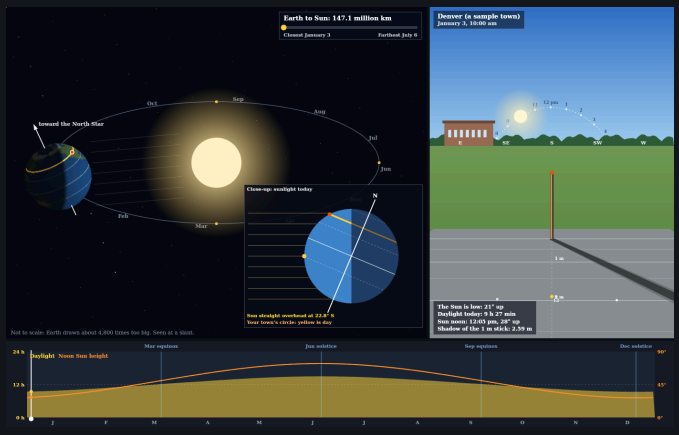
mytekDev

# Sun and Seasons Lab: Is Summer When We Are Closer?

## 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 an evidence table
- 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 and Texas TEKS

# Sun and Seasons Lab: Is Summer When We Are Closer?

Grades 6-8 · 45 minutes · Earth and space science, Astronomy

Ask a room why it is warmer in summer and most of it will say Earth is closer to the Sun. Students pick their own answer first, then watch a stick's shadow in Denver at noon in June and in December, drag Earth to the day it is closest to the Sun and find early January, in Denver's winter. Sydney, on the same day at the same distance, has summer. A card answers "our half leans closer" with real kilometers, and students answer the first question again.

## At a glance

### ESSENTIAL QUESTION

**Is summer the time of year when Earth is closest to the Sun?**

### OBJECTIVES

Students will be able to:

- use evidence from the model to show that Earth is closest to the Sun in early January, during the northern winter
- describe how the noon Sun's height, the noon shadow and the length of the day change from June to December
- explain why one Earth at one distance can have winter in Denver and summer in Sydney
- explain why the half of Earth that leans toward the Sun is not warmer because it is closer

### VOCABULARY

Axis, Tilt, Orbit, Solstice, Sun noon

### STANDARDS

MS-ESS1-1, 112.26(b)(9)(A)

### 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

### PREP

Make copies of the worksheet and exit ticket. Before class, open mytekdev.com/try/sunseasonslab?lesson=is-summer-when-we-are-closer&ref=tpt-sunseasonslab-1 once on a student computer: it opens on a schoolyard in Denver on June 21 at 10 in the morning, with the guide asking why it is warmer in summer. Run the guide to the end yourself, 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. The app never reads where a device is: a town is picked from a list or a map.

## Lesson sequence

| MINUTES | STAGE | WHAT YOU DO | WHAT STUDENTS DO |
|---|---|---|---|
| 0 to 5 | **Warm-up**<br>Hook | Show the title, essential question and Today I can slides (about 1 minute). Then the warm-up: why is it warmer in summer? Tally the answers on the board: closer to the Sun, our half leans closer, the Sun is higher and up longer, the axis flips toward the Sun. | Write an idea on the worksheet. |
| 5 to 12 | **Direct instruction (I do)**<br>Model it | Project the app with Big screen. Point out the three views: the schoolyard in Denver with a stick, Earth going round the Sun, and the year graph along the bottom. Show December in Denver, then Closest in January. Do not say why yet.<br><br>> **It's working when:** The year graph is the easiest way in: the yellow band is how long the day is, the orange line how high the Sun gets at noon. | Fill in the vocabulary. |
| 12 to 24 | **Guided practice (We do)**<br>The distance test together | Students open the link or scan the QR code. The guide asks them to pick an answer, press Play to sun noon, go to December, open Tilt and Orbit, find the day Earth is closest to the Sun, pick Sydney, read a card about the half that leans closer, and answer again.<br><br>> **Watch for:** Students who find the closest day but never read the season heading above it. Ask what season it is in Denver that day. | Follow the guide and fill in the evidence table as they go. |
| 24 to 38 | **Independent practice (You do)**<br>The evidence table | Students finish the evidence table: Denver on June 21 and December 21, the closest and farthest days with their distances, and Sydney on the closest day. Then the two questions. Walk the room with the What to look for questions.<br><br>> **If they ask:** "Leaning brings a town a few thousand kilometers nearer the Sun. Earth's distance changes by about 5 million. Which is bigger, and by how much?" The closer half | Fill in the table and answer the questions. |
| 38 to 45 | **Closure**<br>Showcase and exit ticket | Show the Showcase slide and take two or three answers. Go back to the warm-up tally and cross out the ideas the model ruled out. Hand out the exit ticket. | Answer the exit ticket. |

## Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/sunseasonslab?lesson=is-summer-when-we-are-closer&ref=tpt-sunseasonslab-1. A schoolyard in Denver on June 21 at 10 in the morning, with a stick and its shadow. On the right, Earth going round the Sun; along the bottom, Denver's year.

