# South Carolina K–5 Unit Sequence and Academic Standards

<table>
<thead>
<tr>
<th>PHYSICAL SCIENCE</th>
<th>LIFE SCIENCE</th>
<th>EARTH/SPACE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>K</strong></td>
<td><strong>1</strong></td>
<td><strong>2</strong></td>
</tr>
<tr>
<td><strong>Solids and Liquids</strong></td>
<td><strong>Exploring Plants and Animals</strong></td>
<td><strong>Exploring My Weather</strong></td>
</tr>
<tr>
<td>K.P.4A.1–3; K.S.1A.1–8; K.S.1B.1</td>
<td>K.L.2A.1–6; K.S.1A.1–8; K.S.1B.1</td>
<td>K.E.3A.1–4; K.S.1A.1–8; K.S.1B.1</td>
</tr>
<tr>
<td><strong>Light and Sound Waves</strong></td>
<td><strong>Discovering Plants</strong></td>
<td><strong>Sky Watchers</strong></td>
</tr>
<tr>
<td>1.P.2A.1–4; 1.S.1A.1–8; 1.S.1B.1</td>
<td>1.L.5A.1–2; 1.L.5B.1–3; 1.S.1A.1–8; 1.S.1B.1</td>
<td>1.E.3A.1–5; 1.S.1A.1–8; 1.S.1B.1</td>
</tr>
<tr>
<td><strong>Push, Pull, Go</strong></td>
<td><strong>Ecosystem Diversity</strong></td>
<td><strong>Soils</strong></td>
</tr>
<tr>
<td><strong>Changes</strong></td>
<td><strong>Animal Studies</strong></td>
<td><strong>Earth Materials</strong></td>
</tr>
<tr>
<td><strong>Electric Circuits</strong></td>
<td><strong>Rocks and Minerals</strong></td>
<td><strong>Weather</strong></td>
</tr>
<tr>
<td><strong>Matter</strong>*</td>
<td><strong>Land and Water</strong></td>
<td><strong>or</strong></td>
</tr>
<tr>
<td><strong>Sound</strong></td>
<td><strong>Plant and Animal Structures</strong>*</td>
<td><strong>or</strong></td>
</tr>
<tr>
<td><strong>Light</strong>*</td>
<td><strong>Ecosystems</strong></td>
<td><strong>4.E.2A.1–2; 4.E.2B.1–3; 4.E.3B.2, 4; 4.S.1A.1–8; 4.S.1B.1</strong></td>
</tr>
<tr>
<td>4.P.4A.1–5; 4.S.1A.1–8; 4.S.1B.1</td>
<td>5.L.4A.1–2; 5.L.4B.1–4; 5.S.1A.1–8; 5.S.1B.1</td>
<td><strong>Weather and Climate Patterns</strong>*</td>
</tr>
<tr>
<td><strong>Motion and Design</strong></td>
<td><strong>Structure and Properties of Matter</strong>*</td>
<td><strong>or</strong></td>
</tr>
<tr>
<td>5.P.5A.1–5; 5.S.1A.1–8; 5.S.1B.1</td>
<td>5.P.2A.1; 5.P.2B.1–6; 5.S.1A.1–8; 5.S.1B.1</td>
<td><strong>Changing Earth</strong>*</td>
</tr>
<tr>
<td><strong>Land and Water</strong></td>
<td><strong>Ecosystems</strong></td>
<td><strong>5.E.3A.1; 5.E.3B.1; 5.S.1A.1–8; 5.S.1B.1</strong></td>
</tr>
<tr>
<td><strong>or</strong></td>
<td><strong>Land and Water</strong>*</td>
<td><strong>5.E.3A.1; 5.E.3B.1; 5.S.1A.1–8; 5.S.1B.1</strong></td>
</tr>
<tr>
<td><strong>Changing Earth</strong>*</td>
<td><strong>Ecosystems</strong></td>
<td><strong>4.E.2A2–3; 4.E.3B.1–4</strong></td>
</tr>
<tr>
<td>5.E.3A.1; 5.E.3B.1–4; 5.S.1A.1–8; 5.S.1B.1</td>
<td>5.L.4A.1–2; 5.L.4B.1–4; 5.S.1A.1–8; 5.S.1B.1</td>
<td><strong>Earth and Space Systems</strong>*</td>
</tr>
</tbody>
</table>

*These Carolina units have been approved as a supplemental resource.

