Educator Guide

Science Activity 4: Around the Sun: Exploring the Solar System

Educator Preview

Activity Snapshot

Learners explore the physical properties of planetary bodies in the solar system.

Timing | 45 minutes

Get Ready & Team Up	10 min.
Exploring the Solar System	25 min.
Reflect	10 min.
Total	**45 min.**

Level Up Activities 5–45 min. each

Prep Snapshot*

Prep Time 30 min.

- Space Need: Tables
- Print and cut *Planetary Cards* or *Optional Planetary Cards: Large Print/Translatable version*.

**See Materials & Preparation for full info.*

21st Century Skills

Connection

- Collaboration
- Critical Thinking

Science Practices

- Analyzing and Interpreting Data

Guiding Question

What are the different planetary bodies in the solar system, and what are their properties?

Learners Will Do

Get information about different planetary bodies in our solar system.

Learners Will Know

Scientists study places in the solar system and compare these places with Earth.

Connecting Across Activities

Activity 3: Water Habitability	Activity 4: Exploring the Solar System	Activity 5: Water in the Solar System
Last time, learners explored how different living things need liquid water to survive.	**Today,** learners explore the physical properties of planetary bodies in the solar system.	**Next time**, learners will explore the different reservoirs of water on planetary bodies in the solar system.

Activity Resources

Access videos and digital resources using the link or QR code below. More information for teaching this curriculum is available in the Educator Guide Introduction, pgs. iii–xxv. Access more PLANETS units, research, and pathways at https://planets-stem.org/.

weblink: https://hov.to/a821e7f3

Materials and Preparation

Materials

For the educator

- scissors

For the whole group

- *Our Ideas* poster (on paper or a shared digital document) Examples & Templates

For each group of 4

- 1 prepared deck of Planetary Cards (weblink) *or Optional* Planetary Cards: Large Print/Translatable version (PDF)

For each learner

- pencil

Activity 4 Materials Preparation (30 min.)

Ahead of Time

1. Review the "In-Use Example" in the online Prep & Setup Guide (PDF) to help you think about what to add to the *Our Ideas* poster during the discussions in this activity.

2. Print one set of Planetary Cards (weblink) for each group, in color if possible. It is important to set the printer to double sided (flip on long edge) to ensure the cards print correctly front to back. There are several sheets of cards that form a deck. Cut the cards with scissors (or a paper cutter) to make decks of 54 cards. Print one additional deck to use as a whole group. These decks will be used in Activities 4–7.

3. Print one of the following handouts for each group of four learners:
   - Science Activity 4 Planetary Cards Explanation Handout, pg. 64
   - Science Activity 4 Sorting Instructions Handout, pg. 65
   - Science Activity 4 Challenge Instructions Handout, pgs. 66-67

4. Review the Science Activity 4 Planetary Cards Explanation Handout, pg. 64, to understand how to read the cards.

Teaching Tips

- To reduce preparation time, you can print one set of cards for every two groups, then divide the decks in half. Ensure each group has at least two atmosphere cards.
- Consider printing an extra set of cards as a backup. If a card is lost, you can quickly cut out a replacement.

Support Learner Differences

- Translatable & Screen-Readable Options: For multilingual and low-visual support, print out the Planetary Cards: Large Print/ Translatable version (PDF). Each card has a QR code linking to an accessible version with read-to and translation availability.
- This and other accessibility modifications for blind/low vision learners, including early access, tactile modifications, and mobility aids are listed in *Science Advance Preparation* on pg. 3 and available at this weblink.

In Your Space

5. Place the *Our Ideas* poster in a visible place in your learning setting or prepare to share it digitally.

Teaching Tip

Lead this activity in a room with at least one table for each group.

Activity Guide

Get Ready & Team Up (10 min.)

1. Ask: **If you did the last activity, what did you do and why?** *(We thought about the different living things that live in or need water on Earth.)*

Support Learner Differences

If new learners are joining you, lead an inclusion activity (pgs. xx-xxi) and use other engagement strategies as necessary (pgs. viii–xviii).

