

CT Next Generation Science Curriculum-embedded Performance Task

Grade / Course	Grade 1
Task Name	Light and Materials
Task Summary	Students will investigate how light interacts with different materials, first with structured activities, then through investigations planned and developed by their small group. The class will be involved in small group and larger group discourse about the observations and explanations of cause and effect they make. Their science talk provides opportunities for them to practice engaging in argument from evidence related to their investigations. They will look for patterns in the data they collect and consider the possibility of making predictions based on those patterns. Through interaction with hands-on materials, students will develop an understanding of the meaning of science terms including: transparent, translucent, opaque, and reflective. The class will share their learning with others through a collaborative museum exhibit they design.
Related NGSS PE(s)	<p>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.</p> <p>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).</p> <p>Assessment Boundary: Assessment does not include the speed of light.</p>
Lesson Level PE(s)	Make models to explain the effects of placing objects made with different materials (transparent, translucent, opaque, and reflective) in the path of a beam of light.
Targeted Science and Engineering Practice(s) <ul style="list-style-type: none"> • Related SEP Element for Primary School 	<p>Planning and Carrying Out Investigations</p> <p>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.</p> <ul style="list-style-type: none"> • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. • Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question. <p>Constructing Explanations and Designing Solutions</p> <p>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 phenomenon and designing solutions.</p> <ul style="list-style-type: none"> • Use information from observations (firsthand and from media) to construct an evidence-based account for natural phenomena. <p>Engaging in Argument from Evidence</p> <p>Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).</p> <ul style="list-style-type: none"> • Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument. • Construct an argument with evidence to support a claim.
Targeted Crosscutting Concept(s) <ul style="list-style-type: none"> • Related CCC Element for Primary School 	<p>Patterns</p> <ul style="list-style-type: none"> • Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. <p>Cause and Effect</p> <ul style="list-style-type: none"> • Simple tests can be designed to gather evidence to support or refute student ideas about causes.

<p>Targeted Disciplinary Core Idea(s)</p> <p>*Component Idea</p> <ul style="list-style-type: none"> • Related DCI Element for Primary School 	<p>PS4: Waves and Their Applications in Technologies for Information Transfer</p> <p>* PS4.B: Electromagnetic Radiation</p> <ul style="list-style-type: none"> • 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.)
<p>Targeted Common Core State Standard(s) – English Language Arts</p>	<p>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. (1-PS4-3)</p> <p>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). (1-PS4-3)</p> <p>W.1.8 - With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-PS4-3)</p>
<p>Targeted Common Core State Standard(s) - Mathematics</p>	<p>N/A</p>
<p>Context and Alignment</p>	<p>This task should be used after students have had experiences (such as observing, comparing, sorting, and ordering) with basic properties of objects and materials (color, shape, texture, etc.) or as part of a light unit.</p>
<p>Task Components</p>	<p>Part 1 – Engage: Different types of glasses</p> <p>Part 2 – Explore: Intro to sorting items – Reading through materials.</p> <p>Part 3 – Explore: Sorting items based on effects of a beam of light.</p> <p>Part 4 – Explain: Defining terms based on patterns of data</p> <p>Part 5 – Elaborate: Sorting based on new terms</p> <p>Part 6 - Evaluate: Finding objects and materials in the classroom that can be described using these terms.</p>
<p>Suggested Timeline</p>	<p>Part 1: 20-30 minutes</p> <p>Part 2: 30-45 minutes</p> <p>Part 3: 30-45 minutes</p> <p>Part 4: 30-45 minutes</p> <p>Part 5: 30-45 minutes</p> <p>Part 6: 30-45 minutes</p>
<p>Task Materials</p>	<ul style="list-style-type: none"> • Half-masks (from party store or die cut) or safety goggles (Prep for Part 1) • Scissors (for teacher) (Prep for Part 1 and Part 2) • Aluminum Foil (Prep for Part 1 and 2) • Plastic Wrap (Prep for Part 1 and Part 2) • Waxed Paper (Prep for Part 1 and Part 2) • Dark Construction Paper (Prep for Part 1 and Part 2) • Clear glass (microscope slide) (Prep for Part 2) • Overhead transparency (Prep for Part 2) • Cloudy plastic (translucent, not opaque) (Prep for Part 2) • Tissue paper (Prep for Part 2) • Cardboard (Prep for Part 2) • Wood (Prep for Part 2) • Coins (Prep for Part 2) • Mirrors (Prep for Part 2) • Zipper bags (sandwich-sized) ((Prep for Part 2)