Instructional Resources developed by Carolina; Smithsonian Science Education Center; TWIG; tigtag.
Grade 1

Unit Planning Resources by Lesson

Lesson 1: The Properties of Light ......................................................... 6
Lesson 2: Transparent, Translucent, Opaque ...................................... 8
Lesson 3: Reflection: Bouncing Beams ............................................... 12
Lesson 4: Refraction: Bending Beams .................................................. 16
Lesson 5: Vibrations and Sound .......................................................... 20
Lesson 6: How Does Sound Travel? .................................................... 24

More resources for teachers and students found at www.CarolinaScienceOnline.com
# Light and Sound Waves

## Lesson 1: The Properties of Light

<table>
<thead>
<tr>
<th>Lesson Essentials</th>
<th>South Carolina Academic Standards</th>
</tr>
</thead>
</table>
| **Lesson Objectives:** | **Standard**
| • Complete a pre-unit assessment to determine what students know about light. | 1.P.2: The student will demonstrate an understanding of the properties of light and how shadows are formed. |
| • Develop an understanding that light travels in a straight line until it strikes an object. | **Performance Indicators**
| • Begin an understanding that light has a source and travels in a direction. | 1.P.2A.1
| • Understand that light sources can be naturally occurring sources such as the sun, or sources that are designed by humans. | Obtain and communicate information to describe how light is required to make objects visible. |
| • Distinguish between natural sources of light and light created or designed by humans. | 1.P.2A.3
| **Materials and Preparation:** | Conduct structured investigations to answer questions about how shadows change when the position of the light source changes. |
| • Teacher's Guide pg. 1 | **Guiding Questions:**
| **Procedure:** | • What is necessary to see objects? |
| • Teacher's Guide pgs. 1–7 | • What is necessary to make a shadow? |
| **Guiding Questions:** | • What happens when a light beam hits a mirror? |
| • What is necessary to see objects? | • How can we use evidence to explain events in our world? |
| • What is necessary to make a shadow? | • Why do we gather data? |
| • What happens when a light beam hits a mirror? | • How do scientists use evidence to answer questions? |
| • How can we use evidence to explain events in our world? | • How can we design tests to determine or argue causes? |
Lesson 1: The Properties of Light

Lesson Objectives:
- Complete a pre-unit assessment to determine what students know about light.
- Develop an understanding that light travels in a straight line until it strikes an object.
- Begin an understanding that light has a source and travels in a direction.
- Understand that light sources can be naturally occurring sources such as the sun, or sources that are designed by humans.
- Distinguish between natural sources of light and light created or designed by humans.

Materials and Preparation:
- Teacher’s Guide pg. 1

Procedure:
- Teacher’s Guide pgs. 1–7

Guiding Questions:
- What is necessary to see objects?
- What is necessary to make a shadow?
- What happens when a light beam hits a mirror?
- How can we use evidence to explain events in our world?
- Why do we gather data?
- How do scientists use evidence to answer questions?
- How can we design tests to determine or argue causes?

CORE IDEAS
PS4.B Electromagnetic Radiation
Objects can be seen if light is available to illuminate them or if they give off their own light.

PERFORMANCE EXPECTATIONS
1-PS4-2
Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.

SCIENCE and ENGINEERING PRACTICES
Constructing Explanations and Designing Solutions

CROSSCUTTING CONCEPTS
Cause and Effect

CORE IDEAS
PS4.B Electromagnetic Radiation
Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them. Mirrors can be used to redirect a light beam.

PERFORMANCE EXPECTATIONS
1-PS4-3
Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.

SCIENCE and ENGINEERING PRACTICES
Planning and Carrying Out Investigations

CROSSCUTTING CONCEPTS
Cause and Effect

Evidence of Learning
Lesson 1
Pre-Unit Assessment
- Part A: What We Know About Light, TG pg. 3

Assessment Observation Sheet
- Use the included Assessment Observation Sheet for this lesson to formatively assess your class and adjust instruction as needed.

General Rubric
- Refer to the General Rubric included in Appendix D to assess individual progress with Exploration, Vocabulary (Describing Science and Science Words), Concept Building, and Science Notebooks.

Science Notebooks

Digital Resources
- www.tigtagcarolina.com
  - What Is Light?
  - Light Sources
  - Shadows
  - The Sun as a Light Source
  - Reflection
  - White Light

Language Arts
Reading and Writing Strategies:
- Reading Informational Text:
  - Key Ideas and Details
  - Ask and Answer Questions
  - Craft and Structure
  - Meaning of Words/Phrases
  - Integration of Knowledge and Ideas
  - Use of Illustrations/Images and Key Ideas

Writing
- Research to Build and Present Knowledge
  - Recall of Experiences/Information

Science: TG pg. 8
- Organisms that Make their Own Light—Students research bioluminescence, learning more about organisms such as fireflies that produce their own light.

