Science Logbook



GREAT MINDS® SCIENCE

# GRADE 4

## MODULE 4

CALIFORNIA Edition

GREAT MINDS® SCIENCE



Grade 4 Module 4

# Light: Sight and Communication

*Science Logbook*

Name: _____ Date: _____

Grade 4 Module 4

# Module Question Log



As your class agrees on the Module Driving Question and Phenomenon Questions, record them here.

Name: _____ Date: _____



Lesson 1 Activity Guide

# Notice and Wonder

Use the table below to record what you notice and wonder.

| I Notice | I Wonder |
| --- | --- |
| | |

Record important information

| |
| --- |
| |

## Reflection

Copy the question shared by your teacher in the space below, and then write a response.

Name: _____ Date: _____



Lesson 2 Activity Guide

# Modeling

Draw a model to explain why Amelia Earhart could not find Howland Island.

Compare your model to a classmate's. Record the similarities and differences in the space below.

| Similarities | Differences |
| --- | --- |
| | |

Name: _____ Date: _____



Lesson 3 Activity Guide A

# Sight Model

Draw a model in the space below to explain how you are able to see the object your teacher placed in the middle of the classroom.

## Model Explanation

Name: _____ Date: _____

Group: _____



Lesson 3 Activity Guide B

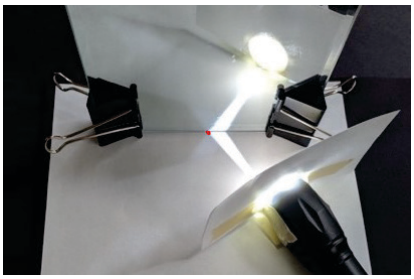
# Reflection Investigation

## Instructions

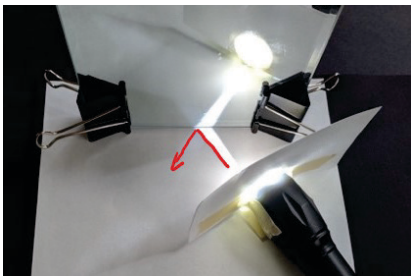
1. Use a ruler to draw a line on your paper near the edge. Place the mirror along the line on your piece of paper.

2. Place the flashlight about 3 cm from the mirror and angle it as shown in the picture below.

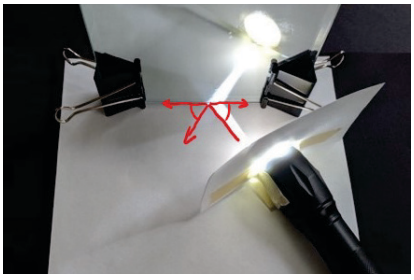
3. Mark the spot where the light ray reflects on the piece of paper with a dot. Make sure to always reflect your light ray off the same spot to make measuring easier.



4. Trace the incoming light ray (light going to the mirror) and the outgoing light ray (light reflecting from the mirror): Mark two spots on the paper along each light ray, and then use a ruler to draw a line connecting the dots with the reflection spot.



5. Use a protractor to measure the incoming and outgoing angles (the angles between the rays and the mirror line). Record your results in the table below.



6. Change the angle of the flashlight and repeat the process until you have three sets of angles. Use a new color each time to keep track of each reflection.



## Data

| | Incoming Angle | Outgoing Angle |
|---|---|---|
| Trial 1 | | |
| Trial 2 | | |
| Trial 3 | | |

## Observations

Name: _____ Date: _____



Lesson 4 Activity Guide

# Sight Investigation

## Observations

Record observations about the object in the shadow box.

## Model

Draw a model to explain how your team could see the object in the shadow box.

Name: _____ Date: _____

Lesson 5 Activity Guide

# Shadow Investigation



Make a claim about the Phenomenon Question **How do we see an object in shadow?**

_____

_____

## Develop a Model

Draw a model of what you observe in the shadow box investigation.

