**Light it Up!**

**The Science of Lights**

**Grade 1**

**NGSS Unit**

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| **Unit Synopsis** |
| Overview:This unit will develop the idea that by exploring the properties of light, human beings create fun and useful things. |
| **Essential Understandings** | **Essential Questions (PS4, ESS)**  |
| Target DCIs (From NGSS)* **1-PS4-2 Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.**
	+ **Objects can be seen if they are illuminated by light or produces their own light and materials all a certain amount of light through.**
* **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.**
	+ **Light is one form of communication**
 | <https://www.nap.edu/read/13165/chapter/9#106> (to understand the science concepts)(By the end of grade 1. Objects can be seen only when light is available to illuminate them. Very hot objects give off light (e.g., a fire, the sun). 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 (i.e., on the other side from the light source), where the light cannot reach. Mirrors and prisms can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.))**Kid Friendly:** * How do we use light to communicate?

**Focus Question: What is light and what does do?**  |
| **Knowledge: What students figure out by the end of the unit storyline** | **Skills: How students will figure it out**  |
| See “What we figure out” in the unit storyline below | See target SEPs |
| **Phenomena:** | **Community Partners:** |
| Anchor Phenomena (Lesson 1) : LighthouseLesson Phenomenons* Lesson 2: Planning & Investigations
* Lesson 3: What is light?
* Lesson 4: How does light move?
* Lesson 5: Transparent, translucent, and opaque
* Lesson 6: Shadows
* Lesson 7: Reflective
* Lesson 8: Communication
* Lesson 9: Performance Task
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| * Hawaiian Electric Rep
	+ Different ways hawaii gets their electricity
	+ How the city uses
	+ Devices they use or service that is used for public safety
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| **NGSS Performance Expectations Bundle** |
| * [Grade 1 Waves: Light and Sound Topic Bundle-](https://goo.gl/5mnkhF) NSTA (good resource to see SEP, DCI, and CC)
* [Grade 1 Waves: Light and Sound Topic Bundle- NGSS Website](https://goo.gl/iSRjHU)
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| [**NGSS Website**](https://goo.gl/zhpjc6)**Targeted NGSS Performance Expectation(s):** *Students who demonstrate understanding can…*  |
| * **1-PS4-2 Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.** [Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]
* **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.** [Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).] [*Assessment Boundary: Assessment does not include the speed of light.*]
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| **Targeted SEP** | **Targeted DCI** | **Targeted CCC**  |
| **[Planning and Carrying Out Investigations](http://www.nap.edu/openbook.php?record_id=13165&page=59)**Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.* Plan and conduct investigations collaboratively to produce evidence to answer a question. (1-PS4-1),(1-PS4-3)

**[Constructing Explanations and Designing Solutions](http://www.nap.edu/openbook.php?record_id=13165&page=67)**Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.* Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-PS4-2)
* Use tools and materials provided to design a device that solves a specific problem. (1-PS4-4)

 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  ***Connections to Nature of Science*** **Scientific Investigations Use a Variety of Methods*** Science investigations begin with a question. (1-PS4-1)
* Scientists use different ways to study the world. (1-PS4-1)
 | **[PS4.A: Wave Properties](http://www.nap.edu/openbook.php?record_id=13165&page=131)*** Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1)

**[PS4.B: Electromagnetic Radiation](http://www.nap.edu/openbook.php?record_id=13165&page=133)*** Objects can be seen if light is available to illuminate them or if they give off their own light. (1-PS4-2)
* 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, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (1-PS4-3)

**[PS4.C: Information Technologies and Instrumentation](http://www.nap.edu/openbook.php?record_id=13165&page=136)*** People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4)
 | **[Cause and Effect](http://www.nap.edu/openbook.php?record_id=13165&page=87)*** Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-1),(1-PS4-2),(1-PS4-3)