Technology: TG pg. 8
- The Path of a Light Ray—Students make chalk dust by rubbing the chalk back and forth on sandpaper, then turn off the lights and shine a flashlight toward a wall or opaque surface while the other partner sprinkles chalk dust in the light ray’s path.

Mathematics: TG pg. 8
- Shapes and Lines—Make a class list of shapes that are made up of straight lines. Sort die-cut shapes into a group made of lines and a group made with round edges.

Movement Education: TG pg. 8
- Acting Out How Light Travels—Hold a flashlight or similar light source parallel over the top of a student’s head. Turn on the light. When you turn on the light, ask the student to model how light travels out of a light source.

Art: TG pg. 8
- Glow-in-the-Dark Window Clings—Using included instructions, students create glow-in-the-dark window clings at school or at home.
# Light and Sound Waves

## Lesson 2: Transparent, Translucent, Opaque

### Lesson Essentials

#### Lesson Objectives:
- Observe and experiment with opaque materials to understand that these materials block light and do not let any light pass through.
- Observe and experiment with transparent materials to understand that these materials let most light pass through.
- Observe and experiment with translucent materials to understand that these materials let some light pass through.
- Begin to develop an understanding that objects reflect light.

#### Materials and Preparation:
- Teacher’s Guide pgs. 11–12

#### Procedure:
- Teacher’s Guide pgs. 13–17

#### Guiding Questions:
- What is necessary to see objects?
- What is necessary to make a shadow?
- What happens when a light beam hits a mirror?
- How can we use evidence to explain events in our world?
- Why do we gather data?
- How do scientists use evidence to answer questions?
- How can we design tests to determine or argue causes?

### South Carolina Academic Standards

#### Standard
- **1.P.2**: The student will demonstrate an understanding of the properties of light and how shadows are formed.

#### Performance Indicators
- **1.P.2A.2**: Analyze and interpret data from observations to compare how light behaves when it shines on different materials.

---

*Evidence of Learning*

**Lesson 2**

**Student Activity Sheets**
- **Student Activity Sheet 2A**: Vocabulary Book
- **Student Activity Sheet 2B**: Transparent, Translucent, or Opaque

**Science Notebook Opportunity**
- Inside each flap of the vocabulary book, ask students to summarize each term in one sentence. Use these summaries to assess understanding before proceeding to Part B. (TG pg. 15)

**Assessment Observation Sheet**
- **Lesson 2—Transparent, Translucent, Opaque**
  - **Formative Assessment**: Use the Assessment Observation Sheet and Vocabulary books to ensure that students have grasped the main ideas of the lesson:
    - Light travels in a straight line.
    - Transparent (or clear) materials let light rays through and therefore do not cast a shadow.
    - Translucent (or cloudy) materials let some but not all light through and therefore cast a dim shadow.
    - Opaque (or dark) objects block all light and cast shadows because light travels in straight lines and cannot go around the objects.

Observe students as they conduct tests on the three types of materials using the flashlight. Use the following criteria to evaluate their ability to plan and conduct an experiment:
- Do they have a plan?
- Can they carry it out?
## Lesson Objectives:

Lesson 2: Transparent, Translucent, Opaque

### Light and Sound Waves

**Procedure:**

**Materials and Preparation:**

- Observe and experiment with transparent materials to understand that these materials let light rays through and therefore do not cast a shadow.
- Observe and experiment with translucent (or cloudy) materials that let some but not all light through and therefore do not cast a shadow.
- Observe and experiment with opaque (or dark) objects that block all light and cast shadows because light travels in straight lines and cannot go around the objects.

**Why do we gather data?**

- How can we design tests to determine or argue causes?

**Cause and Effect**

**CROSSCUTTING CONCEPTS**

**Planning and Carrying Out Investigations**

**Science and Engineering Practices**

**PERFORMANCE EXPECTATIONS**

- Plan and conduct investigations to determine the effect of placing objects in darkness can be seen only when illuminated.
- Make observations to construct an evidence-based account that objects off their own light.
- Some materials allow light to pass through them, others allow only some light to pass through, and others block all the light and create a dark shadow on their own.
- Mirrors can be used to redirect a light beam.
- Objects can be seen if light is available to illuminate them or if they give off their own light.