2. Ask: **What is the big question we are trying to answer?** *(Where in the solar system should NASA search for life?)* Display and describe NASA's Eyes on the Solar System app to remind learners about the solar system. As needed, use NISE's Exploring the Solar System: Pocket Solar System or Solar System in Sound instead.
3. Say: **Now that we've thought about Earth, we are going to investigate which other places in the solar system might have water that is habitable for living things.** Refer to the word *habitable* on the *Our Ideas* poster. Point out learners' questions about planetary bodies and the water on them.
4. Say: **Today you will look at NASA images of other planetary bodies to start investigating where water is found in the solar system.** Use NASA's *Eyes on the Solar System app* to show examples of different types of planetary bodies as you name them. **Planetary bodies include asteroids, dwarf planets, planets, and moons. This search will help us find out where living things might live. Eventually, we will understand why NASA has chosen certain locations to search for life.** Share the Guiding Question or a similar question from the *Our Ideas* poster with learners aloud and in writing (using multiple languages as needed): **What are the different planetary bodies in the solar system, and what are their properties?**
5. Organize learners into groups of four.

Exploring the Solar System (25 min.)

6. Give each group a copy of *Science Activity 4 Planetary Cards Explanation Handout*, pg. 64. Say: **Each card in this deck describes a planetary body, such as a planet, dwarf planet, moon, or asteroid, in the solar system. Different parts of the card tell us different things about it, or properties of it.** Give a deck of *Planetary Cards* to each group. Give groups 5 minutes to become familiar with the cards.

Support Thinking

As needed, show NASA's Dwarf Planets Overview (weblink) for a fun way to support understanding of dwarf planets and why Pluto was reclassified.

Support Learner Differences

If you have learners who speak multiple languages, have them discuss words for "gravity," "rock," "ice," "gas," and related words in their preferred languages and notice similarities between languages. If you can, provide an example from a language you know. Take time to learn learners' words and use them throughout the activities.

7. Say: **Some moons and planets have multiple cards, representing multiple water reservoirs. To get the total amount of water on a body, including liquid water and frozen water from all reservoirs, add up all the droplet numbers from that body's cards.**

Teaching Tip

The water drop is a relative number comparing the volume of water on different planetary bodies.

8. Give each group a copy of *Science Activity 4 Sorting Instructions Handout*, pg. 65. Say: **This page gives instructions to help you sort the cards. As a group, you have about 10 minutes to follow the instructions.**

9. Give groups 10 minutes to follow the instructions. As needed, offer clarifications and explain that learners are choosing one property and sorting the cards using that property.

10. After about 10 minutes, ask: **How did you sort the cards? What did you learn from sorting them?** *(By distance from the Sun, size, gravity, materials, amount of water. Most of the planetary bodies are in the outer solar system. Most of the planetary bodies are smaller than Earth and have lower gravity.)* Have groups pair up to discuss or record their ideas on the *Our Ideas* poster.

11. Give each group a copy of *Science Activity 4 Challenge Instructions Handout*, pgs. 66-67. Say: **To get to know the cards better, we will complete some challenges with them. This page lists two different challenges. Take a few minutes to read them, and then we will try them all together.**

Support Thinking

- As needed, you can give example properties to sort by, such as distance from the Sun, status as a planet or moon, amount of water, reservoir type, type of planet, gravity, or size.
- To help learners understand what they will be doing during this activity, play the translatable video Sorting Instructions Instructional Read Aloud.
- If it would be helpful to learners, show the translatable videos Rock, Ice, Gas Instructional Read Aloud and Water How to Science (1:39–2:16), as well as Surface, Subsurface, Atmosphere Instructional Read Aloud and Water How to Science (2:16–2:55).

12. Give groups a few minutes to read the instructions. As needed, offer clarifications and explain the rules.
13. When groups are ready, have them try the challenges one after the other.

