

Physics &gt; Big idea PSL: Sound, light and waves&gt; Topic PSL4: Waves

## Key concept (age 11-14)






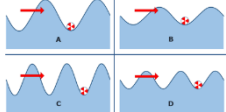


### PSL4.1: Waves on water and ropes

<b>Learning focus</b>	A transverse wave travelling across the surface of water (or along a rope) transfers energy, as particles of water (or rope) are successively made to vibrate at right angles to the direction in which the wave travels.				
<b>As students' conceptual understanding progresses they can:</b>	<div> <div>CONCEPTUAL PROGRESSION</div> <div></div> </div>				
	Recognise that as a transverse wave travels forward, the medium through which it travels does not.  <b>P</b>	Describe the movement of each 'particle' of a transverse wave as the wave moves forward.	Explain how movement of each 'particle' of a transverse wave causes a perturbation to move forward.	Compare the speed of transverse waves that have different amplitudes or frequencies to each other and are moving through a common medium.	Compare the amount of energy transferred by transverse waves that have different amplitudes or frequencies to each other and are moving through a common medium.  <b>B</b>
<b>Diagnostic questions</b>	A moving wave	Part of a moving wave	Rope wave	Faster waves	Energy from a wave
<b>Response activities</b>	Making waves				
		Ripples on a pond			

Key:

**P** Prior understanding from earlier stages of learning

**B** Bridge to later stages of learning

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<p><b>BEST</b> STUDENT WORKSHEET</p> <p><b>A moving wave</b></p> <p>Water waves move through water. But what is that in really moving?</p>  <p>What moves forward with a water wave? Put a tick (✓) in the box next to the best answer.</p> <p>A Just the water moves forward. <input type="checkbox"/></p> <p>B Just the 'hump' of the wave moves forward. <input type="checkbox"/></p> <p>C The 'hump' of the wave and water both move forward. <input type="checkbox"/></p> <p>D A wave pushing the water moves forward. <input type="checkbox"/></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 <a href="http://www.BestEvidenceScienceTeaching.org">www.BestEvidenceScienceTeaching.org</a>. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>	<p><b>BEST</b> STUDENT WORKSHEET</p> <p><b>Part of a moving wave</b></p> <p>A wave moves forward through a water. But how does each bit of water move?</p>  <p>The picture shows a bit of water in front of the wave. The wave moves forward. What do you think happens to this bit of water?</p> <p>For each statement, tick (✓) one column to show what you think.</p> <table border="1"> <thead> <tr> <th></th> <th>I am sure this is right</th> <th>I think this is right</th> <th>I think this is wrong</th> <th>I am sure this is wrong</th> </tr> </thead> <tbody> <tr> <td>A It moves up, then down and then up again.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B It is pushed forward.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C It first moves to go down under the dip.</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 <a href="http://www.BestEvidenceScienceTeaching.org">www.BestEvidenceScienceTeaching.org</a>. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>		I am sure this is right	I think this is right	I think this is wrong	I am sure this is wrong	A It moves up, then down and then up again.					B It is pushed forward.					C It first moves to go down under the dip.					<p><b>BEST</b> STUDENT WORKSHEET</p> <p><b>Rope wave</b></p> <p>Practise makes a wave on a rope. The waves have forward and down quickly. The wave moves forward along the rope.</p>  <p>These statements are about the forces on the rope when the wave moves forward. For each statement, tick (✓) one column to show what you think.</p> <table border="1"> <thead> <tr> <th></th> <th>I am sure this is right</th> <th>I think this is right</th> <th>I think this is wrong</th> <th>I am sure this is wrong</th> </tr> </thead> <tbody> <tr> <td>A When Prudence lifts the rope, the rope in front of her hand is pulled up.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B When rope at the front of the wave lifts up, the rope just behind it is pulled up.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C No forces are pushing forward on the rope.</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 <a href="http://www.BestEvidenceScienceTeaching.org">www.BestEvidenceScienceTeaching.org</a>. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>		I am sure this is right	I think this is right	I think this is wrong	I am sure this is wrong	A When Prudence lifts the rope, the rope in front of her hand is pulled up.					B When rope at the front of the wave lifts up, the rope just behind it is pulled up.					C No forces are pushing forward on the rope.					<p><b>BEST</b> STUDENT WORKSHEET</p> <p><b>Faster waves</b></p> <p>Water waves can be made with a glass of water. If your waves are made by putting it down faster.</p>  <p>1a. Which wave moves faster through the water? Put a tick (✓) in the box next to the best answer.</p> <p>A Wave X moves faster. <input type="checkbox"/></p> <p>B Wave Y moves faster. <input type="checkbox"/></p> <p>C Both waves move at the same speed. <input type="checkbox"/></p> <p>1b. What is the best reason for your last answer? Put a tick (✓) in the box next to the best answer.</p> <p>A Both waves move through the same water. <input type="checkbox"/></p> <p>B Both waves move through the same water. <input type="checkbox"/></p> <p>C It has more energy. <input type="checkbox"/></p> <p>D Less water needs to be moved. <input type="checkbox"/></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 <a href="http://www.BestEvidenceScienceTeaching.org">www.BestEvidenceScienceTeaching.org</a>. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>	<p><b>BEST</b> STUDENT WORKSHEET</p> <p><b>Energy from a wave</b></p> <p>As the waves move forward, it makes the ball move up and down. The waves transfer energy to the ball.</p>  <p>a. Which wave transfers energy to the ball most quickly? Put a tick (✓) in the box next to the best answer.</p>  <p>b. What is the best reason for your last answer? Put a tick (✓) in the box next to the best answer.</p> <p>A This wave contains more water. <input type="checkbox"/></p> <p>B This wave moves the ball faster most quickly. <input type="checkbox"/></p> <p>C This wave contains most energy. <input type="checkbox"/></p> <p>D This wave hits the ball with most force. <input type="checkbox"/></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 <a href="http://www.BestEvidenceScienceTeaching.org">www.BestEvidenceScienceTeaching.org</a>. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>
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<p><b>BEST</b> STUDENT WORKSHEET</p> <p><b>Making waves</b></p> <p>Some children are making a wave on a rope. They want to know how it is made.</p>  <p>To answer:</p> <p>1. State three ways in which this is a good representation of a wave on a rope.</p> <p>2. State three ways in which this is not an accurate representation of a wave on a rope.</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 <a href="http://www.BestEvidenceScienceTeaching.org">www.BestEvidenceScienceTeaching.org</a>. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>	<p><b>BEST</b> STUDENT WORKSHEET</p> <p><b>Ripples on a pond</b></p> <p>Some children from make a bigger boat. It has got much in the middle of a pond.</p>  <p>The children want to get their boat back. They are discussing what will happen if they throw stones into the water.</p> <p>Jenna: Bigger stones make bigger waves.</p> <p>Kelisa: Bigger waves transfer more energy to the boat.</p> <p>Mark: The stone pushes water against the boat.</p> <p>Lara: The waves speed up as they spread out.</p> <p>Nadia: Waves won't push the boat forward.</p> <p>To answer:</p> <p>1. Who is right about what happens? → Explain your answer.</p> <p>2. Who is wrong about what happens? → What would you try to help them 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 <a href="http://www.BestEvidenceScienceTeaching.org">www.BestEvidenceScienceTeaching.org</a>. © University of York Science Education Group. Distributed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</small></p>																																											
Critiquing a representation	Talking heads																																											