	<ul style="list-style-type: none"> • Newspaper (Part 2) • Blank Paper (for showing how objects were initially sorted) (Part 2) • Copies of Sorting Mat for Part 2 (Part 2) • Writing and drawing supplies (Part 2, Part 3, Part 4) • Flashlights or penlights (be sure their batteries work) (NOT Laser Pointers) (Part 3) • Copies of Sorting Mat for Part 3 (Part 3) • Copies of Sorting Mat for Part 5 (Part 5) • Copies of Labels Sheet (Part 6) • Scissors (Part 6) • Tape (Part 6) • Yarn (Part 6)
Old CT Science Content Standard(s)	N/A at Grade 1
Old CT Science Expected Performance(s)	N/A at Grade 1
Old CT Science Inquiry Standard(s)	<p>A INQ.1: Make observations and ask questions about objects, organisms and the environment.</p> <p>A INQ.3: Make predictions based on observed patterns.</p> <p>A INQ.6: Present information in words and drawings.</p> <p>A INQ.9: Count, order and sort objects by their properties.</p>
	TASK ADMINISTRATION / SEQUENCE OVERVIEW
Part 1	Engage: Different types of glasses
Preparation	<p>To introduce the anchor phenomenon for this lesson, show the class a variety of glasses and eye coverings (reading glasses, safety goggles, sunglasses with dark lenses, sunglasses with mirrored lenses, and sleep masks).</p> <p>To introduce the concept of how different materials interact with light, you'll need to prepare 4 types of glasses for the class (plastic wrap, waxed paper, black construction paper, and aluminum foil). Use 2 half-masks (with elastic removed) or 2 die cut frames for each pair. Place desired material between the masks over eye holes. Glue material and layers of mask or frames together. About $\frac{1}{4}$ of the class should have each type of "glasses." (i.e. for a class of 28 students make 7 of each type.) Since these "glasses" will be shared, they are not designed to go over the ears or be secured with elastic around the head. Instead, children should just hold them in front of their eyes.</p> <p>If you have a class set of safety goggles they can be modified for this activity. Use 7 of the goggles "as is" for the glasses that are easy to see through, cover the viewing surface with materials as follows: 7 covered with aluminum foil (shiny side out), 7 covered with waxed paper, and 7 covered with black construction paper. Again, because they are shared, students should not use the strap of the goggles to secure them on their heads. Instead they should just hold them up to their faces to help prevent problems with sharing lice.</p>
Activity	<p>To introduce the anchor phenomenon for this lesson, show the class a variety of glasses and eye coverings (reading glasses, safety goggles, sunglasses with dark lenses, sunglasses with mirrored lenses, and sleep masks). As you hold up each as encourage students to talk with an "elbow partner" about how that type would be used.</p> <p>Tell them you've made some other "glasses" that they will actually use to find out how each type affects how they see what's around them.</p> <p>Have students sit in groups of 4. Give each group a set of 4 glasses (one of each type). Ask</p>