Reflect (10 min.)

14. Have learners revisit the Guiding Question on the *Our Ideas* poster in their small groups: **What are the different planetary bodies in the solar system, and what are their properties?** *(There are many planets, dwarf planets, asteroids, and moons in the solar system, and these different bodies have different properties.)* **Which properties would make it easier or harder to send a spacecraft to a planetary body?** *(Planetary bodies that are close by and have low gravity are probably easier to visit than planetary bodies that are far away and have high gravity.)* **Which planetary bodies are probably easier to get to?** *(Mercury, Venus, Earth's Moon, Mars.)*
15. Say: **Next time, in order to continue searching for life in the solar system, we'll focus specifically on the water in each body.**

Level Up!

- As learners participate, have them make the American Sign Language sign for each category when they complete that category:
  - **Rock**: Curl your two hands into fists, then knock the dominant fist over the non-dominant fist, as if you are knocking two rocks together.
  - **Ice**: Make your hands look like claws and have your palms face down. Pull the claws in towards your torso.
  - **Gas**: Put one hand horizontally above the other with fingers spread apart. Wiggle your fingers. Move your hands toward each other and then away. (5 min.)
- Learn about American Sign Language for states of matter (PPT). (5 min.)
- Have learners try movement challenges using Science Activity 4 Movement Challenge Instructions Handout (PDF). Allow learners to invent alternative movements or continue working on the previous challenges. Or, have learners play a game in which each learner puts a card facing out on their forehead, then ask other learners questions to determine what is on their card. (20 min.)
- To help learners learn more about how the planetary bodies formed and their properties, have them watch The Solar System's Formation (3:02) and make a scale solar system.

Level Up!

- Ask this story prompt question: **What kinds of stories do you know that include other planets or moons?** *(Possible responses include stories about the night sky, space travel, or the spiritual significance of different bodies.)* Have learners share with a partner (note that the sharing can take forms other than speaking aloud). Consider returning to learners' ideas at the start of the next activity. (20 min.)
- Tell learners, if anyone asks them what they did today, they can tell them "We learned about the different bodies in the solar system." (5 min.)
- Give each learner a copy of the Family Connection flier (PDF) to share at home. (5 min.)
- Invite a family or community member to come in as a special guest and share their knowledge about water-related topics. (45 min.)
- Have learners invent games to play using the cards. (45 min.)

