

ALTERNATIVE LESSON PLANS FOR DISTANCE LEARNING

These alternative lesson plans condense what is taught and suggest ways to support students learning at home. We acknowledge that every situation is unique and strive to provide plans that can be used online or as printed packets. Focus on fewer scientific principles. Use print and audio readings. Share the videos that you can. Discuss if you can.

STUDENT ACTIVITY VIDEOS COMING SOON!

UNIT TITLE	PS1
DRIVING QUESTION	Can I believe my eyes?

Lesson 1 (1-2 days)	Do You See What I See?
Activity 1.1	Anchoring Activity— Strange Images Share projected images <ol style="list-style-type: none"> 1. Moving Circles 2. Checkerboard
Reading 1	<i>Look at This!</i>
Activity 1.2	Driving Question Board Elicit and post student questions to a central DQB as you are able.

Lesson 2 (1 day)	What Do We Need to See an Object?
Activity 2.1	Probing Ideas: Seeing Objects around the Room Share projected images <ol style="list-style-type: none"> 1. What Affects Sight?: 2. What Hinders Sight? 3. What Can You See? 4. <p>Using only the projected images, discuss patterns of what can be seen in the images and what can't from different vantage points and discuss the conditions for sight</p>
Reading 1	<i>Picture This!</i>

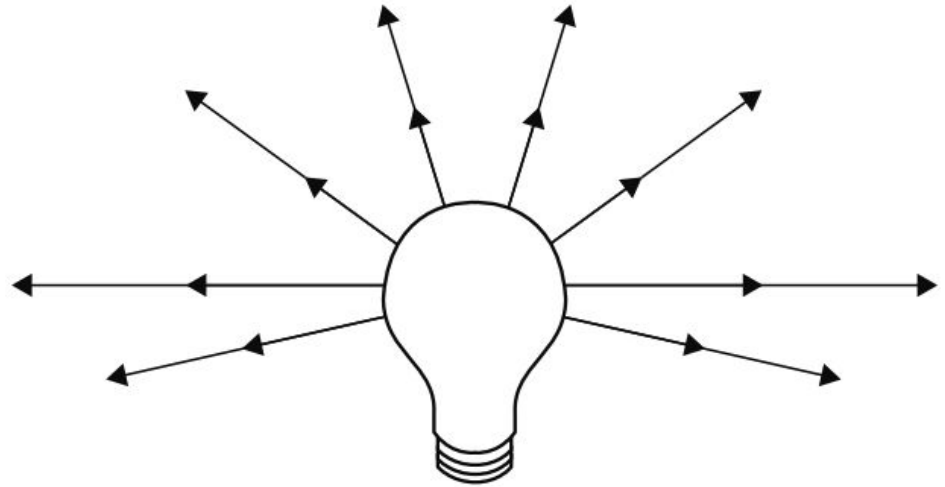
Lesson 3 (2 days)