	<p>the class to put on their glasses, look around, and notice what they see. Encourage them to talk with others in their group about their visual observations while wearing those glasses. Conversation starters could include. “How did the classroom look with those glasses on?”; “Did it look the same for each of you? Why or why not?” Have students in small groups trade glasses with the person to their right to try a different type of glasses, then remind them to talk about their observations. Repeat two more times until everyone has had an opportunity to try all four types and talk with each other about the experience. Challenge groups to decide what each pair of glasses could be used for and defend their thinking.</p> <p>Bring class into a circle for a whole class discussion about how the different glasses they tried out could be used and why.</p>
Part 2	Explore: Intro to sorting items – Reading through materials.
Preparation	<p>Prepare enough zippered bags containing these suggested materials for each pair of students. For the items that are flat, a 10 cm by 10 cm piece is big enough</p> <ul style="list-style-type: none"> • clear plastic wrap, • clear glass (microscope slide), • overhead transparency • waxed paper • cloudy plastic • tissue paper • cardboard • dark construction paper • wood • mirror • etc. <p>The important thing is that the collection of items includes several examples of each type of material (transparent, translucent, opaque, and reflective) and that each bag contains similar objects.</p> <p>Have a copy of Sorting Mat for Part 2 for each group</p>
Safety	If any of the items have sharp corners or edges, caution the class to handle them carefully or cover the sharp parts with a little masking tape.
Activity	<p>Give each group of students a sheet of paper to use as a sorting mat and a zippered bag of items. Challenge them to organize the items into groups, and to explain to each other why they sorted them the way they did. Suggest that they illustrate the groups on the mat and use a title or headings to explain their thinking to others. Leaving the mats and items in place on the table, have students walk around the room to find out how the groupings were alike or different.</p> <p>Lead a discussion about whether there is one “right way to make the groups”. If the students don’t bring it up, remind them that you just told them to organize the objects into groups, not what properties they should consider.</p> <p>Tell the class that this time we’ll all sort the items into groups according to the question: <i>How well can you see text (letters and words) under the item?</i> Distribute a sheet of a newspaper and Mat 2 to each small group and have them notice there are spaces for 3 groups, labeled as follows: (1) Can see text through it easily; (2) Can see text through it but not very clearly; (3) Cannot see text through it.</p> <p>Tell the class we’ll plan our investigation together before starting to sort. Scribe the ideas</p>

	<p>of the class on sentence strips, so they can be rearranged if necessary. Once the class agrees on the plan, then groups may sort the items onto Mat 2.</p> <p>Tell them, when they finish sorting to talk with their group about why items were placed where placed as they were. Leaving the mats and items behind, encourage the children to visit other groups to see how groupings were similar or different.</p> <p>In a whole group setting encourage the students to discuss this experience. Ask students to suggest ways to record the findings. Help the class make a chart summarizing their findings with the names of the items (and attached items) in the rows down the left and the three categories of what happened labeling columns across the top. Have students explain how the chart helps them keep track of their observations.</p>
Part 3	Explore: Sorting items based on effects of a beam of light.
Preparation	<p>Check that flashlights or penlights are functioning properly.</p> <p>Check that zipper bags for each group contain same assortment of items as in Part 2.</p> <p>Have copies of the Sorting Mats for Part 3 available for each group.</p>
Safety	Do NOT use laser pointers!
Activity	<p>This time groups will plan and carry out their own investigations to answer a different but related question: <i>What is the effect of placing objects made with different materials in the path of a beam of light?</i> Show them the flashlight or penlight that they may use to produce the beam of light.</p> <p>Individual groups may need hints, such as:</p> <ol style="list-style-type: none"> 1) "What would happen if you covered the front of the flashlight or penlight with an object, then looked directly at the end of the flashlight as if it was pointing toward your face? Or 2) "What would happen if the item was held about 5 cm above the top of the desk and the flashlight was shining down on it from about 10 cm straight above the item?" <p>Depending on their reading/writing skills, groups could share their plans in writing, by arranging steps that you have given them as a scaffold, or by orally and kinesthetically explaining what they will do.</p> <p>Remind them to sort the objects based on their investigation and then make a chart summarizing their findings.</p> <p>With the whole class, add columns to the class summary chart in order to display all of the data together. Ask the students to look for patterns. Which tests seem related? Can we predict from one test what the result of another test might be?</p>
Part 4	Explain: Defining terms based on patterns of data
	<p>Revisit the class summary chart. Have students describe what it shows. Working in small groups, ask them to look for patterns in the data between the different tests. (5 minutes).</p> <p>When the class comes back together for a meaning-making discussion, focus on one of the items. Ask about what happened in each test of that item. (Example: Item: plastic wrap / Can see text through it / Flashlight shines through it / no or very dim shadow) Then ask: What other items could we read text through? (glass slide, overhead sheet) Then ask: Did the flashlight shine through each of those? Did they also make no or</p>