**CORE IDEAS**

- Light travels in a straight line.
- Light travels in a straight line and cannot go around the objects.
- Transparent (or clear) materials let light rays through and therefore do not cast a shadow.
- Translucent (or cloudy) materials let some but not all light through and therefore do not cast a shadow.
- Opaque (or dark) objects block all light and cast shadows because light travels in straight lines and cannot go around the objects.

### Lesson Essentials

**CROSSCUTTING CONCEPTS**

- Planning and Carrying Out Investigations
- Science and Engineering Practices

**SCIENCE and ENGINEERING PRACTICES**

- Constructing Explanations and Designing Solutions
- Making and Refining a Model
- Planning and Carrying Out Investigations

**PERFORMANCE EXPECTATIONS**

- 1-PS4-3: Cause and Effect
- 1-PS4-2: Light and Sound Waves
- PS4.B: Electromagnetic Radiation

**CORE IDEAS**

- What is necessary to make a shadow?
- What is necessary to see objects?
- Transparent (or clear) materials let light rays through and therefore do not cast a shadow.
- Translucent (or cloudy) materials let some but not all light through and therefore do not cast a shadow.
- Opaque (or dark) objects block all light and cast shadows because light travels in straight lines and cannot go around the objects.

### Evidence of Learning

#### Lesson 2

**Student Activity Sheets**

- Student Activity Sheet 2A: Vocabulary Book
- Student Activity Sheet 2B: Transparent, Translucent, or Opaque

**Science Notebook Opportunity**

- Inside each flap of the vocabulary book, ask students to summarize each term in one sentence. Use these summaries to assess understanding before proceeding to Part B. (TG pg. 15)

**Assessment Observation Sheet**

- Lesson 2—Transparent, Translucent, Opaque

**Formative Assessment**

Use the Assessment Observation Sheet and Vocabulary books to ensure that students have grasped the main ideas of the lesson:

- Light travels in a straight line.
- Transparent (or clear) materials let light rays through and therefore do not cast a shadow.
- Translucent (or cloudy) materials let some but not all light through and therefore cast a dim shadow.
- Opaque (or dark) objects block all light and cast shadows because light travels in straight lines and cannot go around the objects.

Observe students as they conduct tests on the three types of materials using the flashlight. Use the following criteria to evaluate their ability to plan and conduct an experiment:

- Do they have a plan?
- Can they carry it out?

---

**Digital Resources**

- www.tigtagcarolina.com
  - What Is Light?
  - Light Sources
  - Shadows
  - The Sun as a Light Source
  - Reflection
  - White Light

**Language Arts**

- **Language Arts:**
  - **Science Notebook Opportunity:** Inside each flap of the vocabulary book, ask students to summarize each term in one sentence. (TG pg. 15)
  - **Reading about Stained Glass:** Look for picture books about modern and historical stained glass. Explore art projects and kits about stained glass, such as Make Your Own Stained Glass Ornaments: Based on Medieval Windows from the Metropolitan Museum of Art. (TG pg. 18)

**Reading and Writing Strategies:**

- **Reading Informational Text:**
  - Key Ideas and Details
  - Ask and Answer Questions
  - Craft and Structure
  - Meaning of Words/Phrases
  - Integration of Knowledge and Ideas
  - Use of Illustrations/Images and Key Ideas

- **Writing**
  - Text Types and Purpose
    - Opinions and Reasoning
    - Informative/Explanatory Text
  - Production and Distribution of Writing
  - Topic Focus and Details
  - Research to Build and Present Knowledge
  - Recall of Experiences/Information

**Homework:**

- TG pg. 17
  - **Family Science Activity: Shadows and Their Shapes**—Students hunt with their families for things that make shadows.

**Science/Art/ Engineering:**

- TG pg. 18
  - **Architectural Dilemma**—Present the scenario included in the teacher’s guide to students, then allow them to design a solution to the problem in art class.

**Technology:**

- TG pg. 18
  - **Take a Trip Back in Time**—Take a field trip to see how hand-blown glass or stained glass is made.
<table>
<thead>
<tr>
<th>Lesson Essentials</th>
<th>South Carolina Academic Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Math:**
  - TG pg. 18
  - Property Sort for Snack Time—Ask students to sort common snacks or candies into transparent, translucent, and opaque objects and then enjoy them for a tasty treat.