Activity 3.1

Constructing Models of How People See

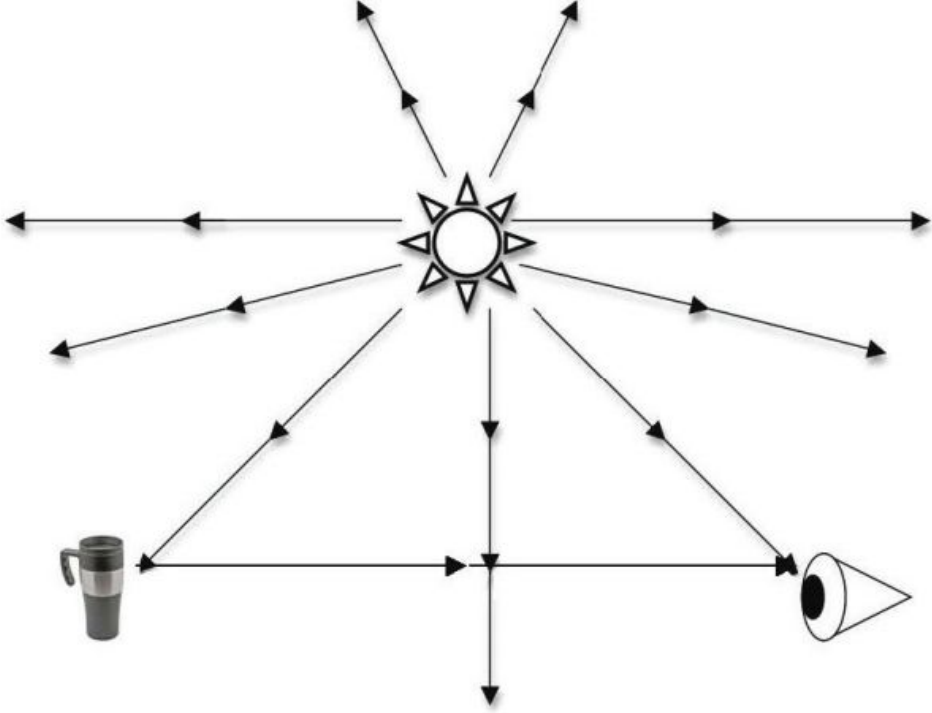
Preparing to Develop Models

Teachers may want to share the images for the TE included here to discuss modeling



Reading 1

Modeling

<p>Activity 3.2</p>	<p>Building the Consensus Model Teachers may choose to have students create their own models with objects at home or the icons in IDE. Teachers may also choose to share the sample consensus model from the TE, included here and discuss.</p> 
<p>Reading 2</p>	<p><i>Faster than a Speeding Bullet</i></p>

<p>Lesson 4 (1 day) The Eye as a Light Sensor</p>	
<p>Activity 4.1</p>	<p>How the Eye Works— Overview Share projected images:</p> <ol style="list-style-type: none"> 1. The Human Eye 2. Tracing the Path of Light <p>Teachers may want to include discussion regarding brightness of an object and how much light reaches the eye (the brighter an object appears the more light reaches the eye from it)</p>
<p>Reading 1</p>	<p><i>Eyes in the Animal Kingdom</i></p>

<p>Lesson 5 (1 day) How Are Shadows Created?</p>	
<p>Activity 5.2</p>	<p>Connecting Shadows to the Light Model Share projected images:</p> <ol style="list-style-type: none"> 1. A Light Model 2. Light Model 2 3. Shadows
<p>Reading 1</p>	<p><i>All Shadows Are Not the Same</i></p>

Lesson 6 (2-3 days)	Scattering and Reflection of Light																																													
Activity 6.1 Activity 6.2	<p>Reflection, Investigating Scattering and Reflection</p> <p>Share: https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS1_te_v2_0_5-ps1_activity_6_1_and_6_2-917.mp4</p> <p>Teachers may also want to search for video of angle of reflection or Share this: https://youtu.be/EZIWPXTHIU (students who are unfamiliar with the idea of angles will benefit from this video. The “angle of incident and reflection” are beyond the scope of the lesson - however this video does demonstrate that light travels in a straight line and that angle of reflection is equal to the angle of the light entering the mirror.</p> <p>Teachers may also wish to share the data table from the video and discuss, it is included here:</p> <table border="1"> <thead> <tr> <th colspan="2"></th> <th colspan="5">Flashlight Position</th> </tr> <tr> <th colspan="2"></th> <th>F1</th> <th>F2</th> <th>F3</th> <th>F4</th> <th>F5</th> </tr> </thead> <tbody> <tr> <th rowspan="5">Sensor Position</th> <th>S1</th> <td>182.26</td> <td>44.86</td> <td>0.64</td> <td>0.58</td> <td>0.45</td> </tr> <tr> <th>S2</th> <td>1.35</td> <td>900.53</td> <td>12.37</td> <td>0.51</td> <td>0.52</td> </tr> <tr> <th>S3</th> <td>0.90</td> <td>6.41</td> <td>2672.46</td> <td>39.90</td> <td>0.64</td> </tr> <tr> <th>S4</th> <td>0.70</td> <td>0.70</td> <td>6.41</td> <td>2134.09</td> <td>16.28</td> </tr> <tr> <th>S5</th> <td>0.58</td> <td>0.50</td> <td>1.67</td> <td>6.41</td> <td>2467.35</td> </tr> </tbody> </table>			Flashlight Position							F1	F2	F3	F4	F5	Sensor Position	S1	182.26	44.86	0.64	0.58	0.45	S2	1.35	900.53	12.37	0.51	0.52	S3	0.90	6.41	2672.46	39.90	0.64	S4	0.70	0.70	6.41	2134.09	16.28	S5	0.58	0.50	1.67	6.41	2467.35
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Activity 6.3	<p>Explaining Scattering, Reflection, and Images</p> <p>Share projected images:</p> <ol style="list-style-type: none"> 1. Paper Magnified 2. Light Hitting a Surface 3. Student Drawing Models 4. Flashlight 5. Flashlight Bouncing Off Wood 																																													
Reading 1	<i>Polishing Objects</i>																																													
Lesson 7 (2 days)	Transmission of Light																																													
Activity 7.1	<p>Evaluating the Light Model</p> <p>Students are unable to use a light box, but should be able to add structure such as cardboard to their model which allows no light to enter the eye. Add a transparent object to the model to demonstrate why they can see some thorough transparent material.</p>																																													
Activity 7.3	<p>Revising the Light Model</p> <p>Share projected image:</p> <ol style="list-style-type: none"> 1. Consensus Model 																																													
Reading 1	<i>Using Light in Optical Fibers</i>																																													

