

Science & Literacy Activity

GRADES 3-5

OVERVIEW

This activity, which is aligned to the Common Core State Standards (CCSS) for English Language Arts, introduces students to scientific knowledge and language related to the characteristics and phases of the Moon. Students will read content-rich texts, visit the Cullman Hall of the Universe, and use what they have learned to complete a CCSS-aligned writing task, creating an illustrated text about the characteristics and phases of the Moon.

Materials in this packet include:

- Teacher instructions for:
 - Pre-visit student reading
 - Visit to Cullman Hall of the Universe and student worksheet
 - Post-visit writing task
- Text for student reading: “Moon Phases: Follow Moonlight through a Month”
- Student Worksheet for Cullman Hall of the Universe visit
- Student Writing Guidelines
- Teacher rubric for writing assessment

Common Core State Standards:

W.3-5.2, W.3-5.8, W.3-5.9
RI.3-5.1, RI.3-5.2, RI.3-5.7, RI.3-5.10

New York State Science Core Curriculum:

PS 1.1g

Next Generation Science Standards:

PE MS-ESS1-1

DCI ESS1.B: Earth and the Solar System
The orbits of Earth around the Sun and of the Moon around Earth, together with the rotation of Earth about an axis between its North and South poles, can cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different position of the Sun, the Moon and stars at different times of the day, month, and year.

SUPPORTS FOR DIVERSE LEARNERS: An Overview

This resource has been designed to engage all learners with the principles of Universal Design for Learning in mind. It represents information in multiple ways and offers multiple ways for your students to engage with content as they read about, discuss, view, and write about scientific concepts. Different parts of the experience (e.g. reading texts, or locating information in the hall) may challenge individual students. However, the arc of learning is designed to offer varied opportunities to learn. We suggest that all learners experience each activity, even if challenging. We have provided ways to adapt each step of the activities for students with different skill-levels. If any students have an Individualized Education Program (IEP), consult it for additional accommodations or modifications.

1. BEFORE YOUR VISIT

This part of the activity engages students in reading a non-fiction text about the phases of the Moon. The reading will prepare students for their visit by introducing them to the topic and framing their investigation.

Student Reading

Have students read “Moon Phases: Follow Moonlight through a Month.” Have them write notes in the large right-hand margin. For example, they could underline key passages, paraphrase important information, or write down questions that they have. They may also use the space for drawings or diagrams.

Discussion Questions:

- Ask:
- What is the role of sunlight in the phases of the Moon? (*A: The Moon does not make its own light, it reflects the light of the Sun. Its position relative to the Sun determines what phase we see.*)
 - How does looking at the Moon from Earth determine what phase we see? (*A: As the Moon circles Earth, the half of the Moon facing the Sun is always lit. The amount of the lit side that we see changes depending on the Moon's position relative to Earth.*)
 - Why do the phases of the Moon have a repeating pattern? (*A: The Moon has a day night cycle just like Earth, except that the Moon's cycle lasts almost 30 days. During the course of a month the Moon circles once around Earth. Once that cycle is completed, the sunlit half of the Moon is back to its original position, facing away from Earth in what we call a New Moon.*)

They can work in pairs, small groups, or as a class. During discussion, remind students to use evidence from the text to explain their thinking.

SUPPORTS FOR DIVERSE LEARNERS: Student Reading

- “Chunking” the reading can help keep them from becoming overwhelmed by the length of the text. Present them with only a few sentences or a single paragraph to read and discuss before moving on to the next “chunk.”
- Provide “wait-time” for students after you ask a question. This will allow time for students to search for textual evidence or to more clearly formulate their thinking before they speak.
- After the reading, show students the OLogy visualization “See the Moon in Action” to help them understand the position of Earth, the Moon, and the Sun in relation to each phase of the Moon: amnh.org/ology/features/stufftodo_astro/moon.php

2. DURING YOUR VISIT

This part of the activity engages students in exploring the hall.

Museum Visit & Student Worksheet

Explain to students that they will be focusing on the Bronze Moon Globe and the Full Moon Photographs and using worksheets to gather all the necessary information about the characteristics of the Moon’s surface. Tell students that back in the classroom they will refer to these notes when completing the writing assignment.

SUPPORTS FOR DIVERSE LEARNERS: Museum Visit

- Review the Student Worksheet with students, clarifying what information they should collect during the visit.
- Have students explore the hall in pairs, with each student completing their own Student Worksheet.
- Encourage student pairs to ask you or their peers for help locating sources of information. Tell students they may not share answers with other pairs, but they may point each other to places in the hall where answers may be found.

