

TEACHING GUIDE

DISCOVERING THE UNIVERSE

Activities
supporting the
historic launch
of **NASA's Webb**
Space Telescope

Class set of
MAGAZINES



GAZING
ACROSS
GALAXIES



STUDENTS WILL:

- Read about **engineering**, the **solar system**, **light**, **exoplanets**, and more
- Conduct **research** and create **scale models**
- Meet **STEM professionals**



Video Connection

Share the journey to launching NASA's Webb Space Telescope with your students with the new documentary from CNN Films: ***The Hunt for Planet B.*** Get video clips and bonus articles at: scholastic.com/nasawebb.

ACTIVITY 1: Modeling the Scale of the Universe

Objective

Students will create a model to represent the scale of the universe.

Time 30 minutes

Materials

- Magazine pages 2–4
- Photos of Jupiter: bit.ly/Webb01A and bit.ly/Webb01B

Lesson

1 Hook students by showing an image of Jupiter. Challenge students to guess what they think the red spot might be. (A storm—that has been observed raging for centuries.) Ask them to guess its size. Tell them it's bigger than Earth! Display the composite image that shows scale.

2 Ask students to share examples of models they have used in the past. How did the model help them? Explain that models can help us explore difficult concepts like the scale of the universe.

3 Have students create a live model of the universe with their bodies by calculating relative distances between objects (e.g., our solar system; Earth; Alpha Centauri; and Proxima Centauri) and measuring where they should stand in the classroom or schoolyard. Students should conduct online research to find the distances of their chosen objects.

- What happens if students try to add Alpha Centauri to their scale model of the solar system? Discuss how the scale needs to shift when transitioning from modeling relatively close objects (the Sun) to more distant objects (Alpha Centauri) so students can stay within sight of each other!

Remote modification: Students can create and photograph a model using objects at home, or draw a scale model.

High school extension: Students can use 2D and 3D methods to model the same concept and compare the merits and limitations of each type of model.

ACTIVITY 2: What We Learn From Telescopes

Objective

Students will use a model to explain how scientists learn about faraway objects in the universe.

Time 20 minutes

Materials

- Magazine pages 3, 6–7
- Round objects and a light source
- Optional: NASA video of transit graph: bit.ly/Webb02A and photo of Mercury transiting the Sun bit.ly/Webb02B
- High School: “Exploring Redshift” article (scholastic.com/nasawebb)

Lesson

1 Explain that telescopes not only help us see what faraway objects look like, but we can also observe how celestial objects change our perception of other objects to infer more about outer space.

2 Model how a transiting planet blocks light from a star by holding up round objects of different sizes in front of a light source at different speeds and distances. **If possible:** Show the NASA video and/or image, referenced above. Ask: *How could this concept help astronomers?*

3 Ask students: *How does the object's size affect the amount of light it blocks? What about the distance between the object and the light source?* Explain that scientists also make these sorts of observations in order to calculate the mass of a transiting planet and to investigate the planet's orbit.

4 Point out that NASA has found more than 1,000 exoplanets by looking for the drop in brightness that transiting planets cause to our view of faraway stars!

5 For high school: After reading page 3 of the magazine, ask students to share questions they have about redshift. Then have students read the “Exploring Redshift” article and respond to the questions.

ACTIVITY 3: Galactic Exploration

Objective

Students will conduct guided research about an object in the universe and share their findings.

Time 90 minutes

Materials

- Magazine pages 6–7
- Middle School: Research Activity A and sample research source (bit.ly/Webb03A)
- High School: Research Activity B, sample source (bit.ly/Webb03B), and “Star Power” article (scholastic.com/nasawebb)

Lesson

1 ask students to discuss the following questions with a partner: How can studying exoplanets help us better understand our own planet? If there is other life in space, what would you want to know about it?

2 High school: Have students read the “Star Power” article and answer the questions about how stars form helium and other elements. Then, ask: *Why do people say we are “made of stardust”?*

3 All grades: Distribute the research activity sheet (and sample research sources if desired). Students can work with a partner or independently.

Remote modification for limited internet: Print text from sample sources to add to student packets.

4 Have students complete Part 3 of the activity sheet by creating a podcast, blog post, multimedia presentation, or infographic. Invite students to share their projects with their classmates.

Writing Extension: The planets in the TRAPPIST-1 system are likely tidally locked, meaning one side of the planet is in perpetual day and the other is in perpetual night. Have students imagine what it might be like to live on such a planet and write a creative story about it.

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NGSS STANDARDS

Grs. 7-8: MS-ESS1-1: Model the Earth-Sun-Moon system. MS-ESS1-3: Determine scale properties of solar system objects.

NGSS, Grs. 9-10: Practice 2: Models: Evaluate merits and limitations of two different models of the same system.

Name _____

EXPLORE THE SOLAR SYSTEM

There is a lot that scientists have learned about objects in our solar system—and a lot they still don't know! Follow the prompts below to guide your research about one object in our solar system.

Part 1: Brainstorm and Plan

1. Choose a research topic. You can use one of the options listed or select your own.

☐ Jupiter ☐ Comet 238P/Read ☐ Eris (dwarf planet) ☐ Other: _____

2. If you are working with a partner, assign research tasks for each person to complete.

Part 2: Research

Record your notes and sources in the following chart, or make a similar one on a separate sheet.

Question	Notes	Source
How far away from Earth is this object?		
What size is this object relative to Earth's size?		
How does gravity affect this object?		
What questions about this object will NASA's Webb Space Telescope explore?		
What is another question about this object that you would like to explore?		

Part 3: Share and Reflect

Choose a way to share your findings with the class:



podcast



blog post



multimedia
presentation



infographic

If you worked with a partner, how did teamwork help you to complete this project?
What strengths did each partner bring to the team?

Name _____

RESEARCH EXOPLANET SYSTEMS

Exoplanets are planets outside our Solar System. There is a lot that scientists have uncovered about exoplanet systems—and a lot they still don't know! Use the prompts below to conduct your own research.

Part 1: Brainstorm and Plan

1. Choose an exoplanet system to research. You can use one of the options listed or select your own.

☐ TRAPPIST-1 ☐ Kepler-452 ☐ 55 Cancri ☐ Other:

2. If you are working with a partner, assign research tasks for each person to complete.

Part 2: Research

Record your notes and sources in the following chart, or make a similar one on a separate sheet.

Question	Notes	Source
How far away, in light-years, is this exoplanet system?		
Have scientists estimated how old it is?		
Choose one of its exoplanets. How does it compare to Earth?		
What questions about these exoplanets could NASA's Webb Space Telescope explore?		
What is another question about this exoplanet system that you would like to explore?		

Part 3: Share and Reflect

Choose a way to share your findings with the class:



podcast



blog post



multimedia
presentation



infographic

If you worked with a partner, how did teamwork help you to complete this project?