

# Unit 3: Light

Content Area: **Science**  
Course(s): **Science Gr 1**  
Time Period: **DecJan**  
Length: **6 Weeks Grade 1**  
Status: **Published**

## **Title Section**

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**Department of Curriculum and Instruction**



**Belleville Public Schools**

**Curriculum Guide**

## **Science: Grade 1**

### **Unit 3: Light**

**Belleville Board of Education**

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Board Approved: August 30, 2017

## **Unit Overview**

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Kids are born scientists. They want to know WHY: Is the sun a star? How do magnets work? It's our job to encourage their curiosity, creativity, and exploration while preparing them for careers in science, technology, engineering, and math.

### **Unit 3 Performance Expectations:**

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

PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.

PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

Throughout Unit 3, students will develop skills to

- provide evidence, based on observations, of the relationship between the amount of light and how an object is seen.
- explain, using evidence based on observations, why objects that give off their own light can be seen in the dark.
- explain and demonstrate how different materials can allow different amounts of light to pass through.
- explain how shadows are made.
- observe that light shines in a straight line until it hits an object.
- explore how reflection can be used to redirect light.
- explore how technology is used to send and receive information using light.

**Unit Vocabulary:** light, shadow, reflect

**Unit Project:** Make a Rainbow

Lesson 1:

In Lesson 1, students will observe how light is necessary to see an object. They will explore how the amount of light affects how much can be seen. As the lesson progresses, they will observe objects that give off their own light. During a Hands-On activity, students will record observations and compare how much they can see in different amounts of light. Finally, students will discuss how Thomas Edison's invention of the light bulb helped bring electricity to people's homes.

**Essential Question:** How does light help us see?

**Can You Explain It? (Lesson 1 Engagement Question):** How can you see fireworks in a dark sky?

**Hands-On Activity:** Make Observations in Different Light

Lesson 2:

In Lesson 2, students will observe how light passes through objects and develop an understanding of transparent, translucent, and opaque objects. They will also explore how shadows are made.

**Essential Question:** How do materials block light?

**Can You Explain It? (Lesson 2 Engagement Question):** How does the artist make the shapes?

**Hands-On Activity:** Test How Light Passes Through Materials

Lesson 3:

In Lesson 3, students explore how light travels, including how it can be reflected or redirected. They also explore how people use light to communicate. Students gather observations how light travels and what causes light to be redirected. They carry out an investigation to test how smooth, shiny surfaces affect a beam of light. Finally, students design a way to communicate with light.

**Essential Question:** How does light travel?

**Can You Solve It? (Lesson 3 Engagement Question):** How could you point light away from your eyes?

**Hands-On Activity:** Test What Happens to Light

**Online Interactive Activity:** Message Projector

## **Enduring Understanding**

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Unit 3 Performance Task: Students will observe reflections in a mirror and use their observations to predict where their partner should stand in order to be visible in the mirror. Students will observe the cause-and-effect relationship between where they stand and whether they are visible in the mirror.

(Refer to Scoring Rubric TE page 133)

By the end of Lesson 1, students will make observations to explain how objects can be seen if the objects give off their own light or if light is available to shine on them.

By the end of Lesson 2, students will ask questions, make observations, and gather information to describe how light passes through objects.

By the end of Lesson 3, students will gather evidence to support or refute ideas about causes relating to how light travels and explore how people use light devices to communicate over distances.

## Assessments

### **Pre-Assessment**

Assessment Guide, Unit Pretest

### **Formative Assessment**

Interactive Worktext, Apply What You Know, Lesson Check and Self Check

### **Summative Assessment**

Assessment Guide, Interactive Worktext, Lesson Quiz and Unit Test

### **Online Assessment**

## **Essential Questions**

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### **Essential Questions for Unit 3 Project:**

Students can be prepared for their Unit 3 Project by asking the following questions:

- What is light?
- How can we tell that light is shining on something?
- What do we observe?
- How does light travel?
- What happens to light when you put something in its path?

### **Essential Questions:**

- How does light help us see?

- How can you see fireworks in a dark sky?
- How do materials block light?
- How does the artist make the shapes?
- How does light travel?
- How could you point light away from your eyes?