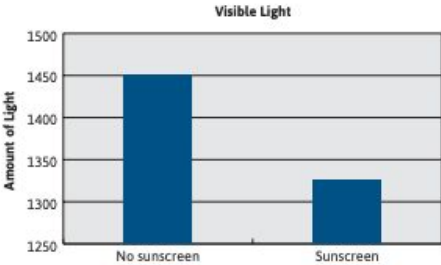
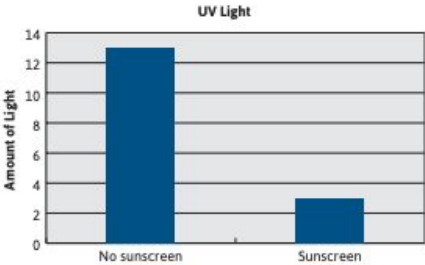
Lesson 8 (3 days)	Absorption of Light															
Activity 8.1	<p>Light Makes Things Happen</p> <p>Student activity video: https://iat.wistia.com/medias/pfzecs24s1 from PS2</p> <p>OR</p> <p>Teachers may choose to search for radiometer video such as: https://youtu.be/U9TTC_eKzqo https://youtu.be/j7UtjEjh7k4</p> <p>Search for video of time-lapse heliotropism or share this: https://youtu.be/g8mr0R3ibPU</p>															
Activity 8.2	<p>Investigating Heating by Light</p> <p>Share: https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/PS1_te_v2_0_5-ps1_activity_8_2-918.mp4</p> <p>Sample Data Sample data were obtained using the experimental setup shown and a 100W light bulb.</p> <table border="1"> <thead> <tr> <th>Variable</th> <th>Clear Water</th> <th>Dyed Water</th> </tr> </thead> <tbody> <tr> <td>Amount of reflected light</td> <td>1571lux</td> <td>765lux</td> </tr> <tr> <td>Amount of transmitted light</td> <td>5248.7lux</td> <td>3543.2lux</td> </tr> <tr> <td>Starting temperature</td> <td>22.8°C</td> <td>23.1°C</td> </tr> <tr> <td>Final temperature (after 30 minutes)</td> <td>44.7°C</td> <td>48.7°C</td> </tr> </tbody> </table>	Variable	Clear Water	Dyed Water	Amount of reflected light	1571lux	765lux	Amount of transmitted light	5248.7lux	3543.2lux	Starting temperature	22.8°C	23.1°C	Final temperature (after 30 minutes)	44.7°C	48.7°C
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Reading 1	<i>Solar Power Plants</i>															
Activity 8.3	<p>Keeping Track of Light</p> <p>Teachers may choose to share the consensus model developed by them or with students in Activity 3.1 and to share the results from Activity 8.2 again with students</p> <p>Sample Data Sample data were obtained using the experimental setup shown and a 100W light bulb.</p> <table border="1"> <thead> <tr> <th>Variable</th> <th>Clear Water</th> <th>Dyed Water</th> </tr> </thead> <tbody> <tr> <td>Amount of reflected light</td> <td>1571lux</td> <td>765lux</td> </tr> <tr> <td>Amount of transmitted light</td> <td>5248.7lux</td> <td>3543.2lux</td> </tr> <tr> <td>Starting temperature</td> <td>22.8°C</td> <td>23.1°C</td> </tr> <tr> <td>Final temperature (after 30 minutes)</td> <td>44.7°C</td> <td>48.7°C</td> </tr> </tbody> </table>	Variable	Clear Water	Dyed Water	Amount of reflected light	1571lux	765lux	Amount of transmitted light	5248.7lux	3543.2lux	Starting temperature	22.8°C	23.1°C	Final temperature (after 30 minutes)	44.7°C	48.7°C
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Activity 8.4	<p>Revisiting Phenomena Caused by Light</p> <p>Teachers revisit the light related phenomena from Activity 8.1</p>															
Reading 2	<i>Solar Energy</i>															

