

Title of Lesson Plan	Fade Away, Fade Away, Fade Away
Objective	Students will describe different materials used to filter light and predict similarities. They will measure light with different filters/blocking materials and graph light exposure with different filters (bar graph).
Standards	<p><i>National:</i>  3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</p> <p><i>Georgia:</i>  S4P1. Obtain, evaluate, and communicate information about the nature of light and how light interacts with objects.</p>
Grade Level	4 <sup>th</sup> Grade
Pacing	3 sessions, can be shortened to 2 sessions without supplemental light prints activity.
Guiding Questions	What is light? How can light affect museum collections? What are some sources of light and how are they different? How can light be used to make art?
Collection Connection	Khipu/quipu (2002.1.130) Earspool with Spondylus Shell Diving Scene (1992.015.261A/B) Vessel with Peanut-Human Playing a Qena (Notched Flute) (1988.012.003) Lime Dipper with Duck (1989.008.034)
Content (About the Artwork and/or connection to the topic)	<p><b><u>What is Light?</u></b>  Light is a form of energy that travels in waves. Visible light is the region of the electromagnetic spectrum between infrared and ultraviolet radiation. Visible light is made up of the colors of the rainbow. Ultraviolet radiation has shorter wavelengths and higher energy than visible light.</p> <p><b><u>How Can Light Affect Museum Collections?</u></b>  Because light is a source of energy, it can drive chemical reactions within the art materials themselves, often leading to damage. The most frequent result of exposure to light is fading. Because the damage caused by fading is irreversible, museums try to limit light exposure by using filters or coverings on lamps and windows. Museums also rotate objects off display to limit the amount of light exposure they accumulate. If light exposure is not controlled, objects can fade severely. The bright orange shirt on this model has</p>

	<p>faded, except where the fabric was protected by the belt. Dyes and organic materials like leather, feathers, and textiles/ fabrics are especially vulnerable to light damage. Many artifacts of US history that are now in museums are vulnerable to damage from light exposure. You will recognize many of these items and the people associated with them from your Social Studies class, so you know the importance of these historical artifacts. Many objects in our homes can also be damaged by excessive light exposure. Many of these objects are family heirlooms or personal possessions – even your own artwork.</p> <p><b><u>Different Light Sources</u></b></p> <p>Different light sources use different amounts of energy to generate light. Incandescent bulbs use the most energy and become hot to touch when left on. The color of the light from different bulbs also varies – incandescent bulbs produce a warm yellow light, while fluorescent bulbs produce a cool blue light. Museums use a lot of lights in galleries and display cases. Look how many lamps are on the ceiling in the Egyptian galleries at the Carlos Museum. You can see in the right-hand image that lamps are also inside display cases. It takes a lot of energy to power all of these bulbs. To be energy efficient, the Carlos Museum uses LED bulbs. Because LED bulbs do not get hot, cases with internal lamps do not build up heat.</p> <p><b><u>Using Light to Make Artwork</u></b></p> <p>Artists make cyanotypes by exposing specially coated papers to ultraviolet radiation. The energetic waves turn the salts on the paper blue, leaving protected areas white. <b>Anna Atkins</b> (1799-1871) was a biologist who used cyanotypes to record plants. <b>Christian Marclay</b> is a contemporary artist who makes cyanotypes using pieces from music cassette tapes.</p>
Project Title	<i>Fade Away, Fade Away, Fade Away; Light Intensity in a Museum Environment</i>
Materials	<p><u>Week 1:</u></p> <p>6 Clip lamps (desk lamps could work for this too)</p> <p>6 bulbs (see How-To Presentation)</p> <p>6 acrylic picture frames</p> <p>12 Binder clips</p> <p>Opaque paper</p> <p>Translucent paper</p> <p>Black-out curtain fabric</p> <p>UV filter paper</p> <p>Printed curtain fabric</p>

	<p>Extension Cords 5 iPads loaded with free light metering (App called Lux Light Meter Pro, instructions in How-To PowerPoint)</p> <p><u>Week 2:</u> 9 Clip lamps 9 bulbs, 3 each of 3 types (see How-To Presentation) White and green paper to place on floor beneath lamps Masking tape (to hold paper on floor) Info sheets about bulbs (provided)</p> <p><u>Week 3:</u> 4x6 Sun Art or SunPrint or similar cyanotype sun print papers – enough for each student to have one sheet Assorted objects to place on papers - feathers, cut-outs, lace, ribbon, flowers, leaves, etc. Plexi sheets to hold objects on top of papers during exposure Washing trays – any sort of shallow bin, depending upon size of tray several may be needed; multiple sheets can be rinsed in one tray, as long as there is room to agitate them Lemon Juice Clocks or timers Paper towels</p>
Instructions	<p><u>Week 1</u></p> <ul style="list-style-type: none"> <li>- Teacher will introduce light and light fading using Classroom Presentation. Include Carlos Museum collection connections and student personal connections.</li> <li>- Students will answer #1-3 on their worksheet individually.</li> <li>- Students will be guided through the first light activity in small groups. Each group will have a “window,” “sun,” and different blocking materials. They will experiment with each material and measure the intensity of light able to pass through each material using the iPad and light measuring app. Teacher may need to model how to use the application first (see worksheet instructions).</li> <li>- Once students have measured light intensity through each material, they will use their data to create a bar graph.</li> <li>- Teacher will lead the class in a concluding discussion about general observations.</li> </ul> <p><u>Week 2</u></p> <ul style="list-style-type: none"> <li>- Teacher will present the concept of different light sources through PowerPoint presentation including a Museum lighting scenario.</li> </ul>

	<ul style="list-style-type: none"> <li>- In small groups, students will observe the light given off by three types of lightbulbs. They will shine the different light sources on green and white paper to observe the different temperatures (“colors”). They will answer #1-2 on their worksheet based on these observations.</li> <li>- The teacher will pass out lightbulb information sheets to each group. In their groups, students will use the information sheets to answer #3 on their worksheet.</li> <li>- Students will then follow the instructions on their worksheet to calculate the amount of energy and cost to light the gallery pictured in the PowerPoint presentation.</li> <li>- The teacher will then lead the class in a discussion where each group will discuss their results and decide as a class which lightbulb would be best to light the gallery.</li> </ul> <p>Week 3</p> <ul style="list-style-type: none"> <li>- The teacher will reintroduce the concept of high energy UV light and artwork made using UV light through PowerPoint presentation.</li> <li>- The teacher will guide students through the sun print activity following the worksheet instructions.</li> <li>- While the paper is being exposed to sunlight, the students will answer #4 on their worksheet.</li> <li>- While the paper is being rinsed, students will answer #7 on their worksheet.</li> <li>- After the prints are finished, the students will answer #9 on their worksheet.</li> </ul>
Assessment	<p>Weeks 1 &amp; 2: See attached worksheets</p> <p>Week 3: Completed sun print and attached worksheet</p>
Additional Resources (Bibliography, other artwork in the collection, FAQs, books/websites for the classroom, etc.)	<p>Light - (Amazing Science (Picture Window)) by Natalie M Rosinsky (Paperback)</p> <p>What Is Light? by Markette Sheppard</p> <p>All about Light by Lisa Trutkoff Trumbauer</p>
Handouts/Worksheets	See attached worksheets
Vocabulary	Opaque, translucent, refraction, reflection, transparent, light intensity, watt.