## **Exit Skills**

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By the end of Grade 1, Science Unit 3, the students should be able to:

- describe how light helps us see
- identify fireworks as objects that give off light
- explain that fireworks can be seen in the dark because they give off light
- describe how light passes through some objects, but not all objects
- explain that shadows are made when an object blocks light
- use evidence to support their ideas
- explain what kind of surfaces reflect light
- describe how light can be pointed in a new direction
- effectively explain how to use a smooth, shiny surface to point the light away from their eyes

## **New Jersey Student Learning Standards (NJSLS-S)**

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SCI.1-PS4-2

Make observations to construct an evidence-based account that objects can be seen only when illuminated.

SCI.1-PS4-4

Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

## **Interdisciplinary Connections**

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### **Lesson 1:**

#### **Connections to Math**

1.MD.B.3 Tell and write time in hours and half-hours using analog clocks.

#### **Connections to English Language Arts**

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.

### **Lesson 2:**

#### **Connections to Math**

1.NBT.A.1 Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

#### **Connections to English Language Arts**

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.

### **Lesson 3:**

## **Connections to Math**

1.OA.A.2 Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

## **Connections to English Language Arts**

W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).

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.

LA.W.1.7	Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).
LA.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.
MA.1.MD.B.3	Tell and write time in hours and half-hours using analog and digital clocks.
MA.1.OA.A.2	Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.
MA.1.NBT.A.1	Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

## **Learning Objectives**

### **Effective Learning Objectives Used in Lesson Planning:**

- SWDAT make observations to explain how objects can be seen if the objects give off their own light or if light is available to shine on them
- SWDAT make observations in different amount of light and record observations
- SWDAT make a claim and support that claim using evidence from their observations during the exploration
- SWDAT ask questions, make observations, and gather information to describe how light passes through objects
- SWDAT investigate beams of light and discover what happens when different materials are placed in the path of the light
- SWDAT gather evidence to support or refute ideas about causes relating to how light travels
- SWDAT explore how people use light devices to communicate over distances
- SWDAT make a claim about how smooth, shiny surfaces affect a beam of light and support their claim with evidence and data from their observation during the exploration



**Action Verbs:** Below are examples of action verbs associated with each level of the Revised Bloom's Taxonomy.

<b>Remember</b>	<b>Understand</b>	<b>Apply</b>	<b>Analyze</b>	<b>Evaluate</b>	<b>Create</b>
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize
Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play
Draw	Paraphrase	Add	Detect	Rate	Drive
Outline	Represent	Calculate	Diagram	Support	Devise
Point	Restate	Change	Discriminate	Test	Generate
Quote	Rewrite	Classify	Illustrate		Integrate
Recall	Select	Complete	Outline		Prescribe
Recognize	Show	Compute	Point out		Propose
Repeat	Summarize	Discover	Separate		Reconstruct
Reproduce	Tell	Divide			Revise
	Translate	Examine			Rewrite
	Associate	Graph			Transform
	Compute	Interpolate			
	Convert	Manipulate			
	Discuss	Modify			
	Estimate	Operate			
	Extrapolate	Subtract			
	Generalize				
	Predict				



## Suggested Activities

Vocabulary Game- Guess the Word

Hands-on Activities: Make Observations in Different Light, Test How Light Passes Through Materials, Test What Happens to Light

Interactive Activity: Message Projector

Unit Project

## Take It Further

- Animals That Glow
- Make a Sundial
- Art with Light

## **Evidence of Student Learning - Checking for Understanding (CFU)**

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In addition to the assessments provided with the Houghton Mifflin Harcourt Science Series, teachers may use different formative and informative assessments to guide their instruction. Below is a checklist of possible assessment strategies to be used to check for understanding in Science.

- Admit Tickets
- Anticipation Guide
- Common benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share

- Think, Write, Pair, Share
- Top 10 List
- Unit tests

## **Primary Resources & Materials**

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HMH Science Dimensions Text

Professional Development Video

Equipment Kits (includes consumable and non-consumable materials)

Safety Kit

The Science and Engineering Practices Online Handbook

Science and Engineering Leveled Readers (On Level, Extra Support, Enrichment)

HMH Player app

Home Letters (Online)

## **Ancillary Resources**

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Safety in Science Rules

Online Resources

## **Technology Infusion**

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[www.hmhco.com/classroom/classroom-solutions/digital-and-mobile-learning/ed](http://www.hmhco.com/classroom/classroom-solutions/digital-and-mobile-learning/ed)

3D Evaluation Rubric

Computer-Based Assessments

HMH Field Trips

Online Videos and Animations

Online access to Science and Engineering Leveled Readers (includes On Level, Extra Support, and Enrichment)