- **Art:**
  - TG pg. 18
  - Stained Glass Window—Collaborate with the art teacher to allow the students to make their own stained glass artwork to display at your school following instructions included in TG pg. 18.

- **Movement Education:**
  - TG pg. 18
  - Shadow Puppets of the World—Show a map of the world that includes Indonesia, and explain that many Asian and Eastern countries have been and continue to practice the tradition of shadow puppets. Challenge students to learn more about this ancient art form in one or more countries, and/or to create a play using shadow puppets.

**General Rubric**
- Refer to the General Rubric included in Appendix D to assess individual progress with Exploration, Vocabulary (Describing Science and Science Words), Concept Building, and Science Notebooks.
### Digital Resources

<table>
<thead>
<tr>
<th><strong>Math:</strong> TG pg. 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <em>Property Sort for Snack Time</em>—Ask students to sort common snacks or candies into transparent, translucent, and opaque objects and then enjoy them for a tasty treat.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Art:</strong> TG pg. 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <em>Stained Glass Window</em>—Collaborate with the art teacher to allow the students to make their own stained glass artwork to display at your school following instructions included in on TG pg. 18.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Movement Education:</strong> TG pg. 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <em>Shadow Puppets of the World</em>—Show a map of the world that includes Indonesia, and explain that many Asian and Eastern countries have been and continue to practice the tradition of shadow puppets. Challenge students to learn more about this ancient art form in one or more countries, and/or to create a play using shadow puppets.</td>
</tr>
</tbody>
</table>

### Language Arts

<table>
<thead>
<tr>
<th><strong>Assessment Strategies</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Is the team working cooperatively?</td>
</tr>
<tr>
<td>• Do they use equipment appropriately?</td>
</tr>
<tr>
<td>• Have they reached logical conclusions?</td>
</tr>
<tr>
<td>• Do their examples and observations in their vocabulary books show their understanding of transparent, translucent, and opaque objects?</td>
</tr>
</tbody>
</table>

### General Rubric

• Refer to the General Rubric included in Appendix D to assess individual progress with Exploration, Vocabulary (Describing Science and Science Words), Concept Building, and Science Notebooks.

### Science Notebooks
Lesson Essentials

Lesson Objectives:
- Work cooperatively in teams to use flashlights and mirrors to carry out experiments.
- Recognize that in order to see an object, light traveling from the object must enter the eye.
- Predict and explore different ways to change a light ray's path using mirrors and cardboard tubes.
- Develop an understanding of reflection, geometric symmetry, and multiplication using mirrors.
- Investigate ways to change reflections using flexible mirrors.
- Begin building a foundation to understand the law of reflection.

Materials and Preparation:
- Teacher's Guide pgs. 27–29

Procedure:
- Teacher's Guide pgs. 30–37

Guiding Questions:
- What is necessary to see objects?
- What is necessary to make a shadow?
- What happens when a light beam hits a mirror?
- How can we use evidence to explain events in our world?
- Why do we gather data?
- How do scientists use evidence to answer questions?
- How can we design tests to determine or argue causes?

South Carolina Academic Standards

Standard
1.P.2: The student will demonstrate an understanding of the properties of light and how shadows are formed.

Performance Indicators
1.P.2A.4
develop and use models to describe what happens when light shines on mirrors based on observations and data collected.
Lesson 3: Reflection: Bouncing Beams

Light and Sound Waves

Guiding Questions:
- How can we design tests to determine or argue causes?
- How do scientists use evidence to answer questions about why things happen in our world?
- How can we use evidence to explain events from our everyday experiences?
- Why do we gather data?
- What is necessary to see objects?

Procedure:
Investigate ways to change reflections using mirrors. Make observations to construct an evidence-based account of how the light traveled. Students predict what happens when they reflect a light beam. Use Student Activity Sheet 3A to assess understanding of ways to change a light ray’s path by using reflection and mirrors.