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| *Connections to other DCIs in first grade: N/A* |
| *Articulation of DCIs across grade-levels:*[***K.ETS1.A***](https://www.nextgenscience.org/kps2-motion-stability-forces-interactions) *(1-PS4-4);* [***2.PS1.A***](https://www.nextgenscience.org/2ps1-matter-interactions) *(1-PS4-3);* [***2.ETS1.B***](https://www.nextgenscience.org/2ls2-ecosystems-interactions-energy-dynamics) *(1-PS4-4);* [***4.PS4.B***](https://www.nextgenscience.org/4ps4-waves-applications-technologies-information-transfer) *(1-PS4-4);* [***4.PS4.C***](https://www.nextgenscience.org/4ps4-waves-applications-technologies-information-transfer) *(1-PS4-4);* [***4.ETS1.A***](https://www.nextgenscience.org/4ps3-energy) *(1-PS4-1)* |
| *Common Core State Standards Connections:*

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| *ELA/Literacy —* |
| [***W.1.2***](http://www.corestandards.org/ELA-Literacy/W/1) | [*Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. (1-PS4-2)*](http://www.corestandards.org/ELA-Literacy/W/1) |
| [***W.1.7***](http://www.corestandards.org/ELA-Literacy/W/1) | [*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). (1-PS4-1),(1-PS4-2),(1-PS4-3),(1-PS4-4)*](http://www.corestandards.org/ELA-Literacy/W/1) |
| [***W.1.8***](http://www.corestandards.org/ELA-Literacy/W/1) | [*With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-PS4-1),(1-PS4-2),(1-PS4-3)*](http://www.corestandards.org/ELA-Literacy/W/1) |
| [***SL.1.1***](http://www.corestandards.org/ELA-Literacy/SL/1) | [*Participate in collaborative conversations with diverse partners about grade 1 topics and texts*](http://www.corestandards.org/ELA-Literacy/SL/1) [*with peers and adults in small and larger groups. (1-PS4-1),(1-PS4-2),(1-PS4-3)*](http://www.corestandards.org/ELA-Literacy/SL/1) |
| *Mathematics —* |
| [***MP.5***](http://www.corestandards.org/Math/Practice/MP5) | [*Use appropriate tools strategically. (1-PS4-4)*](http://www.corestandards.org/Math/Practice/MP5) |
| [***1.MD.A.1***](http://www.corestandards.org/Math/Content/1/MD) | [*Order three objects by length; compare the lengths of two objects indirectly by using a third object. (1-PS4-4)*](http://www.corestandards.org/Math/Content/1/MD) |
| [***1.MD.A.2***](http://www.corestandards.org/Math/Content/1/MD) | [*Express the length of an object as a whole number of length units, by layering 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. Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps. (1-PS4-4)*](http://www.corestandards.org/Math/Content/1/MD) |

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| **Evidence / Assessments**  |
| GRASPS: Goal (What’s your goal?) To make a device that would let students know when they are too loud in the cafeteria.Role (Who are you?) Inventor/EngineerAudience (Who is the audience in this task?) Students in the cafeteriaSituation (What’s the situation?) Need a way to warn the students of their noise level without adding more noise.Product Performance and Purpose (What is the product?) A noiseless device that uses light to let students know they’re too loud.Standards (Criteria for success) The device has to use light to communicate, has to use available materials, has to be seen by all students in the cafeteria.(Select 3D evidence aligned to the PE for data teaming process. 3D Rubrics around the PEs should be co-constructed with team.)TASK: Our school cafeteria can get very noisy, and everyone knows we should be quiet in the cafeteria to respect everyone who is around us. We could easily tell everyone to be quiet, but that would be making more noise. How could we use what we’ve learned about light to communicate that the cafeteria needs to be more quiet? We have access to everyday material, like plastic wrap, tissue paper, cardboard, aluminum foil, and flashlights. How could we use these kinds of materials to make a device to communicate that students are too loud in the cafeteria or that their volume is “just right”?Questions students might ask: * How can we make light? - use a flashlight
* Can I make two different devices? - yes, it’s up to you
* Is there anything else we can use besides the flashlight? - no, what else could you use
* Does it have to be artificial light? - it’s up to you
* Can we just turn off the light if it’s too loud and turn it back on if it’s just right? - no, you need to create your own device

