

Learning Guide



Exoplanets

We hope you enjoyed learning all about how scientists locate and learn about exoplanets, including whether or not they might be habitable. 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

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

Compare: Planets, Exoplanets, Dwarf Planets

NGSS MS-ESS1-3; CCSS.ELA-LITERACY.W.5-6.1, CCSS W.5-6.1

Design an Exoplanet

NGSS MS-ESS1-3, MS-ETS1-1; CCSS W.5-6.2; ELA-LITERACY.W.5-6.7; CCSS SL.5-6.5

Exoplanet Travel Brochure

NGSS MS-ESS1-3, MS-ESS1-4; CCSS W.5-6.2; ELA-LITERACY.W.5-6.7

Could This Planet Support Life?

NGSS MS-ESS1-3, MS-ESS1-4; CCSS RST.6-8.1, RST.6-8.7

Alien Life Design Challenge

NGSS MS-LS1-5, MS-LS4-6, MS-LS2-1; CCSS RST.6-8.7

Would You Rather? Space Edition

CCSS W.3-8.1, RST.3-8.1, SL.3-8.4; NGSS MS-ESS1-4

Additional Resources & Book List



The Children's Hour
kids public radio

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<https://www.childrenshour.org/exoplanets/>



Get Set to Listen

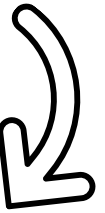
1. Before listening!

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. An exoplanet is a planet that orbits a star outside our solar system.	
	2. A planet can be discovered even if scientists cannot easily see the planet itself.	
	3. Studying an exoplanet's star can provide clues about the planet.	
	4. An exoplanet must be the same size as Earth.	
	5. Scientists already know that intelligent life exists on an exoplanet.	
	6. Our solar system is the only planetary system in the universe.	
	7. The search for exoplanets is finished because scientists have already found all the planets in the universe.	

What did you learn?



Get Set to Listen

Answer key

1. TRUE
2. TRUE
3. TRUE
4. FALSE. Exoplanets come in many different sizes.
5. FALSE. Scientists are still searching for evidence of life beyond our solar system.
6. FALSE. Scientists have discovered many planetary systems beyond our own.
7. FALSE. Scientists continue discovering and studying exoplanets.



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.

exoplanet

A planet that orbits a star other than our Sun.

planet

A large, round object in space that orbits a star.



Vocabulary

dwarf planet

A round object that orbits the Sun but does not meet all the requirements to be called a planet.

galaxy

The Sun and all the planets, dwarf planets, moons, asteroids, and other objects that orbit it.

orbit

The path an object follows as it moves around another object in space.

habitable

Suitable for living things to live in.



Vocabulary

telescope

An instrument used to observe objects that are very far away in space.

detect

To discover or notice something, especially something that is difficult to see.

celestial body

A natural object in space, such as a planet, star, moon, or asteroid.

transit

When a planet passes in front of its star from our point of view, making the star look slightly dimmer.



Discussion Questions

1. What do you think would be the most exciting thing about discovering life outside Earth?
2. Would you rather discover a new exoplanet or discover evidence of life on an exoplanet? Why?
3. Why do you think ordinary people can help scientists look through space images?
4. What skills would someone need to study exoplanets?
5. Pluto was once called a planet and is now classified as a dwarf planet. Do you think changing a scientific classification changes what the object really is? Why?
6. Scientists sometimes think they have detected a planet, but later discover that it was just noise or another signal. Why is it important for scientists to check their evidence carefully?
7. If you discovered an exoplanet that could support life, what would you want scientists to investigate first?

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

Narrative Prompts

1. Write a story about a young scientist who discovers an exoplanet that no one has ever seen before.
2. Imagine scientists receive a radio signal from an intelligent species on another planet. Write about what happens next.

Informational/Expository Prompts

1. Describe how scientists use transits to detect exoplanets. Explain what happens when a planet passes in front of its star.
2. Explain what scientists look for when trying to determine whether an exoplanet could support life.
3. Scientists discover an exoplanet with an atmosphere similar to Earth's. Write an article explaining what scientists should do next. What should they investigate, what questions should they ask, and what evidence would they need before saying the planet could support life?

