

OVERVIEW

SUN, MOON, AND STARS



CONTENT GOALS

The **Sun, Moon, and Stars Module** consists of three sequential investigations, each designed to introduce students to objects we see in the sky. Through outdoor observations made during the day and at night, active simulations, readings, videos, and discussions, students study the Sun, Moon, and stars to learn that these objects move in regular and predictable patterns that can be observed, recorded, and analyzed.

FOSS EXPECTS STUDENTS TO

- Observe and record how the Sun, Earth’s star, rises in the east and sets in the west in a predictable pattern.
- Learn that Earth rotates on its axis, causing day and night. Day happens when a location on Earth is facing toward the Sun, and night happens when a location is facing away from the Sun.
- Understand that the exact path the Sun takes in the sky varies by season.
- Understand that shadows are the areas of darkness created when an opaque object blocks light and that shadows on Earth depend on the position of the Sun in the sky.
- Learn that Earth is one of several planets that orbit the Sun in the solar system.
- Learn that the Moon orbits Earth and can appear in the sky during both day and night; observe and record how the Moon changes its appearance or phase in a regular pattern over 4 weeks.
- Learn how useful telescopes are in studying the solar system, as they make distant objects look closer and larger.
- Learn that stars are suns positioned at great distances from Earth and form groups called constellations that appear to move together across the sky at night.
- Use tools to collect and analyze data to develop logical conclusions about the movements of objects in the sky.
- Predict the outcome of an event and compare the results with the prediction.



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FOSS AND CALIFORNIA STANDARDS

The **Sun, Moon, and Stars Module** supports the following Earth and Physical Sciences Content Standards for grade 3.*

EARTH SCIENCES

ES4 *Objects in the sky move in regular and predictable patterns. As a basis for understanding this concept:*

- ES4a Students know the patterns of stars stay the same, although they appear to move across the sky nightly, and different stars can be seen in different seasons.
- ES4b Students know the way in which the Moon's appearance changes during the four-week lunar cycle.
- ES4c Students know telescopes magnify the appearance of some distant objects in the sky, including the Moon and the planets. The number of stars that can be seen through telescopes is dramatically greater than the number that can be seen by the unaided eye.
- ES4d Students know that Earth is one of several planets that orbit the Sun and that the Moon orbits Earth.
- ES4e Students know the position of the Sun in the sky changes during the course of the day and from season to season.

PHYSICAL SCIENCES

PS2 *Light has a source and travels in a direction. As a basis for understanding this concept:*

- PS2a Students know sunlight can be blocked to create shadows.

"Earth sciences standards in grade three center on the concept that objects in the sky move in regular and predictable patterns. It is important that students know and are familiar with the patterns and movements of the Sun, Moon, and stars, both as those bodies actually move and as they appear to move when viewed from Earth."[†]

*Science Content Standards for California Public Schools: Kindergarten through Grade Twelve (Sacramento: California Department of Education, 2000).

[†]Science Framework for California Public Schools: Kindergarten through Grade Twelve (Sacramento: California Department of Education, 2003), page 52.

The **Sun, Moon, and Stars Module** supports the following Investigation and Experimentation Content Standards for grade 3.*

INVESTIGATION AND EXPERIMENTATION

I&E5 *Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:*

I&E5d Predict the outcome of a simple investigation and compare the result with the prediction.

I&E5e Collect data in an investigation and analyze those data to develop a logical conclusion.



“Students can begin to make predictions based on observations, prior knowledge, and logic. Predictions should not be confused with random guesses. Students should know that their predictions must be verified by experiments and the analysis of data gathered from careful measurements.”[†]

**Science Content Standards for California Public Schools: Kindergarten through Grade Twelve* (Sacramento: California Department of Education, 2000).

[†]*Science Framework for California Public Schools: Kindergarten through Grade Twelve* (Sacramento: California Department of Education, 2003), page 55.

SUN, MOON, AND STARS MODULE MATRIX

SYNOPSIS

CA SCIENCE CONTENT STANDARDS

1. THE SUN

Students use a compass to study the position of the Sun in the sky at different times during the day. They observe the Sun's position, record, make predictions, and make new observations later in the day to check their predictions.