Materials and Preparation:
- Teacher’s Guide pgs. 30–37
- Teacher’s Guide pgs. 27–29
- flashlights and mirrors to carry out experiments.
- Students should describe the demonstrations from Part A: Bouncing Light in words and/or drawings. (TG pg. 31)
- Science Notebook Opportunity: Student Activity Sheet 3C: Reflections (TG pg. 37)
- Secret Code: Leonardo DaVinci developed a secret code called mirror writing. Have students try to write something that can be read by holding it up to a mirror. (TG pg. 38)

Reading and Writing Strategies:

Reading Informational Text:
Key Ideas and Details
- Ask and Answer Questions
- Craft and Structure
- Meaning of Words/Phrases
- Integration of Knowledge and Ideas
- Use of Illustrations/Images and Key Ideas

Writing
Text Types and Purpose
- Opinions and Reasoning
- Narrative Recounts
Production and Distribution of Writing
- Topic Focus and Details
Research to Build and Present Knowledge
- Recall of Experiences/Information

Science: TG pg. 38
- Using a Spoon as a Convex Mirror—Students predict what happens when they look at their reflections in spoons. How is that like what happens in curvy funhouse mirrors? How could they use their flexible mirrors to make a funhouse mirror?
- It’s a Law—Challenge students to try out the law of reflection with the flashlight and mirrors and see what happens, sketching what they found out, using arrows to show how the light traveled.

Evidence of Learning

Lesson 3

Student Activity Sheets
- Student Activity Sheet 3A: Hit the Target: Use Student Activity Sheet 3A to assess understanding of ways to change a light ray’s path by using reflection and mirrors.
- Student Activity Sheet 3B: Line of Reflection

Science Notebook Opportunity
- Students respond to the prompt, I observed __________. Students should describe the demonstrations from Part A: Bouncing Light in words and/or drawings (TG pg. 31)
- Student Activity Sheet 3C: Reflections (TG pg. 37)

Assessment Observation Sheet
- Lesson 3—Reflection: Bouncing Beams

Formative Assessment
Use the included Assessment Observation Sheet along with the three Student Activity Sheets provided for this lesson to formatively assess your class and adjust instruction as needed.

Use the following lesson-specific assessment guidelines:
- During the experiments, check that students:
  - Are working cooperatively
  - Have made a reasonable plan
  - Use equipment appropriately
  - Are recording in words and pictures
  - Are persistent in their efforts
<table>
<thead>
<tr>
<th>Lesson Essentials</th>
<th>South Carolina Academic Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Science/Movement Education:</strong></td>
</tr>
<tr>
<td></td>
<td>TG pg. 38</td>
</tr>
<tr>
<td></td>
<td>• Living Things and their Reflections — Place several mirrors around a class aquarium. Observe how the fish react to their reflections. Does the tank look larger than before? Do the fish dart back and forth when they see their reflection? Do they hide? Why do students think so?</td>
</tr>
<tr>
<td></td>
<td><strong>Technology/Engineering:</strong></td>
</tr>
<tr>
<td></td>
<td>TG pg. 38</td>
</tr>
<tr>
<td></td>
<td>• Design Your Own Periscope — Challenge students to design a periscope using two mirrors.</td>
</tr>
<tr>
<td></td>
<td><strong>Math:</strong></td>
</tr>
<tr>
<td></td>
<td>TG pg. 38</td>
</tr>
</tbody>
</table>
|                   | • Types of Angles — Find as many angles as you can in your classroom and label them as right angles, obtuse angles, and acute angles. Next, give students the same materials they used in Part B. Challenge them to use the light rays to create a right angle, an obtuse angle, and an acute angle.  
  • How Many Angles? — Have students fold a piece of notebook paper as instructed, and then open the paper back up and trace over the folds. Ask, Can you find the right angles? Where could you fit a square where two lines meet? How many angles can you locate? How many right angles can you find?  
  • Letters and Angles — Write a capital “L” on the board and show the students how you can fit a square in the angle (where the two lines meet). What other capital letters make a right angle? Examples include E, F, H, and T. |
|                   | **Art:**                            |
|                   | TG pg. 38                          |
|                   | • Create Your Self Portrait with a Steel Ball — Have students look at the famous piece of artwork by M.C. Escher called “Hand with Reflecting Sphere.” Give students a steel ball. Ask them to draw what they observe reflected in the ball to create their own artwork using reflections. |
|                   | **Check the Student Activity Sheets** to make sure that students have grasped the main ideas:** |
|                   | • Light travels in a straight line until it hits an object such as a mirror and is reflected into the eye  
  • Light can be reflected by mirrors  
  • The angle of reflected light can be controlled |
|                   | **General Rubric**                  |
|                   | • Refer to the General Rubric included in Appendix D to assess individual progress with Exploration, Vocabulary (Describing Science and Science Words), Concept Building, and Science Notebooks. |
### Science/Movement Education: TG pg. 38
- **Living Things and their Reflections**—Place several mirrors around a class aquarium. Observe how the fish react to their reflections. Does the tank look larger than before? Do the fish dart back and forth when they see their reflection? Do they hide? Why do students think so?

