison and will teach readers all about the sun, how it was created, and how its energy affects Earth.

ages 7-10

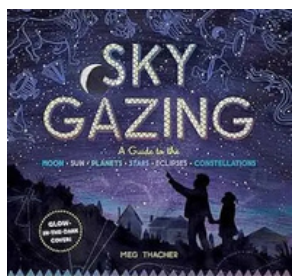


The Sun

by Seymour Simon

This classic non-fiction book features clear text and full-color photographs. It introduces readers to the layers of the sun, solar flares, eclipses, and more.

ages 7-10



Sky Gazing: A Guide to the Moon, Sun, Planets, Stars, Eclipses, and Constellations

by Meg Thacher

This book offers older kids a deep dive into the history of astronomy, explaining exactly how we know what we know about the sun and the planets orbiting it as well as how to observe the night sky. Part of the popular *Who HQ* series.

ages 9-14