Key concept (age 14-16)
PSL6.1: Refraction and dispersion

Progression toolkit: Explaining refraction

Learning focus	Light has wave properties, which allows it to be refracted at a boundary between one transparent medium and another in which it travels at a different speed.				
As students' conceptual understanding progresses they can:	CONCEPTUAL PROGRESSION				
	Use ray diagrams to show how light refracts at a boundary between transparent media. **P**	Describe rules for the refraction of light at a boundary between transparent media.	Use wavefront diagrams to show how water waves refract.	Use a wave model to explain how light refracts.	Compare the refraction of light at the boundary of different pairs of transparent media. **B**
Diagnostic questions	Refracting rays	Bending bananas	Refracting water waves	Representing light Refracting light	Liquid refraction
Response activities	Measuring refraction		Modelling refraction	Explaining refraction	Turning expectations

Key:

P Prior understanding from earlier stages of learning

B Bridge to later stages of learning

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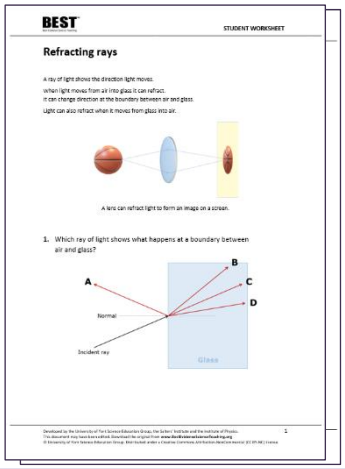
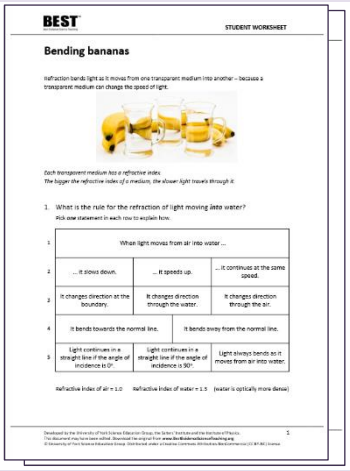
Refracting rays