Students explore shadows created by blocking sunlight on the schoolyard. They trace shadows, predict where shadows will be later in the day, and return to check their predictions. Students read about the changing position of the Sun in the sky.

- ES4e Students know the position of the Sun in the sky changes during the course of the day and from season to season.
- PS2a Students know sunlight can be blocked to create shadows.
- I&E5d Predict the outcome of a simple investigation and compare the result with the prediction.
- I&E5e Collect data in an investigation and analyze those data to develop a logical conclusion.

2. THE MOON

Students observe the Moon in the sky during the day and night for a period of 4 weeks. They record the appearance of the Moon and analyze the data to discover a sequence of changes, the lunar cycle. Students learn the names of the Moon phases and how to predict the next step in the sequence. Concepts are reinforced through simulations, readings, a video, and writing.

- ES4b Students know the way in which the Moon's appearance changes during the four-week lunar cycle.
- ES4d Students know that Earth is one of several planets that orbit the Sun and that the Moon orbits Earth.
- I&E5e Collect data in an investigation and analyze those data to develop a logical conclusion.

3. THE STARS

Students look to the night sky to observe the stars and are introduced to the constellations people have named. Students engage in simulations to understand why the stars appear to move across the sky during the night and why different stars can be seen from Earth at different seasons.

Students read about the role of telescopes in astronomy research and about star scientists.

- ES4a Students know the patterns of stars stay the same, although they appear to move across the sky nightly, and different stars can be seen in different seasons.
- ES4c Students know telescopes magnify the appearance of some distant objects in the sky, including the Moon and the planets. The number of stars that can be seen through telescopes is dramatically greater than the number that can be seen by the unaided eye.

- The Earth spins on its axis.
- The Sun rises in the east and sets in the west every day.
- A compass is a tool used to determine directions (east, west, north, and south).
- Shadows are the areas of darkness created when an opaque object blocks light.
- The shapes of shadows change over a day and depend on the position of the Sun in the sky.
- Day happens when a location on Earth is facing toward the Sun.
- Night happens when a location on Earth is facing away from the Sun.
- The exact path the Sun takes in the sky varies by season.

- *Sunrise/Sunset*
- *Changing Shadows*
- *Summary: The Sun*
- Science Notebook: Students record and predict the movement of the Sun. They respond to questions on sun and shadows.

Pretest

Embedded Assessment

- Science notebook

Benchmark Assessment

- I-Check 1

- Objects in the night sky include the Moon, stars, and other planets.
- Earth is one of several planets that orbit the Sun in the solar system.
- The Moon orbits Earth.
- The Moon can appear in the sky during both night and day.
- The Moon changes its appearance, or phase, in a regular pattern over 4 weeks.
- Moon phase is the portion of the illuminated half of the Moon that is visible from Earth.

- *The Night Sky*
- *Changing Moon*
- *Summary: The Moon*
- Science Notebook: Students record their observations of the Moon over time. They show their understanding of the lunar cycle.

Embedded Assessment

- Science notebook

Benchmark Assessment

- I-Check 2

- Stars are suns positioned at great distances from Earth.
- Groups of stars form patterns called constellations.
- Stars (constellations) appear to move together across the night sky because Earth rotates.
- Stars can be observed from Earth's surface only at night.
- Different constellations can be observed during different seasons because Earth revolves around the Sun.
- Stars are different sizes and have different brightnesses.
- Telescopes make distant objects look closer and larger.

- *Stargazing*
- *Looking through Telescopes*
- *Star Scientists*
- *Summary: The Stars*
- Science Notebook: Students explain the apparent motion of the stars across the night sky.

Embedded Assessment

- Science notebook

Benchmark Assessment

- I-Check 3

Posttest

SAFETY IN THE CLASSROOM AND OUTDOORS

Following the procedures described in each investigation will make for a very safe experience with earth science in the classroom. You should also review your district safety guidelines and make sure that everything that you do is consistent with those guidelines.