Opinion/Persuasive Prompts

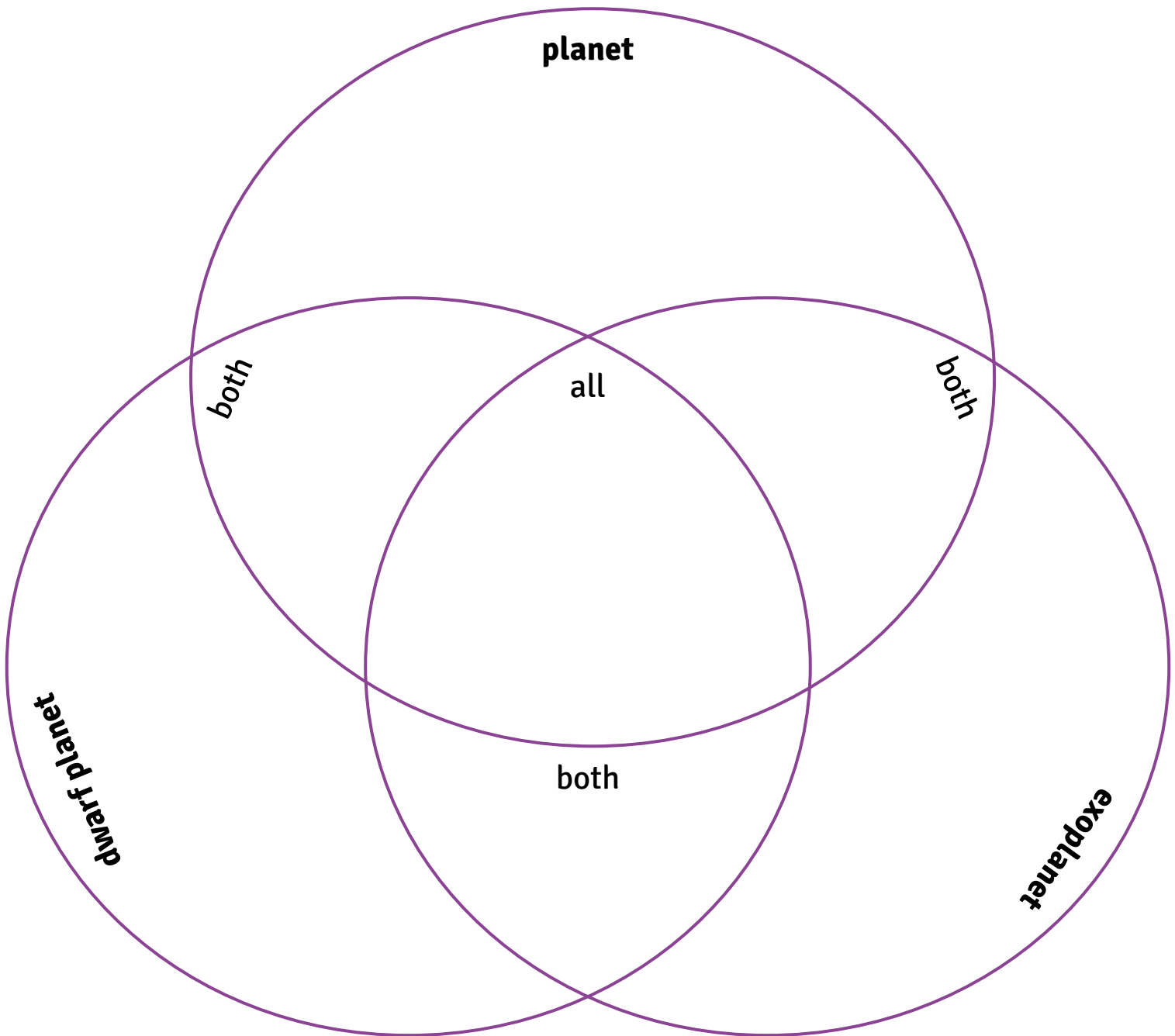
1. If scientists discovered an exoplanet that was very similar to Earth, would you want humans to try to travel there? Why or why not?
2. Explain how discovering life on another planet could change the way humans think about Earth and life in the universe. Dr. Dragomir says she would rather take care of the planet we have. Do you agree that protecting Earth should be a priority? Explain your thinking.