**Model Explanation:** Explain how the components of the system in your model interact.



Compare your model with a partner's.

| Similarities | Differences |
|---|---|
| | |

## Evaluate your Claim

What evidence from your investigation supports or refutes your claim?

Name: _____ Date: _____

Lesson 6 Activity Guide

# Conceptual Checkpoint



Respond to the question posed by your teacher.

Name: _____ Date: _____



Lesson 7 Activity Guide

# How Materials Reflect Light

Record the class reflectiveness rating scale in the space below.

Record the class investigation plan in the space below.

Record your group's data in the table.

| Object | Rating | Object Description (color, texture) |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |



Reflectiveness Rating Table Number _____

What patterns did you identify for the objects at your table?

Name: _____ Date: _____



Lesson 8 Activity Guide

# Investigate Different Surface Textures

Record observations during the shadow box investigation.

| |
|---|
| |

Draw the diagrams your class created to show how light is reflected differently by the two building blocks.

| | |
|---|---|
| | |

Write an explanation that describes why the two plastic building blocks look different under the light in the shadow box.

Name: _____ Date: _____



Lesson 9 Activity Guide

# How Color Affects What We See Investigation

Obtain the following materials from your teacher: flashlight, Flashcard Set A, Flashcard Set B, 3 color filters (red, blue, and green), rubber band.

## Part 1

During this part of the investigation, use Flashcard Set A and different colors filters for the light.

1. Shine white light on each flashcard by using the flashlight without a filter. Record the colors that you see for each flashcard in the tables.
2. Next, add a filter to the flashlight by folding the color filter twice (creating four layers), covering the light with the filter, and securing it with a rubber band. See the picture below for an example.

3. Shine the flashlight with the color filter on each flashcard. Record the color of the filter and the colors that you see for each flashcard in the tables.
4. Remove the filter, and repeat steps 2 and 3 for each remaining color filter.

## American Flag Flashcard

| Filter Color | Observations |
|---|---|
| None | |
| | |
| | |
| | |



## Red Rose Flashcard

| Filter Color | Observations |
|---|---|
| None | |
| | |
| | |
| | |

## Dalmatian on Beach Flashcard

| Filter Color | Observations |
|---|---|
| None | |
| | |
| | |
| | |



## Tiger Flashcard

| Filter Color | Observations |
|---|---|
| None | |
| | |
| | |
| | |

## Yellow Daffodils Flashcard

| Filter Color | Observations |
|---|---|
| None | |
| | |
| | |
| | |



## House Cat Flashcard

| Filter Color | Observations |
|---|---|
| None | |
| | |
| | |
| | |

## Part 2

For this part of the investigation, use Flashcard Set B.



1. Look at both flashcards at your table and record what you see in the tables below.
2. Have one group member move 2 meters away and hold up each flashcard. Record what you see in the tables below.
3. Switch roles so that everyone has a chance to see the flashcards from far away. Think about whether one of the flashcards is harder to see from a distance than the other.

**Parrot Flashcard**

| Describe the picture at the table. | Describe the picture from 2 meters away. |
|---|---|
| | |

**Tree Flashcard**

| Describe the picture at the table. | Describe the picture from 2 meters away. |
|---|---|
| | |

## Part 3

For the last part of the investigation, use the color wheel.

1. Place one color filter on the flashlight from Part 1 of the investigation.
2. Shine the flashlight with the color filter on the color wheel and record your observations in the table. Be sure to record how the colors in the color wheel change when you look at them using each filter.
3. Repeat for each color filter.

| Green Filter | Red Filter | Blue Filter |
|---|---|---|
| | | |

## Investigation Questions



**Part 1**

How do the colors in the pictures for Flashcard Set A change when you change the color of the light?

If different colored materials reflect light differently, how do you think using a different color light source affects what we see?

**Part 2**

Which picture in Flashcard Set B was easier to see from a distance: the parrots or the trees? Explain why you think this is the case.