Look for the safety-note icon in the Getting Ready section, which will alert you to safety concerns throughout the module.

One important note you will see throughout the module is that when students go outdoors to observe shadows or the Moon, they should be careful to avoid looking directly at the Sun. Students should never look directly at the Sun, as it will damage their eyes. Make that very clear to students and remind them often.

Materials Safety Data Sheets (MSDS) for materials used in the FOSS program can be found on the Delta Education website (<http://www.delta-education.com/msds.shtml>). If you have questions regarding any MSDS, call Delta Education toll free at 800-258-1302 (Monday–Friday 8 a.m. to 6 p.m. EST).

General classroom safety rules to share with students include

1. Listen carefully to all instructions. Follow directions. Ask questions if you don't know what to do.
2. Tell your teacher if you have any allergies.

3. Never put any materials in your mouth. Do not taste anything unless your teacher tells you to do so.
4. Never smell any unknown material. If your teacher asks you to smell something, wave your hand over the material to draw the smell toward your nose.
5. Do not touch your face, mouth, ears, nose, or eyes while working with chemicals, plants, or animals.
6. Always protect your eyes. Wear safety goggles when necessary. Tell your teacher if you wear contact lenses.
7. Always wash your hands with soap and warm water after working with chemicals, plants, or animals.
8. Never mix any chemicals unless your teacher tells you to do so.
9. Report all spills, accidents, and injuries to your teacher.
10. Treat animals with respect, caution, and consideration.
11. Clean up your work space after each investigation.
12. Act responsibly during science investigations.

These rules are provided for your class on the FOSS safety poster and are in the *Science Resources* book for each student.

SCHEDULING THE MODULE

For comprehensive teaching of the science standards at grade 3, with multiple exposures, science should be taught on the schedule below. Active-investigation sessions (including wrap-up) and reading sessions might be 40–45 minutes, I-Check and assessment-review sessions 20–25 minutes.

Active-investigation (A) sessions include firsthand observations of objects in the sky, active thinking about the experiences, small-group discussion, simulations, writing in science notebooks, learning new vocabulary in context, viewing a video, and completing written embedded assessments to inform instruction.

Wrap-up (W) sessions are teacher-directed vocabulary reinforcement and science content review.

Reading (R) sessions (*Science Resources* book) include individual and interactive reading, answering review questions, and discussing the reading to ensure that students integrate the information.

I-Checks are short summative assessments. Students respond to written prompts. The next day, after you have scored the assessments, students review their written responses to reflect on and improve their understanding.

Week	Day 1	Day 2	Day 3	Day 4	Day 5
	Pretest				
1	START Inv. 1 Part 1 A	A/W	R	START Inv. 1 Part 2 A	A/W
2	R		I-Check 1		Review
3	START Inv. 2 Part 1 A		A/W		R
4	START Inv. 3 Part 1 A		A/W		R
5	START Inv. 3 Part 2 A/W		R		R
6	R		I-Check 3		Review
7	START Inv. 2 Part 2 A	A	A/W	R	R
8	I-Check 2		Review		Posttest

NOTE Start Investigation 2 when the Moon is in first-quarter phase. Refer to Getting Ready for Investigation 2 for more about determining the start time for Moon study. Students need to observe the Moon for a month in Investigation 2, Part 1. That is why Investigation 2, Part 2 starts on week 7.



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SCOPE AND SEQUENCE FOR FOSS CALIFORNIA 2007 EDITION

GRADE	PHYSICAL SCIENCES	LIFE SCIENCES	EARTH SCIENCES
5	Mixtures and Solutions	Living Systems	Water Planet
4	Magnetism and Electricity	Environments	Solid Earth
3	Matter and Energy	Structures of Life	Sun, Moon, and Stars
2	Balance and Motion	Insects and Plants	Pebbles, Sand, and Silt
1	Solids and Liquids Air and Weather	Plants and Animals	Air and Weather
K	Wood and Paper	Animals Two by Two Trees	Wood and Paper Trees

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