	<p>very dim shadow? Do you see the pattern? Some materials have similar results on all of these tests. Items like the plastic wrap, the glass slide, and the overhead sheet show similar results on these tests. Materials with these properties are called <i>transparent</i>. Next, focus on one of the remaining items that is not transparent. Following similar reasoning, introduce the terms <i>translucent</i> and <i>opaque</i>. Also discuss the difference between opaque items that just block the light and those that reflect it, to introduce the term <i>reflective</i>.</p>
Part 5	Elaborate: Sorting the object in the baggy according to the new terms
Preparation	<p>Check that flashlights or penlights are functioning properly.</p> <p>Check that zipper bags for each group contain same assortment of items as in Part 2.</p> <p>Have some newspaper pages available.</p> <p>Have a copy of the Sorting Mat for Part 5 available for each group and additional copies for each student.</p>
Activity	<p>Distribute Sorting Mats, zipper bags with objects to sort, a sheet of newspaper, and a flashlight or penlight to each group.</p> <p>Discuss the Sorting Mat for Part 5 with the class. Be sure that they understand that their group will use this mat to sort the objects according to the new words presented in the previous lesson.</p> <p>Provide time for sorting. Provide scaffolding through questioning as needed to groups that are struggling. Students may wonder what to do with objects that can be described belong in one of the three categories on the sorting mat but are also reflective. Encourage them to figure out a way to represent that on their mat.</p> <p>Once a group reaches consensus about their sorting, distribute blank Sorting Mats for Part 5 to students in that group. Ask students to make a record of the groups' placement of objects by writing words or drawing pictures on their own sheet.</p> <p>Hold a whole group discussion about the placement of the objects on this mat. Let groups defend their placements if there are differences among the groups.</p>
Part 6	Evaluate: Labeling objects and materials in the room using new terms.
Preparation	<p>Make copies of the label sheet for the class. Prepare a few extra in case some students want (need) to redo their first try.</p> <p>Be sure all students have access to a pair of age appropriate scissors to separate the labels on their sheet. Have several rolls of tape and some yarn for children to use when posting their labels after they are filled out. Arrange to have some visitors come to your room after labels are posted (other teachers, students from a different grade level, parents, building or district administrators or staff, etc.)</p>
Activity	<p>Challenge the class to find other examples of items or materials in the classroom that belong in these categories. Tell the class that we are expecting some visitors that may not know the differences among transparent, translucent, opaque, and reflective materials; so we will help them understand the meaning of these terms by labeling some examples in our classroom.</p> <p>Show the Label Sheet to the class.</p> <p>Explain that each student should:</p> <ol style="list-style-type: none"> 1. Cut the sheet on the solid lines to make 4 labels. 2. Identify an object or material in the classroom that belongs in the category printed on one of the labels.

3. Fill in the information on that label for that object or material identified.
4. Post that label near the object or material they identified (using tape and/or yarn)
5. Repeat steps 2 through 4 with the other labels.

After all labels have been posted. Allow students to check the work of others by exploring the room and reading the labels. Then have students discuss the placement of the notes, making claims about the placement of some of them (correct or not correct) and supporting their claims with evidence (the results of that object if tested). Remind them of the norms for science discussions, including respectful talk. If any students want to change their labels or their label's location, give them an opportunity to do so if they explain to you the reason they need to make a change.

You can assess students' understanding of the terms used to describe how light interacts with different material and/or objects by applying the rubric to the labels they have posted.