1. **Predict.** Pick one of the four answers in the guide. Nothing is marked right or wrong.

2. **Sun noon.** Press `Play`. When the shadow is shortest, a note says sun noon in Denver is at 1:02 pm and the shadow points north.
3. **December.** Press `December solstice`. The Sun's path is low: at noon it is 27 degrees up, the shadow 1.97 m, and the day 9 hours 21 minutes.
4. **The closest day.** Open `Tilt and Orbit` and drag Earth round, or press `Closest to the Sun`. Early January, 147.1 million km. The heading says Winter in Denver.
5. **Sydney.** Pick Sydney, Australia in the Town list: the same day, the same distance, and it is summer. Read the card, press `I see`, and answer again.

> Dragging Earth forward from December lands on January 2, 2027; the Closest to the Sun button goes to January 3, 2026, the closest day of the year on screen. Both are about 147.1 million km.

## Background for the teacher

Earth's orbit is nearly a circle. Earth is about 147.1 million km from the Sun in early January and 152.1 million km in early July, a change of about 3 percent. Light spreads out as it travels, so that changes the sunlight by about 7 percent, for the whole planet at once.

What changes with the season is the angle and the length of the day. Earth's axis is tilted about 23.4 degrees and keeps pointing the same way, toward the North Star. In June the north end leans toward the Sun: in Denver the noon Sun climbs to 74 degrees and the day lasts 14 hours 59 minutes. In December it leans away: 27 degrees and 9 hours 21 minutes. In the Sunlight chapter, a summer day in Denver gets 3.1 times the sunlight of a winter day.

Many students who say "tilt" mean that the half leaning toward the Sun is closer. In Trumper's study of 378 high schoolers in Israel, 62% named the tilt, and 13% of those then chose "closer in summer" to explain it. The lean moves a town only a few thousand kilometers, and the guide's card gives the town's own number.

## What to look for

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

- When is Earth closest to the Sun? What season is it in Denver then?
- What is the season in Sydney on that same day?
- What changes about the noon shadow from June to December?
- Leaning brings a town a few thousand kilometers closer. Why does that not matter?
- If distance made summer, which months would be summer everywhere?

> The last question is the real test: a student who answers "January, for the whole Earth at once" can see why distance cannot be the cause.

## Cross-curricular extensions

- Math: 147.1 and 152.1 million km. What percent farther is July than January? Divide and square to find the change in sunlight.
- Geography: find three cities in the southern half of the world and say which months are summer there.
- History: read about "A Private Universe", the 1987 film in which new Harvard graduates explain the seasons by distance.
- English: write the distance idea and the tilt idea as two short claims, each with one piece of evidence from the model.

## Vocabulary

| | |
|---|---|
| **Axis** | The imaginary line Earth spins around, through the North Pole and the South Pole. |
| **Tilt** | How far Earth's axis leans: about 23.4 degrees. It keeps pointing the same way, toward the North Star, all year. |
| **Orbit** | Earth's path around the Sun, once a year. It is almost a perfect circle. |
| **Solstice** | The day the Sun is farthest north or south, about June 21 and December 21: the longest and the shortest day. |
| **Sun noon** | The moment the Sun is highest and a stick's shadow is shortest. It is rarely 12:00 on the clock. |

## Differentiation

### ENGLISH LEARNERS

- Keep the vocabulary slide up, and point at the noon Sun in June and December as you say "high" and "low".
- Pair each learner with a partner who reads the guide aloud.
- Accept the evidence table as numbers copied from the screen, and the explanation as a labeled drawing.

### STUDENTS WITH IEPS OR 504 PLANS

- Pair students, one at the controls and one filling in the table.
- Zoom the browser to 150%.
- Allow the June and December rows only where the IEP allows a modified assignment.

### STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "Earth is closest to the Sun in ___, and in Denver that is ___."
- Fill in the June row of the evidence table together.
- Run the guide at the front with Big screen while students follow on their own screens.

### STUDENTS READY FOR MORE

- Open Sunlight and read the size test: how much more sunlight does a summer day in Denver get than a winter day, and how much does distance change it?
- Turn on The wrong axis in Tilt and Orbit and say what seasons Denver would have if the axis turned to face the Sun.

- Solve the puzzle Explain it, then compare the answer with the one in the app.

## Adapting for other grades

**Younger students:** In grades 4 and 5, run the guide together at the front and fill in the June and December rows only; the cause of seasons is beyond grade 5, so stop at "the Sun is higher and the day is longer in summer". 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 change in sunlight from distance, (152.1 / 147.1) squared, about 1.07, against the size test's 3 times for Denver.