Teacher Notes:* Fill out after teaching this unit

Materials to collect: * ~~Foil~~, saran wrap, tissue paper, ~~cardboard~~, ~~wax paper~~, ~~flashlights~~, plastic materials (milk cartons, old food containers), cups

Rubric Resource* [Literacy Design Collaborative NGSS Rubrics](https://docs.google.com/document/d/1jZ0jmDkdwVZbT3KMXtrVax1oc7maecIvOC9I2wmbqXU/edit)

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**Lights**

**Grade 1 Lights Unit Storyline : 5E Alignment**

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| Question | Claim: What we figured out | Evidence in nature: How do we know this? | 5E Instructional Model How | NGSS Alignment (Bundled PEs) |
| **Lesson 1****Phenomenon: What is light and what does it do?** | Light is a type of energy and moves in waves. | Lighthouses use their beam to warn boats of the coastline in bad weather. | **ENGAGE:** Students will make observations, ask questions |  1-PS4-2 |
| **Lesson 2****Planning and Investigation: What can we do to find more out about light?** | We can make an investigation to learn more about light. We can test out our claim.  | Natural curiosity and “testing” nature occurs in people of any age | **EXPLORE:** Students will pick something they want to know more about. Students will create and plan an investigation to test their claim. | 1-PS4-2 |
| **Lesson 3** **What is light?** | Light is a type of energy that moves in waves. It moves very fast and travels in a straight line. | There are two different types of light: natural and artificial | **EXPLORE:** Students will give their own examples of light sources, sort them, and discuss similarities and differences.**EVALUATE:** Students sort pictures of natural and artificial light sources | 1-PS4-2 |
| **Lesson 4****How does light move?** | Light will always move in a straight line unless something blocks it or reflects it | Shadows | **EXPLORE:** Students will explore how light travels in a straight line using a flashlight**EXPLAIN/EVALUATE:**Students will complete “How does light move?” journal sheets | 1-PS4-2 |
| **Lesson 5** **What are the properties of light?** | When light passes through objects, it can be transparent, translucent, and opaque | Sunlight passing through objects.Sunlight passes through completely, some, none creating shadows. | **EXPLORE:** Students will use flashlight to shine through varying cups**ELABORATE:** Students will create their own sunglasses using different types of materials | 1-PS4-3 |
| **Lesson 6****How does light create shadows?** | Light can be blocked by solid objects. This makes a shadow. | Shadows can be seen in the environment | **EXPLORE:** Students explore using different objects to experiment how light cannot travel through objects. **EXPLAIN:** Students will explain that when light is blocked by a solid objects, it makes shadows. | 1-PS4-3 |
| **Lesson 7:** **How is light reflective?** | Light moves very fast in a straight line. Light can change direction or be reflected using objects | Sunlight can be reflected on objects. | **EXPLORE:**Students will use flashlights to shine on the wall and use a mirror to try to reflect the light onto the ceiling**EXPLAIN/EVALUATE:**Students will complete “Light can be Reflected?” journal sheets | 1-PS4-3 |
| **Lesson 8****How can we use light to communicate?** | Light can be used to communicate over long distances -HECO Rep  | Lighthouses, sirens, flashing telephones for the deaf, car blinker/stopping light | **EXPLAIN:**After turning off the classroom lights, students explain how we can communicate using lights | 1-PS4-4 |
| **Engineering Problem/Solution****(See GRASPS)****Lesson 9****Performance Task****How can we use light to communicate?** | Light can be used to communicate over long distances | Lighthouses, sirens, flashing telephones for the deaf, car blinker/stopping light | **ELABORATE/EVALUATE:**Students will create a device to show the cafeteria is getting too loud or is “just right” | 1-PS4-4 |
| **Reading Street:** **Wonders:** **Science A to Z:****Light** **All About Light** | n/a | n/a | **ELABORATE:**Use the science to engage students and create an interest in reading.1 & 2 read, read for ELA standardsAfter experience the standards, read it for the science & bring in all the science. | n/a |