3. BACK IN THE CLASSROOM

This part of the activity is to engage students in an informational writing task that draws on the pre-visit reading and on observations made at the Museum.

Writing Task

Distribute the Student Writing Guidelines handout, which includes the following prompt for the writing task:

Based on your reading, your visit to the Cullman Hall of the Universe, and your discussions, write an illustrated essay in which you describe:

- basic characteristics of the Moon
- why the Moon has phases and why those phases have a repeating pattern

Be sure to include:

- labeled illustrations of Moon phases and characteristics

Support your discussion with evidence from the reading and the visit to the Cullman Hall of the Universe.

Go over the handout with students. Tell them that they will use it while writing, and afterwards, to evaluate and revise their essays.

Before they begin to write, have students use the prompt and guidelines to frame a discussion around the information that they gathered in the Cullman Hall of the Universe and compare their findings. They can work in pairs, small groups, or as a class. Referring to the writing prompt, have students underline or highlight all relevant passages and information from the reading and discussion and their notes from the hall that can be used in their response to the prompt. Instruct each student to take notes on useful information that their peers gathered as they compare findings. Students should write their essays individually.

SUPPORTS FOR DIVERSE LEARNERS: Writing Task

- Re-read the “Before Your Visit” assignment with students. Ask what they saw in the hall that helps them understand the characteristics of the Moon.
- Allow time for students to read their essay drafts to a peer and receive feedback based on the Student Writing Guidelines.

Student Reading**Moon Phases: Follow Moonlight Through a Month**

Though the Moon looks like it glows, there's no such thing as moonlight. That's because the Moon doesn't make its own light. It just reflects light from the Sun, like a giant bike reflector.

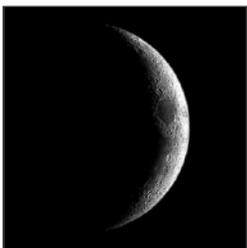
The Moon has a day and night cycle just like Earth. But the Moon's day and night cycle lasts almost thirty days. That's a long time compared to the twenty-four hours in Earth's day and night cycle.

When we look up into the sky each night, the Moon looks a little different. Sometimes it's almost round. Other times it's just a sliver. But the Moon doesn't really change shape – all that changes is our view of it.

During the course of a month, the Moon circles once around Earth. The half of the Moon facing the Sun is always lit. But the lit side does not always face our planet! As the Moon circles Earth, the amount of the lit side we see changes.

Think of the Moon as a giant ball. As the Moon moves around Earth, we see changing amounts of the sunlit half. Since we can only see the lit-up part, the Moon appears to grow and shrink. We call these changing views the phases of the Moon.

If the Moon is in the direction of the Sun, then we call it a *New Moon*. During this phase, the Moon rises about when the Sun rises. It is in the sky all day, and sets when the Sun sets. In this phase the entire backside of the Moon is lit up. That leaves the side we see in darkness.



The next phase is called the *Waxing Crescent*. The word "waxing" means increasing. At this phase, the Moon is best observed just after sunset. More and more of the sunlit half will be seen each night. At first, only a small sliver of the Moon can be seen. This sliver is in a crescent shape.



Then, half of the sunlit face of the Moon is visible from Earth. The Moon is in the *First Quarter* phase. The lit-up part we see is a quarter of the entire Moon. The other lighted quarter is on the backside of the Moon. That is the side of the Moon that we can't see.



A *Waxing Gibbous* Moon is when three quarters of the Moon's sunlit side faces Earth. At this point, the Moon is best seen after sunset through late evening.



During a *Full Moon* the Moon is opposite from the Sun as seen from Earth. Here, the Moon rises when the Sun sets and sets when the Sun rises. When there is a Full Moon, the entire disk as seen from Earth is lit up. You can see the Moon all night long.

After a Full Moon, the Moon begins *waning*. That means that the size of the Moon you can see is decreasing. Less and less of the sunlit half will be seen each night. But more and more will be visible during the day!



During the *Waning Gibbous* phase, three quarters of the Moon's sunlit side faces Earth. The best time to see this phase is very late at night or very early in the morning.



In the *Last Quarter* phase, half of the sunlit side of the Moon is visible. In this phase you can look for the Moon from the middle of the night through the morning.



The last phase is the *Waning Crescent* phase. You can only see a small sliver of the sunlit side of the moon again. You can see this Moon sliver early in the morning. The last time you can see it is in the afternoon.

At this point the cycle starts all over again with the *New Moon*. The sunlit half of the Moon is facing away from Earth again. So the Moon seems to be dark from our view.

All photos courtesy of NASA.