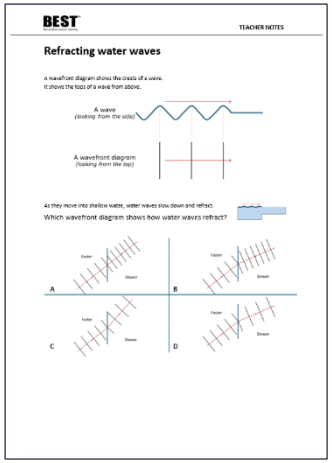
Simple multiple choice

Bending bananas



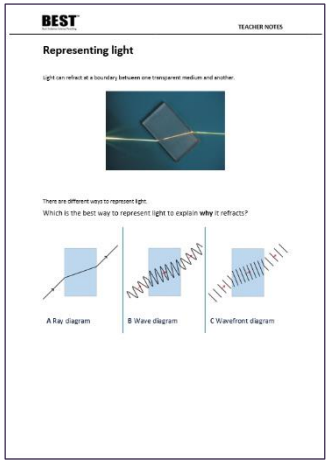
Explanation story

Refracting water waves



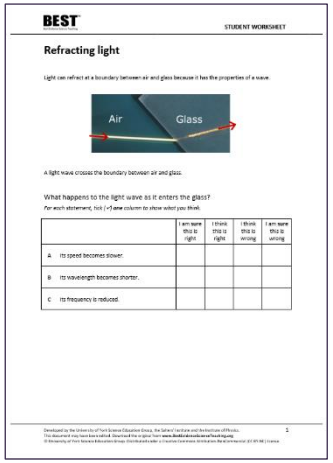
Simple multiple choice

Representing light



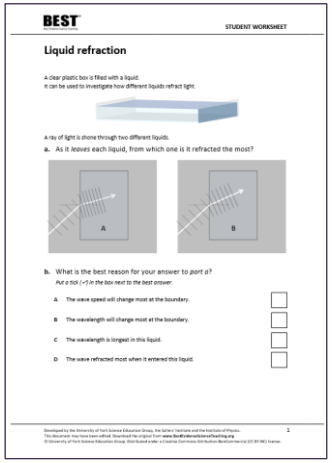
Simple multiple choice

Refracting light



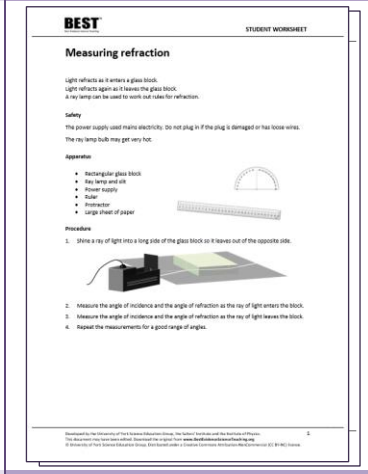
Confidence grid

Liquid refraction



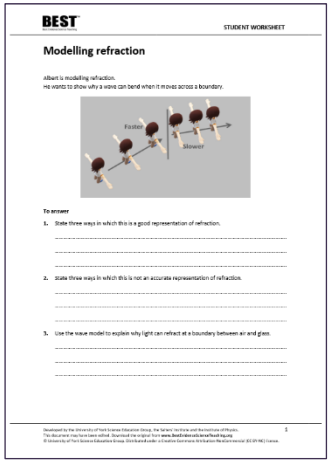
Two-tier multiple choice

Measuring refraction



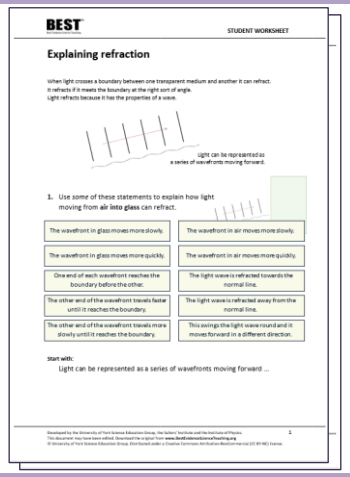
Application and practice - practical

Modelling refraction



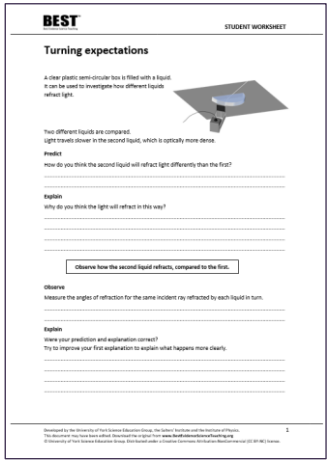
Critiquing a representation

Explaining refraction



Explanation story

Turning expectations



Predict, explain; observe, explain (PEOE)

Developed by the University of York Science Education Group, the Salters' Institute and the Institute of Physics.
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Progression toolkit: Explaining dispersion

Learning focus	The frequency of a light wave determines the colour of the light. When light refracts at a boundary, the size of the angle by which each different colour changes direction is different.				
As students' conceptual understanding progresses they can:	CONCEPTUAL PROGRESSION				
	Use ray diagrams to show how red light refracts as it passes through a prism with three 60° angles. **P**	Explain why red light refracts in the way it does through a prism with three 60° angles.	Explain why blue light refracts more at a boundary than red light.	Predict how blue light refracts as it passes through a prism with three 60° angles.	Compare different colours of pure light. **B**
Diagnostic questions	Refracting red	Prism rules	Refraction blues	Double refraction	The colour violet
Response activities		Prism blues			Light comparison
			Rainbow light		
			Making rainbows		

Key:

P Prior understanding from earlier stages of learning

B Bridge to later stages of learning

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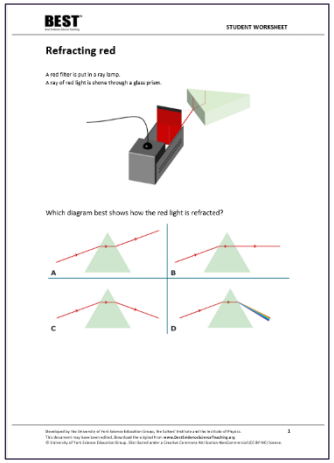
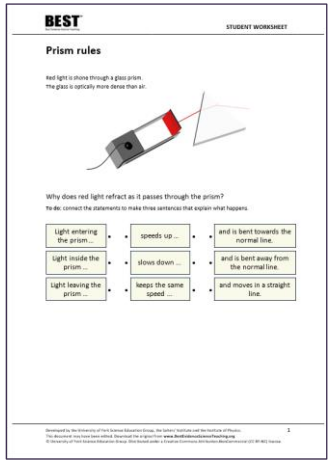
Refracting red