**Light It Up NGSS Unit Plan**

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| **Lesson 1: Phenomenon** |
| **Lesson 1 Materials****Teacher Provided:** * Picture of phenomena <https://wonderopolis.org/_img?img=/wp-content/uploads/2013/01/846.jpg&transform=resizeCrop,720,450>

**Student Provided:*** **Student journal**
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| **Lesson 1: Phenomenon: What is light and what does it do?** | Light is a type of energy and moves in waves. | Lighthouses use their beam to warn boats of the coastline in bad weather. | **ENGAGE*** Teacher to show ST picture of lighthouse (see link above)
* Discussion Questions:
	+ Have you ever seen this in Hawaii?
	+ Do you know what it is used for?
	+ What do you see/notice?
	+ What does this make you think of?
	+ What does this make you wonder?
* ST write in journal first, then share out their ideas

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| See | Record observations (student journal) |
| Think | What you notice about the phenomenonThinking prompts: I see...which makes me think…I see...which makes me feel…I think…because I see… |
| Wonder | What questions do you have about the phenomenon? Write your questions Thinking prompts:I see…which makes me wonder…I wonder because I see... |

* 1. Using your Science lens (senses), what are your observations?
		1. ST record SEE on journal
		2. ST turn and talk
		3. ST share out
	2. Have students discuss one of the following prompts:
		1. I see...which makes me think…
		2. I see...which makes me feel…
		3. I think…because I see…
	3. List all the questions you have based on the phenomena observed:
		1. I see…which makes me wonder…
		2. I wonder because I see...
	4. T guides ST to eliminate questions that are not “testable”
		1. Testable: If can do it right there then it is testable
		2. Examples of testable questions:
			1. Where does the light come from?
			2. How far does the light go?
			3. Are there different kinds of light?
			4. Is there different colors that come out of the lighthouse?
			5. Why do they need the lighthouse?
			6. What is the light for?
			7. Where is the light shining?
			8. Where is the light coming from?
			9. Is the light coming from more than one place?
	5. T asks ST who are successful in crossing out non-testable questions how they know the ones they left are testable.
	6. Have ST share out their testable questions
	7. Cross out ones that are not testable (if any)
	8. T guides ST to identify the focus question - What is light and what does it do?
		1. Find the word or theme that repeats
		2. Guide ST to the focus question by asking them to come up with a question that umbrellas or summarizes all the questions.

Teacher notes: Possible discussion questions: What did you notice? What do you think this picture is trying to show us?Optional: Use chart paper to list questions, cross out non testable questions, then circle the focus question of the unit.FOCUS QUESTION: What is light and what does it do? |
| **Lesson 1 Reflection: (Strengths and keepers in green changes in red):****Strengths:****Challenges:**  |
| **Lesson 2: Planning and Investigation** |
| **Lesson 2 Materials****Teacher Provided:** * Picture of phenomena <https://wonderopolis.org/_img?img=/wp-content/uploads/2013/01/846.jpg&transform=resizeCrop,720,450>

**Student Provided:*** **NO STUDENT JOURNAL**
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| **Lesson 2****Planning and Investigation: What can we do to find more out about light?** | We can make an investigation to learn more about light.. We can test out our claim.  | Natural curiosity and “testing” nature occurs in people of any age | **EXPLORE: ST will bring up Makapuu Lighthouse*** Guide students to explain what the surrounding area looks like to get students to the EQ.
* Show ST the focus question from the previous lesson - What is light and what does it do?
* Ask ST what information do we need to find out more about light?