**Part 3**

When you used the color filters to look at the color wheel in the third part of the investigation, what did you notice about the how the colors changed for each filter?

Name: _____ Date: _____



Lesson 10 Activity Guide A

# Howland Island

## Satellite Map of Howland Island

Record what you notice and wonder about the satellite image of Howland Island National Wildlife Refuge as your teacher zooms out.

| Distance | Notice | Wonder |
|---|---|---|
| 0.3 km (0 clicks) | | |
| 0.61 km (1 click) | | |
| 1.52 km (2 clicks) | | |
| 1.6 km (3 clicks) | | |
| 16.1 km (6 clicks) | | |
| 161 km (9 clicks) | | |

## Howland Island Article

Record important information from the newspaper article about Howland Island in the graphic organizer.



| Size | Location |
|---|---|
| | |

| Animals and Plants | Climate | Inhabitants |
|---|---|---|
| | | |

| Other |
|---|
| |

Name: _____ Date: _____



Lesson 10 Activity Guide B

# Howland Island Physical Model Project

Brainstorm ideas and questions to think about before planning your model. Think about this question: What would we need to do or know to create an accurate physical model of what Amelia could have seen as she approached Howland Island?

Develop a plan for creating your physical model in the space below. Of the available materials provided by your teacher, list the materials you might use in your model in the table on the next page. Explain what the materials will be used for in your model and what they might represent. You do not have to use all materials.

| Material | Explain how the material will be used in your model. |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

As you look at other group's designs, use the chart below to identify similarities and differences between your design and others.

| Similarities | Differences |
| --- | --- |
| | |



Describe any potential issues you may need to address when building your physical model.

What are some ideas other groups had that you like?

Name: _____ Date: _____



Lesson 11 Activity Guide

# Physical Properties of Materials

Record the materials you used in your model. Explain what the material represents and why you selected the material (the physical properties). Do not record glue or tape used to hold items together.

| Material Used | What the Material Represents | Physical Properties of the Material |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| Material Used | What the Material Represents | Physical Properties of the Material |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Name: _____ Date: _____



Lesson 12 Activity Guide

# Amelia Earhart Flight Scenarios

## Introduce Perspective

Record your observations about the pencil in the chart below.

| First Observation | Second Observation | Third Observation |
|---|---|---|
| | | |

## Investigate Perspective

### Simulation 1: Midnight



| Position | **Observations:** What can you see? How are materials interacting with the available light? What colors do you notice? |
|---|---|
| N | |
| W | |
| S | |

## Simulation 2: Sunrise

| Position | **Observations:** What can you see? How are materials interacting with the available light? What colors do you notice? |
|---|---|
| N | |
| W | |
| S | |

## Simulation 3: 8:45 a.m. (last radio call)

| Position | **Observations:** What can you see? How are materials interacting with the available light? What colors do you notice? |
|---|---|
| N | |
| W | |
| S | |

Look at your observations from the three simulations. Why might it have been difficult to spot Howland Island from Amelia's perspective? For each simulation, which perspective made it easiest to see the island? Which perspective made it hardest to see the island?



If you were looking for Howland Island from the perspective of the *Itasca*, would Howland Island have been as difficult to spot? Why or why not?

## Make a Claim

How did texture, color, and perspective affect your ability to locate Howland Island? Support your claim with evidence.

Name: _____ Date: _____

Lesson 13 Activity Guide

# Conceptual Checkpoint



Respond to the question posed by your teacher.