# Student worksheet

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/sunseasonslab?lesson=is-summer-when-we-are-closer

Essential question: Is summer the time of year when Earth is closest to the Sun?

Warm-up: Why is it warmer in summer? Write your best idea. _____

1. **Vocabulary.** Axis, tilt, orbit, solstice, sun noon: write each in your own words.

2. **The evidence table.** Denver on June 21 and on December 21: the noon Sun ____ and ____ degrees up, the noon shadow ____ and ____ m, daylight _____ and _____.

3. **The distance test.** Earth is closest to the Sun on _____, _____ million km away, and farthest on _____. On the closest day it is _____ in Denver and _____ in Sydney.

1. Is summer the time when Earth is closest to the Sun? Use two pieces of evidence from the model.

2. The lean card said leaning brings the town about _____ km nearer the Sun. Why is that too small to matter?

## Exit ticket

Name: _____

1. Earth is closest to the Sun in (A) early July (B) early January (C) late March

2. On the day Earth is closest to the Sun, Sydney, Australia has (A) summer (B) winter (C) no seasons at all

3. Why is Denver colder in December? Use the words angle and day length.

Sun and Seasons Lab: Is Summer When We Are Closer?

## Exit ticket

Name: _____

1. Earth is closest to the Sun in (A) early July (B) early January (C) late March

2. On the day Earth is closest to the Sun, Sydney, Australia has (A) summer (B) winter (C) no seasons at all

3. Why is Denver colder in December? Use the words angle and day length.

# Answer key: exit ticket

| QUESTION | ANSWER | WHY |
|---|---|---|
| 1 | B | About 147.1 million km in early January, against 152.1 million km in early July. |
| 2 | A | The south end of the axis leans toward the Sun then. One Earth, one distance, two opposite seasons. |
| 3 | Low angle and short days | The noon Sun is low (27 degrees in Denver), so its light is spread over more ground, and the day lasts only about 9 hours 21 minutes. A full answer says distance is not the reason. |

## Rubric

Score each row from 1 to 4.

Name: _____

| CRITERIA | 4 EXCEEDS | 3 MEETS | 2 APPROACHING | 1 BEGINNING |
|---|---|---|---|---|
| **Evidence** | All rows of the evidence table right, and the season named in both towns on the closest day. | The June and December rows and the closest day right. | One or two rows right. | No evidence. |
| **Model** | Draws Earth at its closest with the axis leaning away from the Sun in the north and toward it in the south, and labels both seasons. | Draws Earth at its closest with the axis and labels Denver's winter. | Draws Earth and the Sun with no axis. | No drawing. |
| **Explanation** | Explains that closest is in Denver's winter, that Sydney has summer at the same distance, and that the angle and day length make the seasons. | Explains that Earth is closest in winter, so distance is not the cause. | Says distance is not the cause with no evidence. | Says summer is when Earth is closer. |

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

## Standards

The lesson is built for MS-ESS1-1, the seasons part, and its evidence statement: the distance between Earth and the Sun stays relatively constant, and the tilted axis keeps its direction. Texas TEKS 112.26(b)(9)(A) is the grade 6 standard for the seasons (2021 adoption).

| 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 of the tilted Earth and its orbit to show that distance stays nearly the same and that the seasons come from the tilt, and compare the two hemispheres on one day. |
| Texas TEKS | **112.26(b)(9)(A)** | 6 | Model and illustrate how the tilted Earth revolves around the Sun, causing changes in seasons. | Students use a model of the tilted Earth going round the Sun to show that the seasons come from the tilt, not from Earth's distance. |

Checked November 2026 against: NGSS MS-ESS1-1, Earth's Place in the Universe, NGSS MS-ESS1-1 evidence statement (June 2015), Texas Administrative Code, 19 TAC 112.26, Science, Grade 6, Trumper 2001, A cross-age study of senior high school students' conceptions of basic astronomy concepts, Research in Science and Technological Education 19(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/sun-and-seasons-lab/lessons/is-summer-when-we-are-closer/start instead of the worksheet link. Each one gets their own copy of the starter, and the same link reopens it next time. The Sheet button in the app collects their predictions, readings, puzzles and written answers to hand in.

## Terms of use

Thank you for downloading this lesson. The plan, the handouts and the art were made by mytekDev.

**You may:**

- print and copy it for your students
- change it for your own classes
- post it on your class website or learning management system
- share this file with other teachers, whole and unchanged, with this page included

**You may not:**

- sell it, or put it in a product you sell
- share a changed copy
- claim it as your own

The app this lesson uses is free and runs in the browser. Students need no account. It is at mytekdev.com.

Questions, or found a mistake? Ask on the Teachers Pay Teachers Q&A for this resource, or write to us at mytekdev.com/contact.

© 2026 mytekDev. All rights reserved.