Compare: Planets, Exoplanets, Dwarf Planets

Listen

- Part 1: What is an exoplanet and how do you find them?
 - segments (6:05-8:19) + (12:49-18:21)



Write

Should Pluto Be a Planet?

Do you think Pluto should be called a planet or a dwarf planet? Use information from the episode segments and your diagram to support your opinion.



Design an Exoplanet

Listen

- Part 1: What is an exoplanet and how do you find them?
 - segments (6:05-8:19) + (12:49-18:21)
- Part 2: Life on exoplanets?
 - segment (23:50-31:18)

Your Mission

You are an exoplanet scientist! Create your own imaginary exoplanet. Think about what your planet looks like, what it is made of, and whether life could survive there.

Planet Profile

My planet is called _____

My planet orbits the star called _____

How far is your planet from its star?

- ☐ Very close
- ☐ A medium distance away
- ☐ Very far away

Distance: _____

What is your planet like?

Size:

- ☐ Smaller than Earth
- ☐ About the same size as Earth
- ☐ Larger than Earth

Color: _____

Temperature:

- ☐ Extremely hot
- ☐ Hot
- ☐ Mild
- ☐ Cold
- ☐ Extremely cold

Average temperature: _____



Design an Exoplanet

Your Planet's Atmosphere

What gases or materials are in the atmosphere?

- ☐ Oxygen
- ☐ Carbon dioxide
- ☐ Nitrogen
- ☐ Water vapor
- ☐ Other: _____

Describe your atmosphere: _____

The Surface

What is the surface of your planet like?

- ☐ Oceans
- ☐ Mountains
- ☐ Volcanoes
- ☐ Deserts
- ☐ Ice
- ☐ Forests
- ☐ Rocks
- ☐ Lava
- ☐ Other: _____

Describe the surface: _____

Moons

Does your exoplanet have moons?

- ☐ Yes ☐ No

If yes, how many? _____

Describe or name one of its moons: _____



Design an Exoplanet

Your Life on Your Planet

Could your planet support life?

- ☐ Yes
- ☐ No
- ☐ Possibly

Extension

Complete the “**Alien Life Design Challenge**” activity in this Learning Guide!

Draw It

Draw and label your exoplanet below. Include as many details as possible!

Extension

Complete the “**Exoplanet Travel Brochure**” in this Learning Guide!



Exoplanet Travel Brochure

Listen

- Part 2: Life on exoplanets? (segment 23:50-31:18)

Your Mission

You are a space travel expert! Scientists have discovered a new exoplanet, and your job is to create a travel brochure that convinces people to visit.*

Use your imagination, but make your planet scientifically interesting!

* Use the “**Design an Exoplanet**” worksheet in this Learning Guide to help you brainstorm.

Create

Your colorful and attractive travel brochure should include:

- ☐ A catchy title
- ☐ A picture of your exoplanet
- ☐ Things to see
- ☐ Weather and temperature
- ☐ Alien life?
- ☐ How to get there
- ☐ Safety warnings
- ☐ Scientific facts
- ☐ 5+ scientific vocabulary words (See “**Vocabulary**” section of this Learning Guide.)

Bonus Writing Challenge

Could humans actually live on your exoplanet?

- ☐ Yes ☐ No ☐ Maybe

Explain your answer using scientific evidence from the episode or your own research.

Travel Agent’s Final Message

Write one sentence that would convince someone to visit your exoplanet:

“You should visit _____ because _____

_____.”



Could This Planet Support Life?

Listen

- Part 2: Life on exoplanets? (segment 23:50-31:18)

Watch

[How to Find a Planet You Can't See](#)

Your Mission

You are an exoplanetologist, and you've just discovered several exoplanets! Examine the data from each exoplanet data card and consider how it might be used to determine whether the planet might be habitable.