Name: _____ Date: _____

Lesson 14 Activity Guide

# Radio Communication



## Notice and Wonder

Record what you notice and wonder while listening to the radio.

| I Notice | I Wonder |
| --- | --- |
| | |

# *Amelia Lost* Radio Communication Events

My assigned reading pages: _____

As you read, highlight or underline communication events in the text. Record these events and the date and time when they occurred.



| Date | Time | Event |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Name: _____ Date: _____



Lesson 15 Activity Guide

# Radio Communication Investigation

## Investigation Question

_____

_____

## Observations

Record your observations about the radio during the investigation.

| Transmitter Connected to Computer | Transmitter Not Connected to Computer |
|---|---|
| | |

## Communication System Model

Draw a model of what you think is happening when the radio plays music. Identify each part of the system and how these parts interact.



### Model Explanation

Name: _____ Date: _____



Lesson 16 Activity Guide

# Blocking a Radio Signal Investigation

## Investigation Question

_____

_____

## Investigation Plan

Record your investigation plan in the box below.

## Observations

Record what you observe during your investigation in the table below.



| **What did we do?**<br>Record what you did to the radio. | **What happened?**<br>Record the result. |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |

Record similarities and differences in how light and radio signals interact with different materials.



| Similarities | Differences |
| --- | --- |
| | |

Name: _____ Date: _____



Lesson 17 Activity Guide

# Morse Code

What do you notice about Morse code?

_____

_____

_____

_____

_____

Brainstorm possible strengths and limitations of Morse code.

| Strengths | Limitations |
|---|---|
| | |

Create a one-word message in Morse code. Write the word in the box and then write the Morse code below it.



Check your code with the Morse code translator website. Was your code correct? Why or why not?

In your group, create a three-word message in Morse code. Record the words that make up your message and the code in the space below.

In the space below, decode the message sent by the sending group.

Name: _____ Date: _____



Lesson 18 Activity Guide

# Send and Receive Messages across a Distance

Create a two-word message in Morse code. Record the words that make up your message and the code in the space below.

How did you send your encoded message to your partner?

In the space below, record and decode the message sent by your partner.



Were you successful in decoding your partner's message? Why or why not?

Name: _____ Date: _____

Partner's Name: _____



Lesson 19 Activity Guide

# Conceptual Checkpoint

Create a picture in the lettered grid below. Use Morse code to tell your partner which squares to color in their lettered grid to recreate the picture.

My Picture to Send

| | | | | |
|---|---|---|---|---|
| A | B | C | D | E |
| F | G | H | I | J |
| K | L | M | N | O |
| P | Q | R | S | T |
| U | V | W | X | Y |

Use the Morse code your partner sends you to color in the squares on the lettered grid below to create their picture.

My Received Picture

| | | | | |
|---|---|---|---|---|
| A | B | C | D | E |
| F | G | H | I | J |
| K | L | M | N | O |
| P | Q | R | S | T |
| U | V | W | X | Y |

Name: _____ Date: _____

Lesson 20 Activity Guide

# Engineering Challenge



**Ask:** Define the problem. Identify criteria and constraints.

Problem: _____

| Criteria | Constraints |
|---|---|
| | |

**Imagine:** Research. Brainstorm solutions. Select a solution.

With your group, brainstorm and record ideas about how to build your solution.

**Plan:** Gather materials. Generate detailed design.

What materials will you use to make the Howland Island and its runway easier to find?



Create a diagram of your design. Label all materials that you will need to build your solution. Have your teacher approve your diagram, then begin building.

**Create:** Build a solution. Test and evaluate.

Simulations: Midnight, Sunrise, 8:45 a.m.

Gather Evidence: What works well about our solution?



What parts of the solution need improvement?

How can we improve our design to avoid these challenges?

**Improve:** Redesign.

What will you change about your solution? How do you predict those changes will increase visibility?



Update your diagram in the Plan section to include the improvements to your design. Use a new color to show the improvements.

**Share:** Receive feedback.

How can you share what you created and learned? Work with your group to plan your presentation. Include details from your Activity Guide, including your final diagram and your physical model.

**Final Diagram:** Create a final diagram of your design to share during your presentation. In the diagram, label the parts of the design that make Howland Island and the runway easier to find.