### Technology/Engineering: TG pg. 38
- **Design Your Own Periscope**—Challenge students to design a periscope using two mirrors.

### Math: TG pg. 38
- **Types of Angles**—Find as many angles as you can in your classroom and label them as right angles, obtuse angles, and acute angles. Next, give students the same materials they used in Part B. Challenge them to use the light rays to create a right angle, an obtuse angle, and an acute angle.
- **How Many Angles?**—Have students fold a piece of notebook paper as instructed, and then open the paper back up and trace over the folds. Ask, Can you find the right angles? Where could you fit a square where two lines meet? How many angles can you locate? How many right angles can you find?
- **Letters and Angles**—Write a capital “L” on the board and show the students how you can fit a square in the angle (where the two lines meet). What other capital letters make a right angle? Examples include E, F, H, and T.

### Art: TG pg. 38
- **Create Your Self Portrait with a Steel Ball**—Have students look at the famous piece of artwork by M.C. Escher called “Hand with Reflecting Sphere.” Give students a steel ball. Ask them to draw what they observe reflected in the ball to create their own artwork using reflections.
Lesson Essentials

**Lesson Objectives:**
- Apply prior knowledge about the properties of light to begin building an understanding of refraction.
- Identify and describe the similarities and differences between a variety of lenses.
- Use tools such as concave and convex lenses to make observations and investigate how each lens refracts light differently, causing objects to appear smaller or larger.
- Investigate how water refracts light by building a convex lens and compare findings with a hand lens.

**Materials and Preparation:**
- Teacher's Guide pgs. 47–49

**Procedure:**
- Teacher's Guide pgs. 50–56

**Guiding Questions:**
- What is necessary to see objects?
- What is necessary to make a shadow?
- What happens when a light beam hits a mirror?
- How can we use evidence to explain events in our world?
- Why do we gather data?
- How do scientists use evidence to answer questions?
- How can we design tests to determine or argue causes?

---

South Carolina Academic Standards

**Standard**
1.P.2: The student will demonstrate an understanding of the properties of light and how shadows are formed.

**Performance Indicators**
1.P.2A.4
develop and use models to describe what happens when light shines on mirrors based on observations and data collected.
### Lesson Essentials

#### Cause and Effect

- **CROSSCUTTING CONCEPTS:** SCIENCE and ENGINEERING PRACTICES

#### Science and Engineering Practices

- **Teacher's Guide pgs. 50–56**
- **Teacher's Guide pgs. 47–49**

### Digital Resources

- [www.tigtagcarolina.com](http://www.tigtagcarolina.com)
  - What Is Light?
  - Light Sources
  - Shadows
  - The Sun as a Light Source
  - Reflection
  - White Light

### Language Arts

**Language Arts:**
- **Science Notebook Opportunity:** Students respond to the prompt, I observed __________. Students should respond to prompt in their science notebooks by drawing a picture after they have completed Part D: Making a Magnifier with Water (TG pg. 56)
- **Comparing Definitions:** Encourage students to look up refraction in a dictionary and compare that definition with the one they came up with in Part A. (TG pg. 57)

**Reading and Writing Strategies:**

**Reading Informational Text:**
- Key Ideas and Details
- Ask and Answer Questions
- Craft and Structure
- Meaning of Words/Phrases
- Integration of Knowledge and Ideas
- Use of Illustrations/Images and Key Ideas

**Writing**
- Text Types and Purpose
- Opinions and Reasoning
- Narrative Recounts
- Production and Distribution of Writing
- Topic Focus and Details
- Research to Build and Present Knowledge
- Recall of Experiences/Information

**Science/Technology:** TG pg. 57
- **Lenses and Progress**—Students research Galileo, Anton Van Leeuwenhoek, and Robert Hooke to find out more about lenses and how they have contributed to scientific progress.

**Science:** TG pg. 57
- **Lenses and Eyesight**—Students do some research to find out how artificial lenses can work with the natural lenses in our eyes to correct imperfect vision.

### Assessment Strategies

**Evidence of Learning**

**Lesson 4**

**Student Activity Sheets**
- Student Activity Sheet 4A: Observing Bending Light
- Student Activity Sheet 4B: Shade the Shadow

**Science Notebook Opportunity**
- Students respond to the prompt, I observed ________. Students should respond to prompt in their science notebooks after they complete Part D: Making a Magnifier with Water by drawing a picture. (TG pg. 56)

**Assessment Observation Sheet**
- Lesson 4—Refraction: Bending Beams

**Formative Assessment**

Use the included Assessment Observation Sheet for this lesson along with the Student Activity Sheets to formatively assess your class and adjust instruction as needed.