Online Glossary

Originally taken from <http://www.coetail.com/vzimmer/files/2013/02/IPadagogy-Wheel.001.jpg>  
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Wikipedia  
Skydrive  
Lync  
SkyMap  
Skype  
Office 365  
Puzzle Touch  
Easy QR  
Memorylage  
Life Moments  
Word Cloud Maker

Ted Talks  
Record Voice Pen



## **Alignment to 21st Century Skills & Technology**

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- English Language Arts; Communication and Collaboration
- Mathematics; Critical Thinking and Problem Solving
- Science and Scientific Inquiry (Next Generation); Critical Thinking and Problem Solving
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics; Information Literacy
- World languages; Information Literacy
- Technology; Life and Career Skills
- Visual and Performing Arts; Creativity and Innovation

## **21st Century/Interdisciplinary Themes**

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Connection to Earth and Space Sciences: The Universe and its Stars

Discuss that the sun gives off its own light and things that can be seen in the night sky. Have students fold a sheet of paper in half and tell them to draw the night sky on one side and the daytime sky on the other. Have students share the differences between the two images and how light changes what they see during the day and at night.

Connection to Earth and Space Sciences: The Universe and its Stars

Have students pick a stationary object and observe their chosen object in the morning, at noon, and in the afternoon. Have students write a sentence describing the size of the object's shadow for each observation and share and compare their observations.

Connection to Engineering and Design: Defining and Delimiting Engineering Problems

Ask students why they think people started building lighthouses.

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

## **21st Century Skills**

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Collaboration (Build on Prior Knowledge, Small Groups, Think, Write, Pair, Share)

Claims, Evidence, and Reasoning

People in Science & Engineering (Thomas Edison)

Careers in Science & Engineering (Camera Engineer)

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

## **Differentiation**

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## Lesson Vocabulary (light)

### Leveled Readers (On Level, Extra Support, Enrichment)

Reinforce Vocabulary- To help students remember this vocabulary term, ask them to think about what they do when they go in a dark room. Challenge students to think of a sentence that uses *light* to mean energy that helps us see. Remind students to look for the highlighted term as they proceed through the lesson.

RTI/ Extra Support- Encourage students to explore a personal connection to light. Have them draw the room in their home that has the most light and circle all of the ways light gets into the room.

Extension- Research on how lights are used for different purposes

ELL- Point out all labels, pictures, captions, and heading throughout the lesson. Discuss real-life connections to content, and provide hands-on examples of materials when possible.

(ELL support resources include a glossary in English and Leveled Readers in Spanish and English)

### Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives

- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

#### **Hi-Prep Differentiations:**

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

#### **Lo-Prep Differentiations**

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills

- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

## **Intervention Strategies**

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- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

## **Special Education Learning**

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- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes

- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multiple test sessions
- multi-sensory presentation
- preferential seating
- preview of content, concepts, and vocabulary
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

## **English Language Learning**

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- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarify
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

## **Sample Lesson**

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Unit Name: Light

NGSS: 1-PS4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated

Interdisciplinary Connection: Math- Tell and Write Time

Statement of Objective: SWDAT make observations to explain how objects can be seen if the objects give off their own light or if light is available to shine on them

Anticipatory Set/Do Now: Show lesson video, "Light in Darkness"; discuss with students how the sky looks before the fireworks start. Ask guided questions, "What can you see?", "What do you see when the fireworks appear?", "How are you able to see them in the dark sky?" and have students use details from the pictures and video to support their answers.

Learning Activity: Use a digital camera to take pictures of the class in a dimly lit room without using a flash. Then, take a similar picture in the same room with all available lights turned on. If available, display the pictures on the SMART Board or SMART TV or have students look at them on the digital device's display. Students will then work in small groups to compare what they can see in each photograph and identify which photograph was taken with more light and explain how they know. Read aloud pages 82-84 and discuss guided questions.

Student Assessment/CFU's: Student responses of which photograph was taken with more light; Complete "Apply What You Know" in Evidence Notebook and "Do the Math!" Activity (page 85)

Materials: digital camera, Lesson video, SMART TV or SMART Board, text book, analog clock

21st Century Themes and Skills: Collaboration, Communication, Critical Thinking and Problem Solving

Differentiation/Modifications: Lesson video, visuals, small group assistance

Integration of Technology: Lesson video, taking pictures with a digital camera