

Physics > Big idea PSL: Sound, light and waves > Topic PSL2: How we see

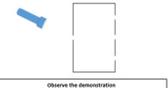
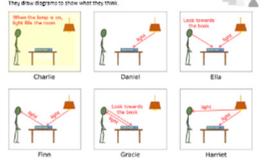
Progression toolkit: The ‘passive eye’ model of vision

Learning focus	Objects are seen when light reflects off them into our eyes.				
As students’ conceptual understanding progresses they can:					
	Describe the pupil in an eye as a hole that light can go through. P	Explain how luminous objects can be seen when light from them enters the eye. P	Illustrate how non-luminous objects can be seen when light reflects off them and enters the eye. P	Explain how non-luminous objects can be seen when sunlight reflects off them and into our eyes.	Apply ideas of how non-luminous objects are seen to interpret new phenomena. B
Diagnostic questions	My eye	Seeing the light	In the dark	Seeing an explanation	
Response activities			How do we see?		Laser beam
				Explaining seeing	Seeing theories

Key:

P Prior understanding from earlier stages of learning

B Bridge to later stages of learning

<h3 style="text-align: center;">My eye</h3> <p>BEST STUDENT WORKSHEET</p> <p>My eye</p> <p>Imagine you are in a room. The book sits on the table & is called a pupil.</p>  <p>Which parts of our eye can detect the light we see? Which of these statements do you think are right? For each statement, tick (✓) or cross (✗) to show what you think.</p> <table border="1"> <thead> <tr> <th>Points</th> <th>I am sure this is right</th> <th>I think this is right</th> <th>I'm not sure</th> <th>I think this is wrong</th> <th>I am sure this is wrong</th> </tr> </thead> <tbody> <tr> <td>A The pupil is how light can get through</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B The pupil can detect light</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C The back of the eye can detect light</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p><small>Developed by the University of York Science Education Group and the Salters' Institute. This document may have been edited. Download the original from www.BestEvidenceScienceTeaching.org. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>	Points	I am sure this is right	I think this is right	I'm not sure	I think this is wrong	I am sure this is wrong	A The pupil is how light can get through						B The pupil can detect light						C The back of the eye can detect light						<h3 style="text-align: center;">Seeing the light</h3> <p>BEST STUDENT WORKSHEET</p> <p>Seeing the light</p> <p>A flashlight has some holes cut in it.</p>  <p>Predict The switch is pointed in the direction above. Which holes do you think the torch will light up?</p> <p>Explain Draw on the diagram to show why you think you will see this.</p>  <p>Observe Record what you see.</p> <p>Explain Were your prediction and explanation correct? If not, can you explain what you observed?</p> <p><small>Developed by the University of York Science Education Group and the Salters' Institute. This document may have been edited. Download the original from www.BestEvidenceScienceTeaching.org. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>	<h3 style="text-align: center;">In the dark</h3> <p>BEST STUDENT WORKSHEET</p> <p>In the dark</p> <p>Imagine you go into a bathroom under the stars and close the door. There was a window. The door is very tight so no light can get in.</p> <p>On the table are some books. The cat is in her basket looking at you. You can see yourself in the mirror.</p>  <p>You switch off the light. After ten minutes, what will you be able to see? Which of these statements do you think are right? For each statement, tick (✓) or cross (✗) to show what you think.</p> <table border="1"> <thead> <tr> <th>Statements</th> <th>I am sure this is right</th> <th>I think this is right</th> <th>I'm not sure</th> <th>I think this is wrong</th> <th>I am sure this is wrong</th> </tr> </thead> <tbody> <tr> <td>A You can see everything, but it's very dim.</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B You can only see the cat's face. They are blinking.</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C You can only see the mirror. It's blinking.</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>D You can't see anything at all.</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p><small>Developed by the University of York Science Education Group and the Salters' Institute. This document may have been edited. 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Pick one statement in each row to explain how.</p> <table border="1"> <tbody> <tr> <td>1</td> <td>Light travels out in all directions from the Sun.</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>Some light from the Sun falls on the book.</td> <td>Some light from the Sun goes into the room.</td> <td>Sunlight fills the room and makes it light.</td> </tr> <tr> <td>3</td> <td>Light is given out by the book.</td> <td>Light is scattered by the book.</td> <td>Light is scattered up by the book.</td> </tr> <tr> <td>4</td> <td>As a result, some light travels from the book to my eyes.</td> <td>At the same time, some light goes from my eyes to the book.</td> <td></td> </tr> <tr> <td>5</td> <td>I see the book because it is lit up.</td> <td>I see the book because the light enters my eyes.</td> <td></td> </tr> </tbody> </table> <p><small>Developed by the University of York Science Education Group and the Salters' Institute. This document may have been edited. Download the original from www.BestEvidenceScienceTeaching.org. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>	1	Light travels out in all directions from the Sun.			2	Some light from the Sun falls on the book.	Some light from the Sun goes into the room.	Sunlight fills the room and makes it light.	