Lesson 9 (3 days)	What Is the Opposite of White Light?
Activity 9.1	Mixing Colors of Light with Projectors The simulation needed for this Activity is found on the Teacher Portal (located under Teaching Resources -->Simulations-->Lesson 9 "Color"-->Click on the icon with the <i>single</i> flashlight that indicates "single bulb"). OR Share: https://phet.colorado.edu/sims/html/color-vision/latest/color-vision_en.html (single flashlight icon, single bulb)
Activity 9.2	Mixing Colors of Light on Computers The simulation needed for this Activity is found on the Teacher Portal (located under Teaching Resources -->Simulations-->Lesson 9 "Color"-->Click on the icon with the <i>three flashlights</i> that indicates "RGB bulb") OR Share: https://phet.colorado.edu/sims/html/color-vision/latest/color-vision_en.html (three flashlights icon, RGB bulb)
Activity 9.3	How Color Sensors Work Share projected images: <ol style="list-style-type: none"> 1. Eye Close- Up (from Lesson 4) 2. Eye Diagram 3. Retina 4. Parts of the Retina 5. Camera PI: Charge Coupled Device
Reading 1	<i>Making Color Photographs</i>

Lesson 10 (2 days)	How Do Objects Change the Color of Light?
Activity 10.1	Analyzing Color Composition Share projected image <ol style="list-style-type: none"> 1. Red Rectangle 2. White Rectangle 3. White Square Share: https://youtu.be/kg6ofsMj8Y This Youtube video is beyond the scope of the activity, but demonstrates what the diffraction gradient "C- Spectra" would also demonstrate for this activity
Reading 1	<i>Rainbows</i>
Activity 10.2	Revisiting the Consensus Model Share projected images: <ol style="list-style-type: none"> 1. Light Hitting a Transparent Object 2. Polychromatic Light 3. Light Scattered by Red Filter 4. Light Absorbed by Red Filter 5. Light Reflecting Off an Apple Teachers may choose to have students revise their consensus models to reflect their new understanding to explain the color-related phenomena that light can be separated into bands or lines of color. Teachers may need to share the consensus model with students again at this time. and discuss.
Reading 2	<i>Diffraction</i>

Lesson 11 (2 days)	Back to the Anchoring Activity
Activity 11.1	<p>Revisiting Learning Sets 1– 3</p> <p>Share projected images:</p> <ol style="list-style-type: none"> 1. Investigation Map Questions 1 2. Investigation Map Questions 2 <p>Teachers may choose to share completed Investigation maps, found in the TE, with students and discuss.</p>
Activity 11.2	<p>Explaining How We See Objects, Including Optical Illusions</p> <p>Share projected images:</p> <ol style="list-style-type: none"> 1. Moving Circles 2. Checkerboard 3. Applying the Light Model 1 <p>Teachers may choose to limit the number of options based on student population for creating an explanation for the anchoring activity and materials available to students.</p>