Student Worksheet

Stop #1: Bronze Moon Globe

Walk around the Moon globe, a model of the Moon cast in bronze. Observe and touch the surface. Do both sides look and feel the same? _____

Explain your answer. _____

What are the two sides of the Moon called and why do you think that they have those names?

Draw the Near Side of the Moon

Draw the Far Side of the Moon

Explore the nearby panels to learn more about the surface of the Moon and the relationship between Earth and the Moon.

Stop #2: Full Moon Photographs

Observe the various photographs taken by astronauts who traveled to the Moon. Based on your observations, describe the surface of the Moon.

ANSWER KEY**Student Worksheet****Stop #1: Bronze Moon Globe**

Walk around the Moon globe, a model of the Moon cast in bronze. Observe and touch the surface. Do both sides look and feel the same? (Answer: No)

Explain your answer.

(Answer: One side is covered in fewer, large craters; the other side is covered in many smaller craters.)

What are the two sides of the Moon called and why do you think that they have those names?

(Answer: The Near Side is the side we see from Earth. It's so called because it is the side closest to Earth. The Far is the side we never see, making it further from Earth.)

****Note for teachers: the side facing the planetarium sphere is the Far Side of the Moon; the side facing the entrance to the Gottesman Hall of Planet Earth is the Near Side.****

Draw the Near Side of the Moon

Draw the Far Side of the Moon

Explore the nearby panels to learn more about the surface of the Moon and the relationship between Earth and the Moon.

Stop #2: Full Moon Photographs

Observe the various photographs taken by astronauts who traveled to the Moon. Based on your observations, describe the surface of the Moon.

(Answers may vary but might include: everything is covered in grey dust, there is no water or landforms, there are craters)

Student Writing Guidelines

Writing Prompt:

Based on your reading, your visit to the Cullman Hall of the Universe, and your discussions, write an illustrated essay in which you describe:

- basic characteristics of the Moon
- why the Moon has phases and why those phases have a repeating pattern

Be sure to include:

- labeled illustrations of Moon phases and characteristics

Support your discussion with evidence from the reading and visit to the Cullman Hall of the Universe.

Use this checklist to ensure that you have included all of the required elements in your essay.

- I introduced the topic of the Moon.
- I described some of its basic characteristics.
- I clearly described why the Moon has phases and explained why those phases have a repeating pattern.
- I included labeled illustrations of the complete cycle of Moon phases and the Moon's characteristics.
- All of the information I presented is relevant to the Moon and its phases and characteristics.
- I used information from "Moon Phases: Follow Moonlight through a Month" to explain the topic in detail.
- I used information from the Cullman Hall of the Universe to explain the topic in detail.
- I included a conclusion at the end.
- I proofread my essay for grammar and spelling errors.

Assessment Rubric

Scoring Elements		1 Below Expectations	2 Approaches Expectations	3 Meets Expectations	4 Exceeds Expectations
RESEARCH	Reading	Attempts to include text using examples, quotes, or other references.	Presents some information from reading materials but may lack accuracy or relevance.	Accurately presents information from reading materials relevant to the purpose of the prompt to inform or explain.	Accurately and effectively presents important information from reading materials to inform or explain.
	AMNH Exhibit	Attempts to include Museum exhibit content using examples, quotes, or other references.	Presents some information from Museum exhibit but may lack accuracy or relevance.	Accurately presents information from Museum exhibit relevant to the purpose of the prompt to inform or explain.	Accurately and effectively presents important information from Museum exhibit to inform or explain.
WRITING	Focus	Attempts to address the prompt, but is off-task.	Addresses the prompt, but focus is uneven.	Addresses the prompt with an adequately detailed response; stays on task.	Addresses key aspects of prompt in a detailed response; stays on task.
	Development	Attempts to inform or explain but lacks details.	Informs or explains by presenting some details.	Informs or explains using appropriate details.	Informs or explains by providing detailed and relevant information.
	Conventions	Lacks cohesion and control of grammar, usage, and mechanics appropriate to grade level	Demonstrates an uneven command of standard English conventions appropriate to grade level.	Demonstrates a command of standard English conventions, with few errors as appropriate to grade level.	Maintains a well-developed command of standard English conventions, with few errors. Response includes language and tone appropriate to the purpose and specific requirements of the prompt.
SCIENCE	Content Understanding	Content is irrelevant, inappropriate, or inaccurate.	Shows uneven understanding of disciplinary content related to the prompt	Presents generally accurate disciplinary content related to the prompt.	Presents accurate and relevant disciplinary content to enhance understanding of the topic.