3	Light is given out by the book.	Light is scattered by the book.	Light is scattered up by the book.	4	As a result, some light travels from the book to my eyes.	At the same time, some light goes from my eyes to the book.		5	I see the book because it is lit up.	I see the book because the light enters my eyes.		<h3 style="text-align: center;">How do we see?</h3> <p>BEST STUDENT WORKSHEET</p> <p>How do we see?</p> <p>David is looking at a book on the table. The book is lit by a lamp.</p>  <p>Some children are thinking about how David sees the book. They draw diagrams to show what they think.</p>  <p>1. Who do you think is right about how David sees the book? Explain your answer.</p> <p>2. What mistakes do you think the other students make? What would you say to them to help them to understand?</p> <p><small>Developed by the University of York Science Education Group and the Salters' Institute. This document may have been edited. Download the original from www.BestEvidenceScienceTeaching.org. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>
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<h3 style="text-align: center;">Explaining seeing</h3> <p>BEST STUDENT WORKSHEET</p> <p>Explaining seeing</p> <p>Imagine you are reading a book in your bedroom. It is a sunny day and the curtains are open.</p>  <p>Some of these statements about light are correct and some are wrong. Use some of the correct statements to explain how you see a book in a sunny room.</p> <table border="1"> <tbody> <tr> <td>light from the Sun fills the room</td> <td>light travels from my eyes to the book</td> </tr> <tr> <td>some of the light falls on the book</td> <td>light travels out in all directions from the Sun</td> </tr> <tr> <td>light is scattered by the book</td> <td>some of the light travels from the book to my eyes</td> </tr> <tr> <td>the book emits light</td> <td>light from the Sun goes into my eyes</td> </tr> <tr> <td>light is absorbed by the book</td> <td>light from the Sun passes through the window into the room</td> </tr> </tbody> </table> <p>I am sitting in my bedroom. It is sunny outside and I am reading a book. I can see my book because.....</p> <p><small>Developed by the University of York Science Education Group and the Salters' Institute. This document may have been edited. Download the original from www.BestEvidenceScienceTeaching.org. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>	light from the Sun fills the room	light travels from my eyes to the book	some of the light falls on the book	light travels out in all directions from the Sun	light is scattered by the book	some of the light travels from the book to my eyes	the book emits light	light from the Sun goes into my eyes	light is absorbed by the book	light from the Sun passes through the window into the room	<h3 style="text-align: center;">Laser beam</h3> <p>BEST STUDENT WORKSHEET</p> <p>Laser beam</p> <p>When the laser is switched on it emits a beam of light. The beam across the room and hits the wall.</p>  <p>Predict What will you see when the laser is switched on? Will you see the light beam?</p> <p>Explain Why do you think you will see this?</p> <p>Observe What do you see when the laser is switched on?</p> <p>Explain Were your prediction and explanation correct? If not, can you explain what you observed?</p> <p><small>Developed by the University of York Science Education Group and the Salters' Institute. This document may have been edited. Download the original from www.BestEvidenceScienceTeaching.org. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>	<h3 style="text-align: center;">Seeing theories</h3> <p>BEST STUDENT WORKSHEET</p> <p>Seeing theories</p> <p>Read the story below. It describes how scientists reached agreement on how we see.</p> <p>Since ancient times people have wondered how we see. Some of the ancient Greek philosophers thought that our eyes send out light rays. If a ray hits an object, we see it. Others thought that we see an object when light comes from it and enters our eye.</p> <p>This debate rumbled on for almost two thousand years. It was finally settled by a scholar called Ibn al-Haytham. He was born in Basra in the 10th century. He noticed what happened if we look at a very bright light. Our eyes are dazzled and close by themselves. He also noticed what happens when you stare at a light that is off. It might take a few seconds for the moment after you look away, we flash that light through your eyes.</p> <p>Ibn al-Haytham also thought about how we see the distant stars. When we open our eyes we can see them at once. He reasoned that a ray from our eyes could not reach them so quickly. So he thought that light rays must come from every point on the object we are seeing and travel to our eyes.</p> <p>We used this idea to explain how we can see things. Other scientists read his work and agreed with what he said. We still agree with most of his ideas today.</p> <p>Put an arrow in each box. Use the story to help.</p> <table border="1"> <thead> <tr> <th>Hypothesis</th> <th>Alternative hypothesis</th> </tr> </thead> <tbody> <tr> <td>What do all rays think about eyes</td> <td>A different idea about eyes</td> </tr> </tbody> </table> <table border="1"> <tbody> <tr> <td>Evidence to support this (1)</td> <td>Evidence to support this (2)</td> <td>Evidence that this is wrong</td> </tr> </tbody> </table> <p style="text-align: center;">CONCLUSION How does Ibn al-Haytham think we see?</p> <p><small>Developed by the University of York Science Education Group and the Salters' Institute. This document may have been edited. Download the original from www.BestEvidenceScienceTeaching.org. © University of York Science Education Group. 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