Lesson 12 (1 day)	Infrared Light and the Wave Model
Reading 1	<i>Infrared Light</i>
Activity 12.2	<p>Introducing the Wave Mode</p> <p>Share projected images:</p> <ol style="list-style-type: none"> 1. Waves 2. Rainbow 3. Wavelength <p>Share:</p> <p>http://www.audionotch.com/app/tune/</p> <p>http://www.falstad.com/ripple</p>

Lesson 13 (2 days)	Ultraviolet Light and Nonvisible Light Imagery																								
Activity 13.1	<p>Investigating UV Light Share projected image: 1. Wavelength</p> <p>Teachers may choose to use the bar graph included here from the TE and discuss with students.</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>Visible Light</p> <table border="1"> <thead> <tr> <th>Condition</th> <th>Amount of Light</th> </tr> </thead> <tbody> <tr> <td>No sunscreen</td> <td>1450</td> </tr> <tr> <td>Sunscreen</td> <td>1330</td> </tr> </tbody> </table> </div> <div style="text-align: center;">  <p>UV Light</p> <table border="1"> <thead> <tr> <th>Condition</th> <th>Amount of Light</th> </tr> </thead> <tbody> <tr> <td>No sunscreen</td> <td>13</td> </tr> <tr> <td>Sunscreen</td> <td>3.25</td> </tr> </tbody> </table> </div> </div> <p>and/or share the data table also in the TE and included here</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #4CAF50; color: white;"> <th colspan="2">UV Detector Reading</th> </tr> </thead> <tbody> <tr> <td>Measurement without sunscreen</td> <td>13</td> </tr> <tr> <td>Sunscreen block 25% of UV</td> <td>9.75</td> </tr> <tr> <td>Sunscreen block 50% of UV</td> <td>6.5</td> </tr> <tr> <td>Sunscreen block 75% of UV</td> <td>3.25</td> </tr> <tr> <td>Sunscreen block 100% of UV</td> <td>0</td> </tr> </tbody> </table>	Condition	Amount of Light	No sunscreen	1450	Sunscreen	1330	Condition	Amount of Light	No sunscreen	13	Sunscreen	3.25	UV Detector Reading		Measurement without sunscreen	13	Sunscreen block 25% of UV	9.75	Sunscreen block 50% of UV	6.5	Sunscreen block 75% of UV	3.25	Sunscreen block 100% of UV	0
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Reading 1	<i>Nonvisible Light</i>																								
Activity 13.2	<p>How Would the World Look if People Could See UV and IR Light? Share projected images: 1. Sun with Camera Lens 2. Sun with UV Camera 3. Sun with Infrared Camera 4. Flowers 5. Infrared Photography</p>																								
Appendix 1 (1 day)	Sending Analog and Digital Signals																								
Reading 1	<p><i>Communicating with Analog and Digital Signals</i> Share projected image: 1. Communication Signals</p>																								

Appendix 2 (1 day)	The Solar System
Reading 1	<i>Studying the Solar System</i> Share projected image: 1. Model of the Solar System
Appendix 3 (1 day)	The Earth- Moon- Sun System
Activity 3.1	Lunar Phases Share projected image: 1. Moon Phases Composite Discuss with students, teachers may choose to search for video of lunar phases or use this: https://youtu.be/wz01pTvuMa0
Reading 1	<i>Movements of the Moon</i>
Activity 3.2	Eclipses Share projected images: 1. Moon During Lunar Eclipse 2. Sun During Solar Eclipse 3. Earth During Solar Eclipse: 4. Comparing Lunar and Solar Eclipses 5. Partial Solar Eclipse Teachers may choose to search for a video demonstrating eclipses or use this: https://youtu.be/r6flhCg5eZ4
Activity 3.3	Seasons Share projected image: 1. Earth's Distance from the Sun Teachers may choose to search for a video of seasons or use one of these: https://youtu.be/Pgg0LThW7QA

SUMMATIVE ASSESSMENT: Students should be able to write a scientific explanation for the Driving Question “Can I Believe My Eyes?” or may choose to use the consensus model as their basis for their explanation. By the end of Lesson 11, students should be able to provide an explanation and evidence to support their answers to the DQB.

You might choose to emphasize only a portion of this as a final assessment, given what you are able to teach and what students are actually able to do during this remotely taught unit.