

Light: Observing the Sun, Moon, and Stars

Teacher Resources

Related Documents

See “Files” section in the LMS.

Preface

In the previous Light and Sound module, students explored how light and sound travel over distances. The primary source of light on Earth is the Sun. The Sun is the star at the center of our solar system. Students will learn that stars, including the Sun, generate their own light, while objects such as the moon reflect that light.

Throughout the module students will document patterns as they observe the Sun, moon, and stars. The ability to recognize patterns is an important scientific skill that researchers use to develop explanations of observations in nature.

Finally, students will be challenged with the task of designing, building, and testing a device to protect students from ultraviolet (UV) radiation. Students will analyze media to determine the peak times during the day for UV radiation and then design a cover for a playground structure.

Transfer

Students will be able to independently use their learning to ...

1. Evaluate a problem in a novel situation.
2. Apply a step by step design process to solve a problem.
3. Identify patterns from observable data.
4. Identify sources of light involved in viewing objects.

Understandings

Students will understand that:

1. The design process is a step-by-step method used to guide people in developing solutions to problems.
2. Engineers and designers create new products or improve existing products and technology to meet human needs and wants.
3. Engineers ask questions, make observations, and gather information about a situation people want to change.
4. The shape of an object can help it perform as needed to solve a given problem.

5. Products may be analyzed by comparing objects designed to solve the same problem.
6. Engineers keep and organize all of their work in an engineering notebook.
7. Engineers share their work and get feedback from others during the design process.
8. Light travels over distances.
9. Objects can be seen only if they reflect available light or if they give off their own light.
10. Patterns of the motion of the Sun, moon, and stars can be observed, described, and predicted.
11. Seasonal patterns of sunrise and sunset can be observed, described, and predicted.
12. Ultraviolet rays from the Sun can cause damage to humans and are strongest during the middle of the day.

Knowledge

It is expected that students will:

- Understand that products created by engineers and designers were created to meet a human need or want.
- Identify questions that engineers may ask when gathering information about a situation people want to change.
- Recognize the differences between a new object and an improved object.
- Recognize that light travels over distances.
- Describe how we see the Sun and other stars.
- Describe how we see the moon.

Skills

It is expected that students will:

- Follow a step by step method to solve a problem.
- Examine how other people have tried to solve a design problem.
- Gather information about a situation that people want to change.
- Describe how the shape of a structure helps it function as needed to meet a human need or want.
- Brainstorm possible solutions and select one solution to develop, taking into account strengths and weaknesses of each design.
- Build and test a physical model of an improved object or tool designed to meet a human need or want.
- Collect and analyze data from two models and compare the strengths and weaknesses of how each performed.
- Organize and maintain an engineering notebook to document work.
- Share findings and conclusions with others.
- Observe and describe patterns of the Sun.

- Observe and describe patterns of the moon.
- Observe and describe patterns of the stars.
- Use data to determine a pattern of ultraviolet light radiation from the Sun over the course of a day.

Essential Questions

Students will keep considering:

1. What are some unique properties of light?
2. What are some unique properties of the Sun?

Day-by-Day Plans

Time: 10 instructional hours

NOTE: *In preparation for teaching this module, it is strongly recommended that the teacher read the Light: Observing the Sun, Moon, and Stars Teacher Resources document, including the Understandings, Knowledge, and Skills addressed in the module. The day-by-day plans call for students to access the curriculum using the Canvas app on a tablet. The activity, project, and problem documents may also be accessed through files in the course on the LMS.*

Part 1: Patterns of the Sun

120 minutes

- Detailed instructions may be found in the document entitled Activity 2.1 Patterns of the Sun Teacher Notes.
- The teacher introduces students to the Learning Management System (LMS) through the Canvas app and assists students with the login process. For the remainder of the module, students will access the curriculum in the LMS and record their work in the Light: Observing the Sun, Moon, and Stars Launch Log.
- The teacher distributes a Light: Observing the Sun, Moon, and Stars Launch Log to each student. All written student work for the module will be completed in this log.
- In Activity 2.1 Patterns of the Sun, students learn about the design process and are introduced to the design problem they will face at the conclusion of the module. Students will also observe and document patterns of the Sun, including how the Sun rises, moves across the sky, and sets.

Part 2: Patterns of the Moon

120 minutes

- Detailed instructions may be found in the document entitled Activity 2.2 Patterns of the Moon Teacher Notes.
- In Activity 2.2 Patterns of the Moon, students learn how we see the moon even though it does not produce its own light. Students also observe and document patterns of the moon, including the apparent movement of the moon through the night sky and phases of the moon.

- NOTE: In Part 3 of this activity, students take binoculars home to observe the moon in the night sky. The teacher will need to determine the most appropriate viewing dates for students to complete this portion of the lesson and may choose to assign the moon watching segment out of order from the rest of the moon activity. More information may be found on the document entitled Activity 2.2a Phases of the Moon.

Part 3: Patterns of the Stars

80 minutes

- Detailed instructions may be found in the document entitled Activity 2.3 Patterns of the Stars Teacher Notes.
- In Activity 2.3 Patterns of the Stars, students learn how we see stars as the light they generate travels through space. Students will also observe patterns of stars, including the trend that stars are able to be observed only at night.
- The students access the Activity 2.3 Patterns of the Stars assignment in the Canvas app and document their work as they follow the steps of the design process in the Light: Observing the Sun, Moon, and Stars Launch Log.
- Optional: The teacher may wish to host a night sky viewing party at the school. Students and parents could participate in an astronomy night, and students could use the binoculars or their eyes to view the stars and other objects in the night sky.

Part 4: Mystery Beads

80 minutes

- Detailed instructions may be found in the document entitled Project 2.4 Mystery Beads Teacher Notes.
- This project is an inquiry experience as students learn about UV rays. The teacher will guide the students as they experiment and document results of exposing UV-sensitive “mystery” beads to sunlight.
- The teacher will also engage students in learning about protection from UV exposure using shadow tests and demonstrations of blocked sunlight.
- The students access the Project 2.4 Mystery Beads assignment in the Canvas app and document their work in their Light: Observing the Sun, Moon, and Stars Launch Log.

Part 5: Take Cover! Design Problem

200 minutes

- Detailed instructions may be found in the document entitled Problem 2.5 Take Cover! Design Problem Teacher Notes.
- In this design problem, students will design a covering for a playground to protect students from UV exposure. They will use the UV-sensitive beads and a UV flashlight to determine the effectiveness of their design to protect students playing on the playground at midday.
- The students access the Problem 2.5 Take Cover! Design Problem assignment in the Canvas app and document their work as they follow the steps of the design process in their Light: Observing the Sun, Moon, and Stars Launch Log.
- Students present their design solution and the evaluation of its success to the class.

- At the conclusion of the module, the students complete the Light: Observing the Sun, Moon, and Stars Check for Understanding.

National and State Standards Alignment

Next Generation Science Standards

- 1-PS4-2. Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.
- 1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted.
- 1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year.
- K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Common Core ELA

- W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.
- SL.1.1 Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
 - SL.1.1a Follow agreed-upon rules for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion).
 - SL.1.1b Build on others' talk in conversations by responding to the comments of others through multiple exchanges.
 - SL.1.1c Ask questions to clear up any confusion about the topics and texts under discussion.
- SL.1.5 Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.
- SL.1.6 Produce complete sentences when appropriate to task and situation.

Common Core Math

- 1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.
- 1.MD.A.2 Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.

- 1.MD.C.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.
- 1.MD.B.3 Tell and write time in hours and half-hours using analog and digital clocks.