Follow the lesson-specific guidelines below:
- The class’s working definition of refraction should convey the idea that it is the bending of light as it travels through different materials.
- In the activities using lenses, students should be able to demonstrate how different types of lenses change the way that light passes through and can cause objects to appear different when you look through them. Some students might reach the conclusion that convex lenses make light rays come together in the middle and other types make them spread out.
<table>
<thead>
<tr>
<th>Lesson Essentials</th>
<th>South Carolina Academic Standards</th>
</tr>
</thead>
</table>

**Lesson Essentials**

- **Penny in a Puddle** — Following instructions in the Teacher's Guide, student pairs investigate refraction using a penny, a cup of water, and a non-transparent bowl.

**General Rubric**

- Refer to the General Rubric included in Appendix D to assess individual progress with Exploration, Vocabulary (Describing Science and Science Words), Concept Building, and Science Notebooks.

**Science Notebooks**
<table>
<thead>
<tr>
<th>Digital Resources</th>
<th>Language Arts</th>
<th>Assessment Strategies</th>
</tr>
</thead>
</table>
|                    | **Penny in a Puddle**—Following instructions in the Teacher’s Guide, student pairs investigate refraction using a penny, a cup of water, and a non-transparent bowl. | **General Rubric**
|                   |                                           | • Refer to the General Rubric included in Appendix D to assess individual progress with Exploration, Vocabulary (Describing Science and Science Words), Concept Building, and Science Notebooks. |
|                   |                                           | **Science Notebooks** |

*Physical Science Curriculum Guide*
# South Carolina Scope and Sequence K–5

<table>
<thead>
<tr>
<th>PHYSICAL SCIENCE</th>
<th>LIFE SCIENCE</th>
<th>EARTH/SPACE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Solids and Liquids</strong></td>
<td><strong>Exploring Plants and Animals</strong>&lt;br&gt;<strong>New!</strong></td>
<td><strong>Exploring My Weather</strong>&lt;br&gt;<strong>New!</strong></td>
</tr>
<tr>
<td><strong>Light and Sound Waves</strong>&lt;br&gt;<strong>New!</strong></td>
<td><strong>Discovering Plants</strong>&lt;br&gt;<strong>New!</strong></td>
<td><strong>Sky Watchers</strong>&lt;br&gt;<strong>New!</strong>&lt;br&gt;<strong>Soils</strong>&lt;br&gt;-or-&lt;br&gt;<strong>Earth Materials</strong>&lt;br&gt;<strong>New!</strong></td>
</tr>
<tr>
<td><strong>Push, Pull, Go</strong>&lt;br&gt;<strong>New!</strong>&lt;br&gt;<strong>Changes</strong></td>
<td><strong>Ecosystem Diversity</strong>&lt;br&gt;<strong>New!</strong></td>
<td><strong>Weather</strong></td>
</tr>
<tr>
<td><strong>Electric Circuits</strong></td>
<td><strong>Animal Studies</strong></td>
<td><strong>Rocks and Minerals</strong>&lt;br&gt;-or-&lt;br&gt;<strong>Land and Water</strong></td>
</tr>
<tr>
<td><strong>Matter</strong>&lt;br&gt;<strong>New!</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sound</strong></td>
<td><strong>Plant and Animal Structures</strong>&lt;br&gt;<strong>New!</strong></td>
<td><strong>Weather and Climate Patterns</strong>&lt;br&gt;<strong>New!</strong></td>
</tr>
<tr>
<td><strong>Light</strong>&lt;br&gt;<strong>New!</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Motion and Design</strong></td>
<td><strong>Ecosystems</strong></td>
<td><strong>Land and Water</strong>&lt;br&gt;-or-&lt;br&gt;<strong>Changing Earth</strong>&lt;br&gt;<strong>New!</strong>&lt;br&gt;<strong>Earth and Space Systems</strong>&lt;br&gt;<strong>New!</strong></td>
</tr>
<tr>
<td><strong>Structure and Properties of Matter</strong>&lt;br&gt;<strong>New!</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Smithsonian’s STC
- Building Blocks of Science
* This Carolina unit has been approved as a supplemental resource.

Instructional Resources developed by Carolina; Smithsonian Science Education Center; TWIG; tigtag.