Need to find out: * Light sources (where does light come from?)
* What it can travel through
* Shadows (how are shadows made?)
* How light can be used to communicate

Possible questions students might ask: * What is light?
* What does it do?
* How does move?
* **Where does it come from?**
	+ Create circle map of light sources to get students ready for lesson 3

Students will pick something they want to know more about. Students will create and plan an investigation to test their claim.* As a whole class, have ST make a claim about what they want to find out and say why they think that
* Once claim has been decided, list on chart paper.
* Disclaimer: If students are having trouble coming up with a testable claim, then provide choices. (e.g. What is light? What does it do? How does move? Where does it come from?)
* Asks ST what can we do to test this? List ideas and choose one as a class. (on chart paper)
* Once you have “designed” a test, ask ST what kind of data will they be collecting?
	+ How do we want to collect this data? Draw pictures? Are we going to measure anything? (turn and talk, chart)
* IF what the ST did matches one of the future explorations, you can proceed with the unit. Just make sure you collect the data in the way they suggest.
* IF the class comes up with a different exploration, have them engage in it for one day.

TIP: at the end of the investigation, go back to focus questionNOTE: If this lesson is not successful, please do not spend more than 2 days on it, the rest of the unit is much more valuable than this lesson.

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| \*\*If unable to do, it is okay and we will reflect on how to make this doable as a grade level. | With guidance and support design a fair test where we:* Collect data
 | With guidance and support design a fair test where we:* Collect data
* Say what is controlled/stays the same in our test.
 | With guidance and support design a fair test where we:* Collect data
* Say what is controlled/stays the same in our test.
* Say what changes in our experiment)
 |
| * Need help in summarizing our data.
 | * With guidance and support summarize our data in a conclusion with some errors.
 | * With guidance and support accurately summarize our data in a conclusion.
 | * With guidance and support gather data from different tests.
* Accurately summarizes the data
* Say how useful our test was to testing our question.
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| **Lesson 2 Reflection: (Strengths and keepers in green changes in red)****Strengths:** **Challenges:**  |
| **Lesson 3: Artificial and Natural Light** |
| **Lesson 3 Materials:** **Teacher Provided:*** **Chart paper or whiteboard**
* **Light source pictures for sorting** [**https://drive.google.com/open?id=1wt6H-cwK\_MgWeW8agv6p6cbLPI5kFlvz**](https://drive.google.com/open?id=1wt6H-cwK_MgWeW8agv6p6cbLPI5kFlvz)
* **Student journal**
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| **Lesson 3** **What is Light?** | Light is a type of energy that moves in waves. It moves very fast and travels in a straight line. | There are two different types of light: natural and artificial | **EXPLORE:** Students will give their own examples of light sources, sort them, and discuss similarities and differences.**EVALUATE:** Students sort pictures of natural and artificial light sources* In journal, students will answer the prompt “what do you know about light?”
	+ Possible student responses:
		- Sun, helps you see, it can be bright, light bulbs, it can be turned off and on
* Have students turn and talk to share their thinking
* Discussion: What is light? What do we know about it? Where does it come from?
* Teacher asks students “What are some examples of things that give off light?”

 (if students only give artificial sources, prompt them to think of sources that may be outside to get them to natural sources), list student responses on board/chart paper, sort examples into categories by finding similarities and differences (aim for natural and artificial)* Discuss: What things are the same? What things are different? How do we know if a light source is natural or artificial? (artificial requires electricity/batteries)
* ST complete sorting activity on their own
* Read first 3 pages of Light book (from Debbie)
* ST revisit model for “what do you know about light?” and add any new information
* Discussion Question:
	+ What other ways does light help us? (let’s us see, help warm you up, alerts you, communication)
* Students turn and talk about responses.
* Class discussion to chart responses on chart paper.