After the Activity

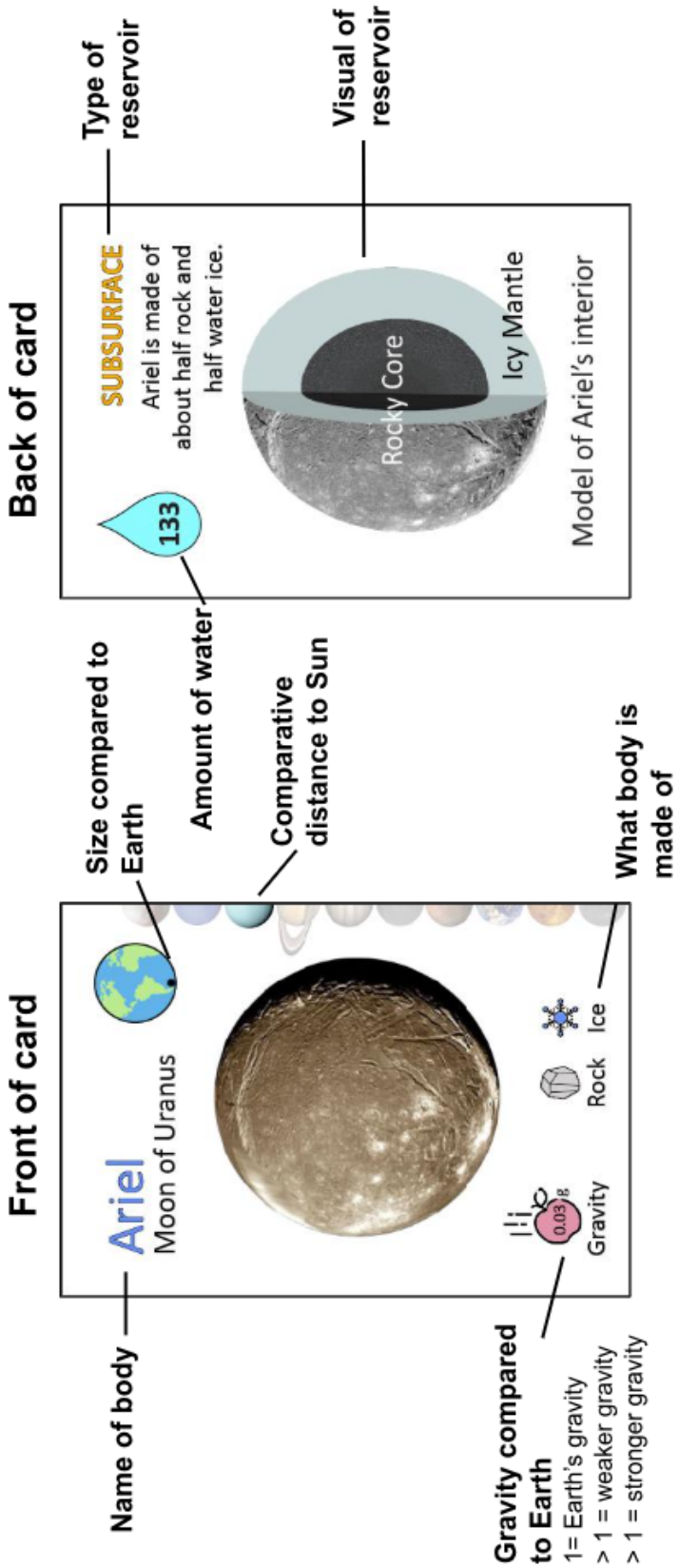
1. Clean up:
   - Save the *Our Ideas* poster for Activity 5.
   - Collect the *Planetary Cards*.
2. Plan for Science Activity 5. See Science Activity 5 Preparation on pg. 71.
3. Take time to reflect on the following educator prompt. **How did learners apply concepts from previous activities during this activity?**

Water in Extreme Environments Additional Resources

Resources include All Downloads, All Videos, Family Connections, and more.

weblink: https://hov.to/7cb5c428

Planetary Cards Explanation

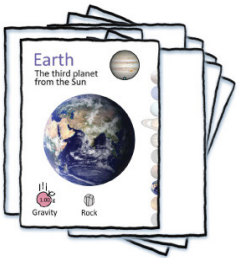


Sorting Instructions

1. As a group, choose a way to sort the planetary cards. You can put them into categories or in a certain order.
2. Organize the cards in the way that you chose.