Name: _____ Date: _____

Group: _____



Lesson 22 Activity Guide

# Engineering Challenge Rubric

| Your presentation should answer the following questions: | 3 (Meets Expectations) | 2 (Partially Meets Expectations) | 1 (Does Not Yet Meet Expectations) |
|---|---|---|---|
| What materials did you use to make Howland Island and the runway easier to see? Why did you choose those materials? | Accurately states materials used to increase visibility and explains their decision with scientific reasoning. | What materials did you use to make Howland Island and the runway easier to see? Why did you choose those materials? | Accurately states materials used to increase visibility and explains their decision with scientific reasoning. |
| Was your solution successful under all three scenarios? How do you know? | Accurately states test results for all scenarios and explains reasoning. | Was your solution successful under all three scenarios? How do you know? | Accurately states test results for all scenarios and explains reasoning. |
| What changes did you make to your solution after testing? Why did you make those changes? | States changes and explains with scientific reasoning and evidence from test results. | What changes did you make to your solution after testing? Why did you make those changes? | States changes and explains with scientific reasoning and evidence from test results. |
| Presentation note: Make sure all group members play a role in the presentation. | All group members contribute equally to the presentation. | Presentation note: Make sure all group members play a role in the presentation. | All group members contribute equally to the presentation. |

Name: _____ Date: _____



Lesson 24 Activity Guide A

# Key Terms about Light, Sight, and Communication

Cut out the key terms about light, sight, and communication.

| | | |
|---|---|---|
| **Code** | **Decode** | **Digitize** |
| **Direct illumination** | **Emit (light)** | **Encode** |
| **Illuminate** | **Indirect illumination** | **Light ray** |
| **Perspective** | **Transmit** | |

## Map

Create a relationship map in the space below. Arrange the terms, draw arrows (or other symbols), and write words to show the relationship between the terms. Glue the terms to the paper once you have finalized your map.

Name: _____ Date: _____



Lesson 24 Activity Guide B

# Light, Sight, and Communication

Module Driving Question: Why didn't Amelia Earhart complete her journey?

Name: _____ Date: _____



Lesson 24 Activity Guide C

# Collaborative Conversation Strategies

Choose one or two strategies with sample sentence frames that you want to use in the Socratic Seminar. Circle them or cut them out.

| | |
|---|---|
| **Make a connection between ideas.**<br><br>*That idea relates to _____.* | **Explain your thinking.**<br><br>*I think that because _____.* |
| **Add to what someone else says.**<br><br>*I agree with _____, and I'd like to add _____.*<br><br>*I like that idea because _____.* | **Offer an example to support your own or someone else's idea.**<br><br>*An example of that would be _____.* |

| | |
|---|---|
| **Give a different viewpoint.**<br><br>*I politely disagree with _____ because _____.*<br><br>*That's a good point, but I think _____.* | **Ask a question to clarify someone else's idea.**<br><br>*I have a question about _____.*<br><br>*In other words, are you saying _____?* |
| **Refocus the conversation on the question or purpose.**<br><br>*I'd like to go back to what _____ was saying about _____.*<br><br>*Let's go back to the question (or idea) that _____.* | **Elaborate on an idea to explain why it is important.**<br><br>*That idea is important because _____.* |
| **Encourage someone to tell more about their ideas.**<br><br>*It is an interesting idea that _____. Can you say more about that?* | **Summarize the conversation.**<br><br>*So, the big idea seems to be _____.*<br><br>*So, what can we conclude from _____?* |

Name: _____ Date: _____



Lesson 26 Activity Guide

# Module Performance Expectations

**4-PS4 Waves and Their Applications in Technologies for Information Transfer**

4-PS4-2 Develop a model to describe light reflecting from objects and entering the eye allows objects to be seen.

4-PS4-3 Generate and compare multiple solutions that use patterns to transfer information.

**3-5-EST1 Engineering Design**

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

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