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| I cannot accurately sort the natural and artificial light sources. | With guidance and support I can sort the natural and artificial light sources. | I can accurately sort the natural and artificial light sources. | I can accurately sort the natural and artificial light sources.I can explain the difference between natural light and artificial light. |

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| **Lesson 3 Reflection: (Strengths and keepers in green changes in red):****Strengths:****Challenges:** |
| **Lesson 4: How Does Light Move?** |
| **Lesson 4 Materials:** **Teacher Provided:*** **Flashlights**
* **“How does light move?” worksheet**
* **Cards with holes (5 - 4 with holes and 1 without)**
* **Accordion filing structure**

**Student Provided:*** **Object**
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| **Lessons 4:** **How does light move?**  | Light moves very fast in a straight line. Light will always move in a straight line, unless something blocks it or reflects it.  | Shadows | **EXPLORE:*** T use their flashlights to see the light in a straight line
* Discussion question:
	+ What do you notice?
	+ What direction is the light going in?
	+ Is the light changing?

Elaborate: * Each pair of students are given 4 cards with holes (hole punches) and 1 solid card for the light to shine onto
* Students are challenged to line the cards up on accordion filing structure so the light can shine through to the 5th card, start with 2 cards then increase to 3 and 4 cards

EVALUATE:* Students complete “How Does Light Move #1” worksheet
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| **Lesson 4 Reflection: (Strengths and keepers in green changes in red):****Strengths:****Challenges:** |
| **Lesson 5: Transparent, Translucent, and Opaque** |
| **Lesson 5:** **Materials Needed:****Teacher Provided:****-Different objects that are:****Transparent****Translucent****Opaque*** Foil
* Black construction paper
* Clear saran wrap
* Tissue paper
* Colored cellophane
* Toilet paper
* Paper towels
* Wrapping paper

**-flashlights****-chart paper****-materials to create sunglasses template and lenses****Student Provided:****Student Journal** |
| Question | Claim: What we figure out | Evidence: How we know  | Lesson Plan |
| **What happens to light when it shines through different types of objects?** | Different objects allow light to pass through in different amounts or not at all. | Sunlight passing through objects.Sunlight passes through objects completely, some, none creating shadows. | **Day 1****EXPLORE:** * **Students will be given different types of objects of varying materials with different properties (objects that are transparent: glass jar, eyeglasses, plastic baggie; translucent (sunglasses, tinted glass cup, wax paper); opaque (book, box, wood, colored paper).**
* **ST to make predictions of what light would do when it is shone through each type of object and verbally explain why (ST journal page).**

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| **Object:** | **All of the light went through.** |  | **Some of the light went through.** |  | **None of the light went through.** |  |
|  | **Prediction** | **Actual** | **Prediction** | **Actual** | **Prediction** | **Actual** |
| 1. **Clear Cup**
 |  |  |  |  |  |  |
| **Lightly Colored Cup** |  |  |  |  |  |  |
| **Colored Cup** |  |  |  |  |  |  |

* **Have them validate their predictions by testing their predictions by shining their flashlight through each object and completing the chart. Ask them, “What did you notice about how the light shone through each object?”**
* **Do you notice that for some objects, the light shines right through? For some objects only some of the light shines through? For some objects none of the light shines through? Record their responses on chart paper (these should lead to the definitions of the terms Transparent, Translucent, Opaque).**
* **Introduce the vocabulary words: TRANSPARENT, TRANSLUCENT, OPAQUE**
* **Read pages 4-6 in Lights book (from Debbie)**
* **Class discussion:**
	+ **What other objects are transparent? Translucent? opaque?**
* **Create class tree map (define Transparent, Translucent, Opaque) and list objects under its appropriate heading).**
	+ **Can use objects around the classroom to sort and put in tree map (2-3 of each)**

Day 2: **ELABORATE:** Students will create their own looking glass (toilet paper roll) using different types of materialsTeacher: “Using what you have learned so far about light and the way it travels, how can you create a looking glass that would allow some light to travel through so you can see but at the same time your eyes will be protected from too much light.”* ST will construct their looking glass and test their it by shining their light through their looking glass and by using natural light.
* ST share with the class what materials they used and use the correct vocabulary

Materials to have available for students to use:* Foil
* Black construction paper
* Clear saran wrap
* Tissue paper
* Colored cellophane
* Toilet paper
* Paper towels
* Wrapping paper