Challenge Instructions

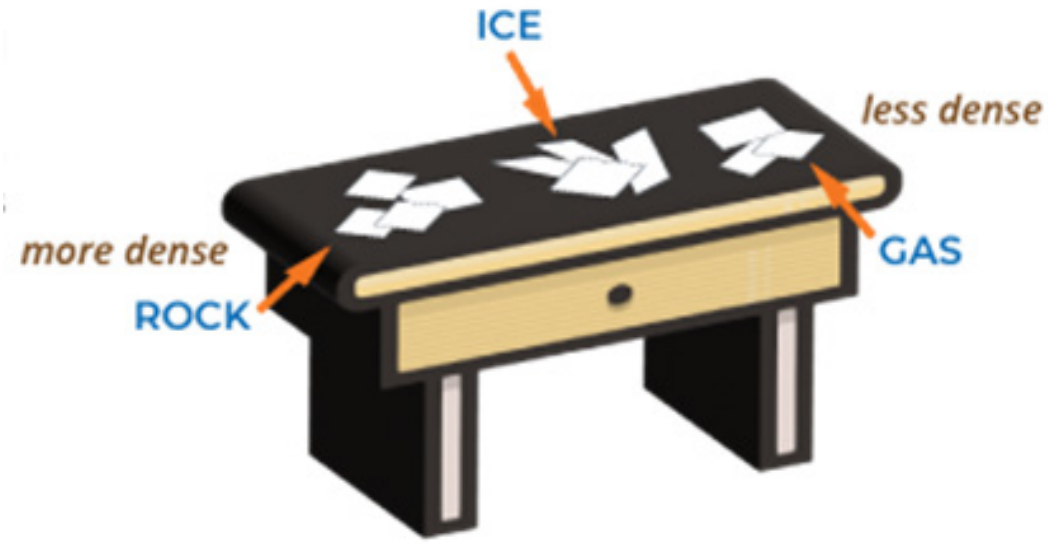
Rock, Ice, Gas

1. Shuffle the deck. 

2. Choose one end of the table to be “More Dense” and one end of the table to be “Less Dense.”

3. When the challenge starts, sort the deck as fast as you can by what the planetary bodies are made of–rock, ice, or gas.

   - **Rock:** Because rocks are dense, put all rock cards at the “More Dense” end of the table.
   - **Ice:** Because ice is less dense than rock, put all ice cards in the middle of the table
   - **Gas:** Because gas is less dense than ice, put all gas cards at the “Less Dense” end of the table.

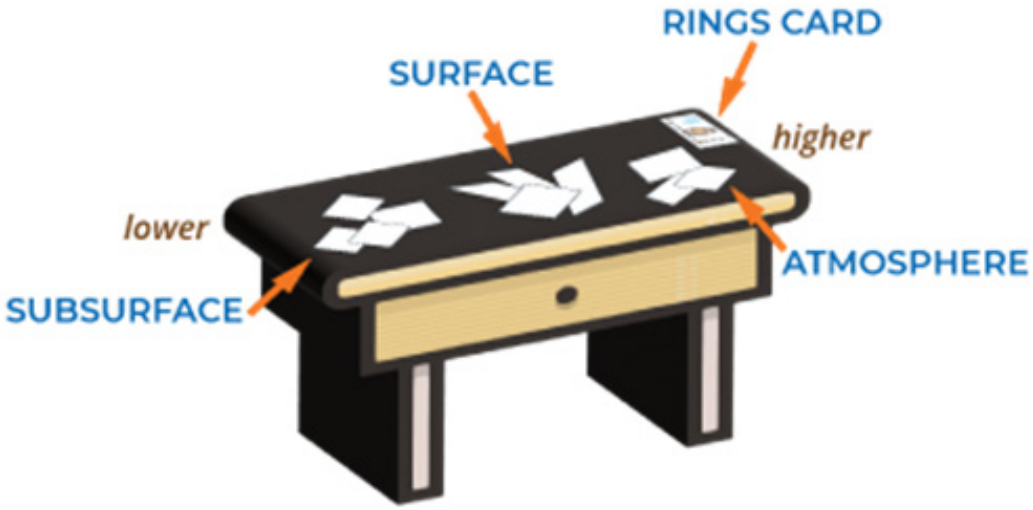


4. Once you have sorted all the cards, make a sound effect or cheer!

Surface, Subsurface, Atmosphere

1. Shuffle the deck.

2. Choose one end of the table to be “Higher” and one end of the table to be “Lower.”
3. When the challenge starts, sort the deck as fast as you can by type of reservoir–subsurface, surface, atmosphere, or rings.
   - **Subsurface:** Put all subsurface cards at the “Lower” end of the table.
   - **Surface:** Put all surface cards in the middle of the table.
   - **Atmosphere:** Put all atmosphere cards at the “Higher” end of the table.
   - **Rings:** Put the rings card on the “Higher” edge of the table.



4. Once you have sorted all the cards, make a sound effect or cheer!