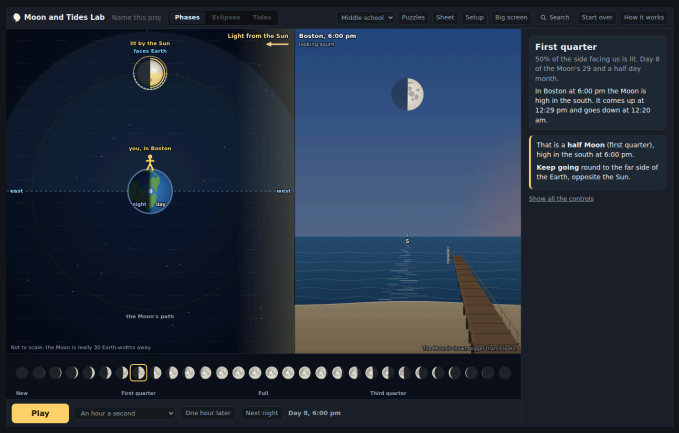
mytekDev

Moon and Tides Lab: Why Does the Moon Change Shape?

Grades 6-8 · 45 minutes

Earth and space science · Astronomy



Slides, rubric and answer key **Print and go** **No student accounts**

Chromebook friendly

What's included

- A one-page overview: objectives, essential question, vocabulary, standards and assessment
- A 45-minute lesson sequence: warm-up, direct instruction, guided practice, independent practice, closure
- Slides for the board: a PowerPoint file that also opens in Google Slides
- A student worksheet with a QR code and a phase table to draw in
- A 3-question exit ticket, two to a page, with an answer key
- A rubric: 3 criteria, 4 levels, scored out of 12
- Differentiation for English learners, students with IEPs or 504 plans, and students who need more support or more challenge
- Cross-curricular extensions, and notes for teaching it in grades 4 and 5 and in high school Earth and space science
- Standards: NGSS

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About half of people say the phases are Earth's shadow. Students write down their own idea first, then drag the Moon round its path and watch it over a beach grow from a crescent to a half Moon to a full Moon. The Sun always lights half of it; the phase is how much of that lit half faces us. Earth's shadow, switched on, points away from the Sun, nowhere near a crescent.

At a glance

ESSENTIAL QUESTION

Why does the Moon look like a different shape on different nights?

OBJECTIVES

Students will be able to:

- explain that the Sun always lights half of the Moon and the phase is how much of that half faces Earth
- name a phase from the positions of the Sun, Earth and Moon
- use evidence from the model to show that Earth's shadow does not make the phases
- describe how the Moon moves across the sky in one night while its shape stays the same

VOCABULARY

Phase, Waxing, Waning, First quarter, Orbit

STANDARDS

MS-ESS1-1

TIME AND MATERIALS

45 minutes, grades 6-8.

- One computer or Chromebook per student
- A projector
- The worksheet and exit ticket, one copy each per student
- The rubric, one copy per student if you grade the work
- Optional: a lamp with its shade off and a ball on a pencil, for a real model at the end

PREP

Make copies of the worksheet and exit ticket. Before class, open mytekdev.com/try/moontideslab?lesson=why-does-the-moon-change-shape&ref=tpt-moontideslab-1 once on a student computer: it opens on a crescent Moon at 7 in the evening over a beach. Pick an answer in the guide, drag the Moon to the top of its path, then to the far side, and turn on Earth's shadow, about five minutes.

ASSESSMENT

- Formative: the questions under What to look for, asked while students work, and the exit ticket (answer key included).
- Summative: the worksheet, scored with the rubric.

TECHNOLOGY AND PRIVACY

Runs in any browser, Chromebooks included, with nothing to install. Students need no account and no email: the link works signed out, and nothing they do is stored on our server unless they choose to save.