- **Planet's size**
 - What might this tell us about the planet?
- **Distance from star**
 - How might this affect the planet?
- **Temperature**
 - Could life survive at this temperature? Why?
- **Orbital period**
 - How might this affect life on this planet?
- **Atmosphere**
 - Would this atmosphere be suitable for life?
- **Amount of starlight**
 - How might this affect the planet?
- **Possible water**
 - Why might water be important for life?

Explain

For each exoplanet, answer the following questions:

- Could life exist there?
- What evidence supports your answer?
- What, if any, additional information would you need to find out for sure if life exists there?



Could This Planet Support Life?

Exoplanet Data Cards

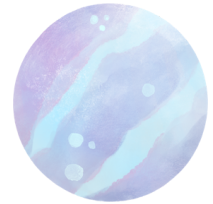


Planet A

- $\frac{1}{4}$ the size of Earth
- Extremely close to its star
- Very hot
- One year on this planet: 79 days
- One day on this planet: 12 hours
- No atmosphere
- Very little starlight
- No evidence of water yet

Planet B

- About the same size as Earth
- Similar distance from its star as Earth is from the Sun
- One year on this planet: 478 days
- One day on this planet: 7 hours
- Atmosphere: oxygen, carbon dioxide, nitrogen, ammonia
- A lot of starlight
- Possible water



Planet C

- 4 times the size of Earth
- Far from its star
- Extremely cold
- One year on this planet: 350 days
- One day on this planet: 22 hours
- Atmosphere: nitrogen, carbon dioxide, sulfur
- Similar amount of starlight as Earth
- Strong evidence of frozen water

Planet D

- 14 times the size of the Earth
- Close to a small, hot star
- One year on this planet: 1,000 days
- One day on this planet: 94 hours
- Thick atmosphere of carbon dioxide and oxygen
- Very little starlight
- No evidence of water yet



Alien Life Design Challenge

Listen

- Part 2: Life on exoplanets? (segment 23:50-31:18)

Your Mission

Imagine scientists discover an unusual exoplanet. Your job is to imagine a life-form that can survive there!*

** Extend your learning with the **"Design an Exoplanet"** activity in this Learning Guide.*

Your Exoplanet

Planet name: _____

What is the environment?

- ☐ Extremely hot
- ☐ Extremely cold
- ☐ Very dark
- ☐ Very little oxygen
- ☐ Other: _____

Your Alien Life-Form

Name of Life-Form: _____

What does it look like? _____

What does it eat or use for energy? _____

How does it move? _____

How does it breathe? _____



Alien Life Design Challenge

What adaptations help it survive the temperature, atmosphere, light and other environmental conditions on your exoplanet?

List at least 3 adaptations.

- _____

- _____

- _____

Draw Your Life-Form

Label at least 3 adaptations on your drawing.



Would You Rather? Space Edition

Listen

- Part 1: What is an exoplanet and how do you find them?
 - segments (6:05-8:19) + (12:49-18:21)
- Part 2: Life on exoplanets?
 - segment (23:50-31:18)
- Part 3: How to discover an exoplanet
 - segment (33:38-37:28)

The Rules

*In each of the following scenarios, choose **one** option (you can't say "both", even if they are both awesome!)*

Then, give evidence or reasoning for your choice.

The Scenarios

- Would you rather discover a new exoplanet or discover alien life?

- Would you rather visit Pluto or an exoplanet?

- Would you rather study a hot lava planet or an icy planet?

- Would you rather be an astronaut or an astronomer?

- Would you rather receive a signal from aliens or photograph a new planet?



Additional Resources

[NASA: Exoplanet Citizen Science](#)

Learn more about becoming an amateur exoplanetologist with NASA.

[Exoplanet Facts for Kids](#)

A kids' encyclopedia entry from Kiddle.

Videos

[Meet the Exoplanets: The Nirks](#)

A 6-part musical about the exoplanets, animated with puppets!

[Paxi Explores Exoplanets!](#)

Learn about exoplanets in this short animated video for kids from the European Space Agency.

[Exoplanets 101: National Geographic](#)

Learn about the types of exoplanets and how scientists find them.

[How to Find a Planet You Can't See](#)

From Vox.