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| --- | --- | --- | --- |
| JS | OTW | GI | WOW |
| I had difficulty sorting the objects according to its properties of being transparent, translucent, opaque. |  I can sort some of the objects accurately according to its properties of being transparent, translucent, opaque. | I can sort most of the objects accurately according to its properties of being transparent, translucent, opaque. | I can sort all of the objects accurately according to its properties of being transparent, translucent, opaque. |
| I had difficulty using my previously learned knowledge about light and could not construct a looking glass. | With guidance, I can use my previously learned knowledge about light to construct a looking glass. | I can use my previously learned knowledge about light to construct a looking glass. | I can use my previously learned knowledge about light to construct an effective looking glass. |

 |
| **Lesson 5 Reflection: (Strengths and keepers in green changes in red):****Strengths:** **Changes:** |
| **Lesson 6: Shadows** |
| **Lesson 6 Materials** **Teacher Provided:*** **Projector**

**Student Provided:*** Student journal
* Pencil
 |
| **Lesson 6:** * **How does light create shadows?**
 | Light can be blocked by solid objects. This makes a shadow. | Shadows can be seen in the environment | **EXPLORE:** Whole Group- “How does light create shadows?” * Through whole group conversation, get the students to a point where they understand you need light to create an objects shadows.
	+ Have some students come up to the projector to create a shadow.
* Explore: Have students pair up and go around the room to shine the flashlight on objects and create shadows.
* Explain experiment/expectations
	+ Have students draw shadow for crayon in their student journal.

\*This is done whole class but we want to ensure participation. Teacher will collect observational data on the below

|  |  |  |  |
| --- | --- | --- | --- |
| JS | OTW | GI | WOW |
| * I do not participate in the station
 | * I need guidance to participate in the station
 | * I participate in the station
 | * I actively participate in the station
 |
| * I do not participate in the discussion
 | * With guidance and support answer guiding questions in whole class discussion to say what I learned from the investigation with errors
 | * With guidance and support answer guiding questions in whole class discussion to say what I learned from the station.
 | GI and* I can identify and name patterns
 |
| * I do not participate in the discussion
 | * With guidance and support I compare my results with others with errors
 | * With guidance and support I compare my results with others
 | GI and * I can identify possible sources of error.
 |

Strengths:Challenges: |
| **Lesson 7: Hit the Target** |
| **Lesson 7 Materials** T**eacher Provided:*** **Flashlight, mirror**

**Student Provided:*** **Student Journal**
 |
| **Lesson 7:** **How does light reflect?** | Light moves very fast in a straight line. Light can change direction or be reflected using objects | Natural and artificial light can be reflected off objects.  | **ELABORATE/EVALUATE:*** Teacher notes: Do whole class.
	+ Teacher shines light from flashlight

Discuss: What do we noticed? How can we describe it? (light travels in a straight line)* + Provide class with definition of “reflect/reflective.”
	+ Pose question to the student, “How does light reflect?”
	+ Pass out flashlights and mirrors, have student explore.
* Students will work in small groups to try to get their beam of light to hit a target (targets will be in different areas around the room: ceiling, floor, wall, etc.)
* Whole Group
	+ Discussion of their findings (What did you have to do? Was it easy/hard?)

Individual:* Students will complete journal page on reflection
 |
| **Lesson 7 Reflection: (Strengths and keepers in green changes in red):****Strengths:****Challenges:** |
| **Lesson 8: Communication** |
| **Lesson 8 Materials** **Teacher Provided:** * Leveled reader: Communication
* Signal worksheet from Mystery Science
* flashlights

**Student Provided:*** Student journal
* Pencil
 |
| **Lesson 8 (Two Days)** * **How can we use light to communicate?**
 | Light can be used to communicate over long distances | Lighthouses, sirens, flashing telephones for the deaf, car blinker/stopping light | **EXPLAIN-****During Reading Block:*** Students read Reading Street leveled reader: “Communication”
	+ See Reading Wonders Pacing guide for questions