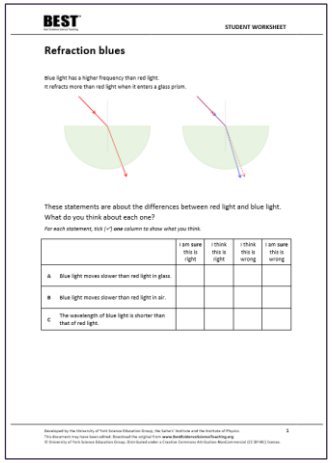
Simple multiple choice

Prism rules



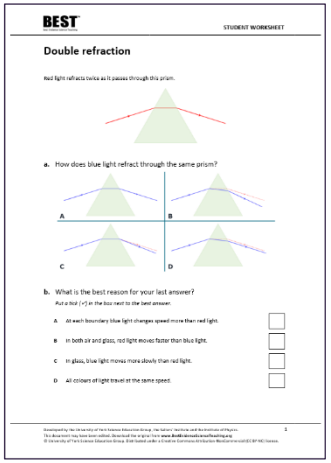
Linking ideas

Refraction blues



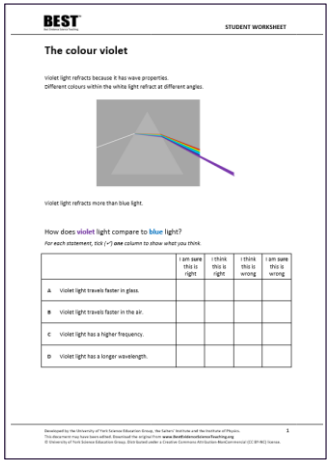
Confidence grid

Double refraction



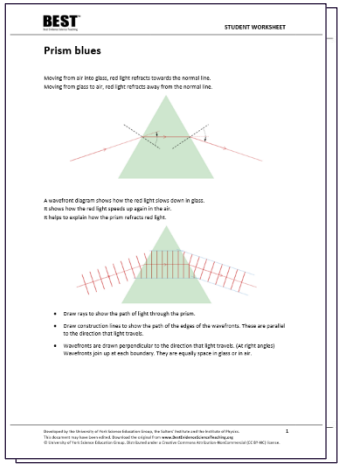
Two-tier multiple choice

The colour violet



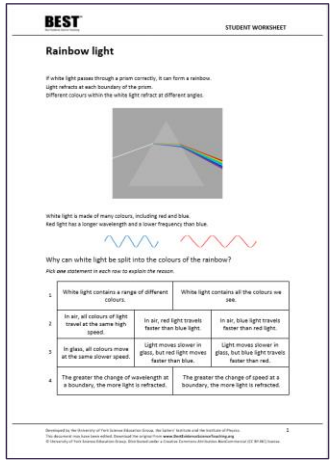
Confidence grid

Prism blues



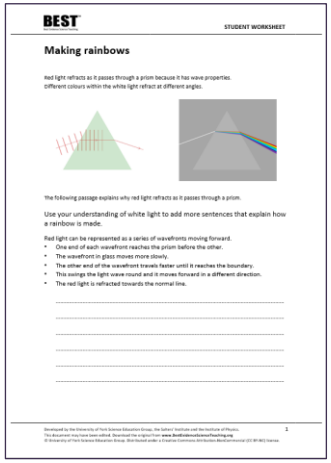
Application and practice

Rainbow light



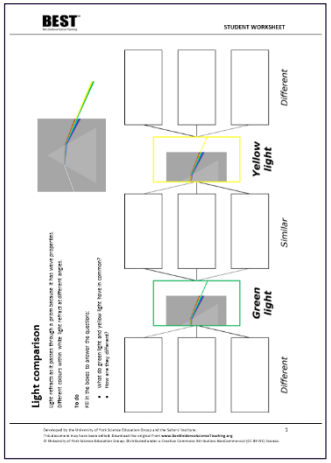
Explanation story

Making rainbows



Explanation story

Light comparison



Application and practice

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