[Paxi: The Solar System](#)

This short animated video from the European Space Agency is a good way to introduce kids to the topic of planets.

[Planets in the Solar System for Kids](#)

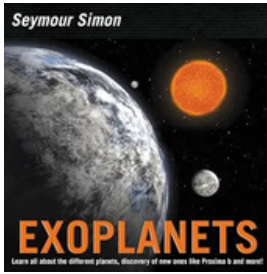
Learn about the Sun and the eight planets in our solar system in this 11-minute video from Learn Bright. Accompanying lesson plans and materials available on the [Learn Bright website](#).

[The Magic School Bus Gets Lost in Space: Full Episode](#)

Learn all about the planets in our solar system with Ms. Frizzle and her class as they travel throughout our solar system on their wacky and magical school bus.



Book List



Exoplanets

by Seymour Simon

The clear, simple text and full-color photographs make this non-fiction picture book fun and engaging for younger readers.

ages 6-10

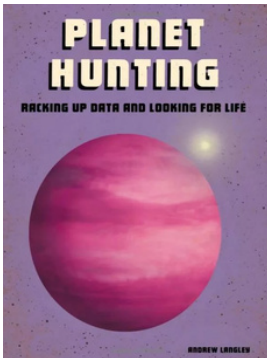


Exoplanets: A Visual Guide to the Worlds Outside Our Solar System

by Wendy Bjazevich, illustrated by David Miles

This book explores planets beyond our solar system, how scientists discover them, and whether they could support life. Learn about four types of exoplanets and fascinating worlds—from water planets to ones that are evaporating.

ages 9-12

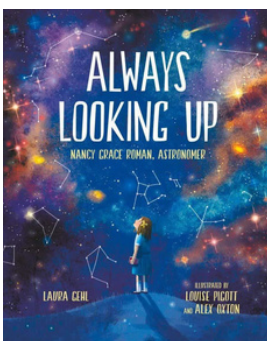


Planet Hunting: Racking Up Data and Looking for Life

by Andrew Langely

An excellent and up-to-date book on exoplanets and how we discover them.

ages 8-14

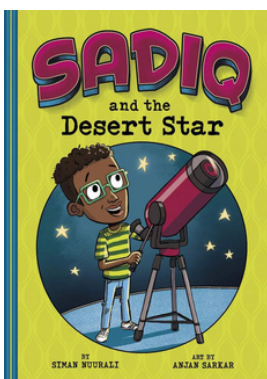


Always Looking Up: Nancy Grace Roman, Astronomer

by Laura Gehl, illustrated by Louise Pigott & Alex Oxton

An excellent biography of a pioneering woman in the field of astronomy. The “mother of the Hubble Space Telescope”, chief of astronomy at NASA, and

ages 4-8



Sadiq and the Desert Star

by Siman Nuurali, illustrated by Anjan Sarkar

A Somali Minnesotan boy discovers astronomy on a planetarium field trip and starts a school Space Club in this easy chapter book. When the club can't afford a telescope, they build one and raise money to finish it.

ages 6-8



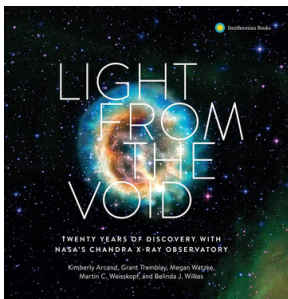
Book List



Imagined Life: A Speculative Scientific Journey Among the Exoplanets in Search of Intelligent Aliens, Ice Creatures, and Supergravity Animals
by James Trefill & Michael Summers

An excellent introduction to the basic ideas of astrobiology, explaining what experiments have shown us so far, what scientists are searching for, and the underlying physics and chemistry. It also speculates on several different kinds of exoplanetary environments where life might arise.

ages 11+



Light from the Void

by Kimberly Arcand, Grant Tremblay, Megan Watzke, Martin C. Weisskopf, & Belinda J. Wilkes, with an introduction by Eileen Collins

This awe-inspiring coffee table book has short introductory essays followed by edge-to-edge prints of gorgeous astronomical objects, each one paired with a detailed caption explaining the significance.
all ages!