**During Science Block:*** Watch video: <https://www.youtube.com/watch?v=37y8g8u5Tyk>
* Through discussion, students establish classroom definition of “Communication.”
* The students will answer the question “How can we use light to communicate?”
* If students are having trouble prompt them:
* “How do lights keep us safe, in our community?” (traffic signal, ambulance, crosswalk, fire alarm)
* Teacher collects ideas and records them on chart paper.
* Teacher will then show Mystery science 5 demonstrating one method of communication using lights.
* Optional: “The Little Red Lighthouse” <https://www.youtube.com/watch?v=9qsBv8xInQI>
* Connect reading back to phenomena

**Day Two** * Teacher has students reflect on what they learned from yesterday (Different forms of communication using light)
* Introduce HECO rep
* Students will have background on communication devices using light, different types of light sources, and how light travels.
* Students will reflect on what was taught by the community partner.
 |
| **Lesson 9: Performance Task** |
| **Performance Task Materials****Teacher Provided:*** Flash lights, foil, saran wrap, wax paper

**Student Provided:*** Student journal
* School supplies needed to create device
 |
| **Lesson 9****Performance Task****How can we use light to communicate?****Engineering Problem/Solution****(See GRASPS** | **Light can be used to communicate over long distances** | **Lighthouses, sirens, flashing telephones for the deaf, car blinker/stopping light** | **ELABORATE/EVALUATE:****Students will create a device to show the cafeteria is getting too loud or is “just right”****Day 1:****Performance Task:** * **Students use materials to design solutions​ to solve a real life problem of their choice. Introduce performance task**
	+ **Have ST discuss in a group or pairs the following and record in their journal**
		- **What is the problem?**
		- **What are we creating?**
		- **“Co -construct” criteria for performance task (guide ST to performance task criteria)**
		- **What are the constraints? What “rules” do you have to follow?**
		- **What questions might you have?**
* **Students then design their creation by:**
	+ **Imagining independently, check their design using the criteria, planning as a team, getting approval, and then creating as a team.**
		- **Check ST design and ask questions if not on the right track.**
	+ **Teacher ensures that the team has a consensus of their design and that they follow their design plans. Teacher should not provide suggestions or guidance beyond supporting students who may be stuck to get unstuck.**
* **Students then test their design following the procedures in the journal**
	+ **As they test, students will record their observations and wonderings.**
	+ **T guided and class discussion: reflect on what worked well, what didn’t**
	+ **How they would want to improve their design and why.**
* **Students share their designs with the class and line up their designs**
	+ **Observe similarities/differences**

**Day 2*** **Students will then brainstorm ways to improve their design following a similar procedure to the original design procedure they followed while initially creating their design.**
	+ **Students need to obtain teacher approval once more before proceeding. Teacher ensures that the group has a consensus of their design and that they follow their design plans.**
* **Students then reflect if their revised device was more successful than their original prototype and draw conclusions.**
* **As a whole class have students revisit their data to make a final analysis and conclusions.**
* **Teacher charts conclusions.**
* **Anchor learning today back to phenomena and focus question.**

**Answer the focus question of the unit.** |
| **Performance Task Reflection: (Strengths and keepers in green changes in red):****Strengths:****Challenges:** |
| **Materials We NEED:*** **Mirrors**
* **Cards with holes (Prep cards)**
* **Wrapping Paper**
* **Clear Saran Wrap**
* **Tissue Paper**
* **Colored Cellophane**

**Materials we HAVE:*** **Flashlight**
* **Student Journal**
* **Foil**
* **Wax paper**
* **Filing structure**
* **Paper towels**
* **Black construction paper**
* **Communication leveled reader**

**Solicit from Parents:*** **Recyclables for performance task**
	+ **Old food containers (cleaned and dried)**
	+ **Toilet paper/Paper towel rolls**
 |