Lesson sequence

MINUTES	STAGE	WHAT YOU DO	WHAT STUDENTS DO
0 to 5	**Warm-up** Hook	Show the title, essential question and Today I can slides (about 1 minute). Then the warm-up: why does the Moon change shape? Collect ideas without judging them.	Write an idea on the worksheet.
5 to 12	**Direct instruction (I do)** Model it	Project the app. Point out the two views: the Earth and Moon from far above the North Pole, and the sky from the beach. Show Always half lit: the yellow arc is the half the Sun lights, the blue dashes the half facing Earth. > **It's working when:** The far-above view is the hard part. Have a student stand where the small person is and point at the Moon.	Fill in the vocabulary.
12 to 22	**Guided practice (We do)** Round the Earth together	Students open the link or scan the QR code. The guide asks them to pick an answer, drag the Moon to a half Moon, then to a full Moon, then turn on Earth's shadow and answer again. > **Watch for:** Students who change their answer to the shadow when they see it at full Moon. Ask them to drag back to a crescent with the shadow still on.	Follow the guide and answer the question a second time.
22 to 38	**Independent practice (You do)** The phase table	Students put the Moon at four places, a quarter of the way round each time, and draw what the beach sees. Then they turn the Earth for a few hours. Walk the room with the What to look for questions. > **If they ask:** "The Moon moved across the sky. Did its shape change? Why not?" Turning the Earth	Fill in the phase table and write what changed when the Earth turned.
38 to 45	**Closure** Showcase and exit ticket	Show the Showcase slide and take two or three answers. Go back to the warm-up ideas and cross out the ones the model ruled out. Hand out the exit ticket.	Answer the exit ticket.

Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/moontideslab?lesson=why-does-the-moon-change-shape&ref=tpt-moontideslab-1. A crescent Moon at 7 in the evening, low in the west over a beach in Boston. On the left, the Earth and Moon from far above the North Pole, with the Sun off to the right.

1. **Predict.** Pick one of the three answers in the guide. The yellow and blue arcs appear on the Moon.
2. **A half Moon.** Drag the Moon a quarter of the way round, to the top. The Moon over the beach becomes a half Moon, high in the south.

3. **A full Moon.** Keep dragging to the far side, opposite the Sun. The full Moon comes up in the east.
4. **The shadow.** Turn on `Earth's shadow`. It points straight away from the Sun. Press `Next` and answer the question again.
5. **Turn the Earth.** Drag the small person round, or press `Play`. The Moon moves across the sky; its shape stays the same.

> Nothing is to scale, and the app says so: the Moon is drawn much closer and bigger. Real distance shows it about 30 Earth-widths away.

Background for the teacher

The Sun always lights the half of the Moon facing it. As the Moon goes round the Earth, about once every 29 and a half days from new Moon to new Moon, we see more or less of that lit half. At new Moon the lit half faces away from us; at full Moon it faces us.

In one survey of 1,213 people, 48% chose "the shadow of Earth falling on the Moon" as the cause of the phases. Earth's shadow only reaches the Moon at a full Moon, and only some months: that is an eclipse of the Moon, the next lesson.

The lit side of the Moon always points toward the Sun. That is why the evening crescent is lit on its lower right, toward the Sun that has just set.

What to look for

Ask these while students work. A student who has understood the lesson can answer them without help:

- Which half of the Moon is lit right now? How do you know?
- Where is Earth's shadow when the Moon is a crescent?
- Where must the Moon be for a full Moon?
- You turned the Earth for six hours. What changed and what did not?
- Which way does the lit side of the Moon point?

> The second question is the real test: a student who can point to the shadow and the crescent at the same time has let go of the shadow idea.

Cross-curricular extensions

- Math: the Moon goes from new to new in about 29.5 days. How many days between a new Moon and a first quarter?
- Art: draw the eight phases in a ring round a Sun, each one lit on the side facing the Sun.
- History: read how sailors and farmers used the Moon's phases as a calendar.

- English: write the shadow idea and the lit-half idea as two short claims, each with one piece of evidence.

Vocabulary

Phase	The shape of the lit part of the Moon that we see from Earth.
Waxing	Growing: the lit part we see gets bigger each night, from new Moon to full Moon.
Waning	Shrinking: the lit part we see gets smaller, from full Moon back to new Moon.
First quarter	A half Moon, a quarter of the way round its path from new Moon.
Orbit	The path the Moon takes round the Earth, about once a month.

Differentiation

ENGLISH LEARNERS

- Keep the vocabulary slide up, and point at the yellow arc and the blue dashes as you say "lit half" and "facing Earth".
- Pair each learner with a partner who reads the guide aloud.
- Accept the phase table as drawings with the phase names copied from the slide.

STUDENTS WITH IEPS OR 504 PLANS

- Pair students, one dragging and one drawing.
- Zoom the browser to 150%.
- Allow two positions instead of four where the IEP allows a modified assignment.

STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "The shadow cannot make a crescent because ___."
- Fill in the first row of the phase table together.
- Do the lamp and ball model at the front before the independent work.

STUDENTS READY FOR MORE

- Find where the Moon must be for a half Moon high in the south at 6 in the evening (Puzzles: Place the Moon).
- Turn on Real distance and say what the drawing gets wrong about the Moon's distance.
- Explain why a waning crescent is seen in the morning, not the evening.

Adapting for other grades

Younger students: In grades 4 and 5, stop after the guide and draw only the crescent, the half Moon and the full Moon; drop the third rubric row; total 8, and 6 meets the objectives.

Older students: In high school, switch the level to High school and work out the lit fraction from the angle between the Sun and the Moon; compare it with the percent the app shows.

Student worksheet

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/moontideslab?lesson=why-does-the-moon-change-shape

Essential question: Why does the Moon look like a different shape on different nights?

Warm-up: Why does the Moon change shape? Write your best idea. _____

1. **Vocabulary.** Phase, waxing, waning, first quarter, orbit: write each in your own words.

2. **The phase table.** Put the Moon a quarter of the way round each time. For each place, draw what the beach sees and name the phase.

3. **The shadow test.** With the Moon a crescent and the shadow on, where is the shadow? _____

1. Is Earth's shadow what makes the Moon change shape? Use what you saw.

2. You turned the Earth for a few hours. What changed, and what stayed the same?

Exit ticket

Name: _____

1. The Sun lights (A) the side of the Moon facing Earth (B) half of the Moon, the half facing the Sun (C) the whole Moon at full Moon only

2. A full Moon is (A) between the Earth and the Sun (B) on the far side of the Earth from the Sun (C) in Earth's shadow

3. Why is a crescent Moon not Earth's shadow?

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Exit ticket

Name: _____

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2. A full Moon is (A) between the Earth and the Sun (B) on the far side of the Earth from the Sun (C) in Earth's shadow

3. Why is a crescent Moon not Earth's shadow?

Answer key: exit ticket

QUESTION	ANSWER	WHY
1	B	The Sun lights the half facing it, all the time.
2	B	Opposite the Sun, the whole lit half faces us. It is only in Earth's shadow during an eclipse.
3	The shadow points away from the Sun	At a crescent the Moon is nearly between the Earth and the Sun, nowhere near the shadow. A full answer says we see only a sliver of the lit half.

Rubric

Score each row from 1 to 4.

Name: _____

CRITERIA	4 EXCEEDS	3 MEETS	2 APPROACHING	1 BEGINNING
Model	Places the Moon correctly for four phases and draws each as seen from the beach, lit side toward the Sun.	Places and draws four phases.	Two or three phases right.	No phases right.
Evidence	Uses the shadow switch at a crescent and a half Moon to show the shadow is nowhere near, and says where it points.	Says the shadow points away from the Sun and misses the crescent.	Says the shadow is not the cause with no evidence.	Says the shadow makes the phases.
Explanation	Explains that half the Moon is always lit and the phase is how much of that half faces Earth, and that the shape stays the same in one night.	Explains the lit half and how much of it faces Earth.	Says the Moon goes round the Earth with no link to the lit half.	No explanation.

Total: ____ / 12. A score of 9 or more meets the objectives.

Standards

The lesson is built for MS-ESS1-1, the lunar phases part.

FRAMEWORK	CODE	GRADES	STANDARD	HOW THE LESSON MEETS IT
NGSS	**MS-ESS1-1**	6-8	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	Students use a model to describe the cycle of lunar phases and predict a phase from the positions of the Sun, Earth and Moon.

Checked November 2026 against: NGSS MS-ESS1-1, Earth's Place in the Universe, NGSS MS-ESS1-1 evidence statement (June 2015), Kavanagh, Agan and Sneider 2005, Learning about Phases of the Moon and Eclipses, Astronomy Education Review 4(1).

Optional: save student work in a free class

The whole lesson runs at the link on the worksheet, with no accounts and no sign-up.

To keep students' work, and see it all in one place, make a free class. It takes about ten minutes, once, and covers every lesson in this series: mytekdev.com/tools/class-setup

Students in a class open mytekdev.com/tools/moon-and-tides-lab/lessons/why-does-the-moon-change-shape/start instead of the worksheet link. Each one gets their own copy of the starter, and the same link reopens it next time.

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