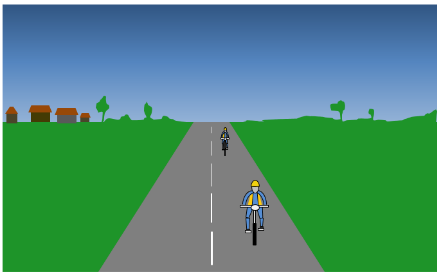
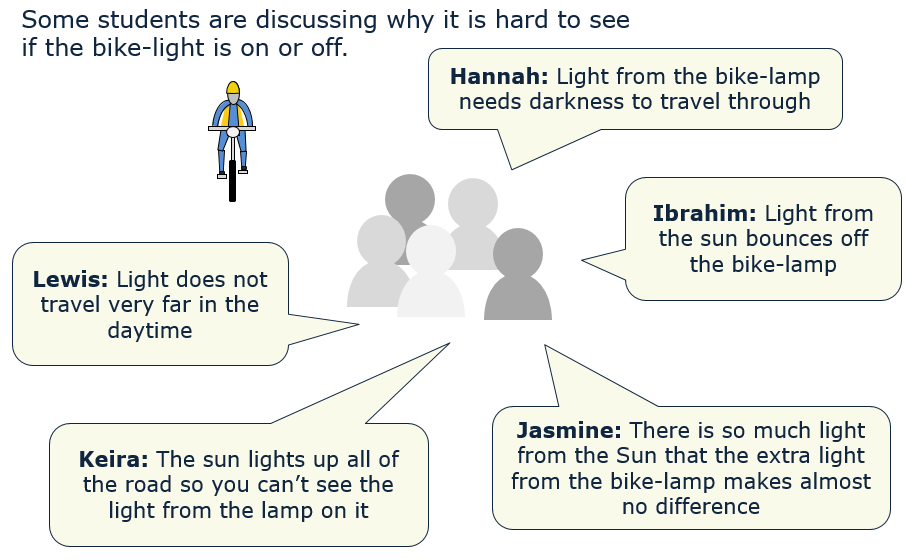
**Daylight**



On a sunny day a cyclist is coming towards you.

It is hard to see if her light is on or off.

****

**To answer**

1. Who do you think is right about why it is hard to see if the light is on?

*Explain your answer*

1. What mistakes do you think the other students made?

*What would you say to them to help them to understand?*

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| --- | --- |
| **Daylight**  cards | **Hannah:** Light from the bike-lamp needs darkness to travel through |
| **Ibrahim:** Light from the sun bounces off the bike-lamp | **Jasmine:** There is so much light from the Sun that the extra light from the bike-lamp makes almost no difference |
| **Keira:** The sun lights up all of the road so you can’t see the light from the lamp on it | **Lewis:** Light does not travel very far in the daytime |

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*Physics > Big idea PSL: Sound, light and waves > Topic PSL1: Sound and light > Key concept PSL1.2: Characteristics of light*

|  |
| --- |
| **Response activity** |
| **Daylight** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Light travels in straight lines at very high speeds. |
| Observable learning outcome: | Explain how light from a bulb illuminates a place. |
| Activity type: | Talking heads |
| Key words: | Light, travel, straight-line |

This activity can help develop students’ understanding by addressing the sticking-points revealed by the following diagnostic question:

* Diagnostic question: Lighting a room

**What does the research say?**

Allen (2014) describes how some students imagine that light moves from a candle, say, to fill a limited space and then stays still. They may think that the light does not travel as far as the dark corners of a room.

Stead and Osborne (1980) also found that most students do not think of light travelling out very far from the source, particularly in day time. Perhaps because torches can be seen to illuminate and change the brightness of distant objects at night, but have no noticeable effect during the day. It has been found that about 40% of 13-15 year olds think that light travels different distances depending on whether it is night or day (Fethersonhough and Treagust, 1990).

In a study of 125 ten and eleven year olds, Anderson and Smith (1986) asked what happens when the light is turned on in a dark room. They found that fewer than 20% of students correctly chose the option ‘light keeps coming out of the lamp and bouncing off things’. Instead over 75% chose the answer ‘the lamp makes the room bright’. This answer does not specify a mechanism and is an incomplete answer that indicates students are not using a general understanding of light to interpret new situations, but instead are describing experiences.

This activity gives students the opportunity to apply their understanding of how light is continually emitted from a lamp to a new situation. In this instance there is a lot of ambient light, but this does not affect how the bike light radiates light.

**Ways to use this activity**

Students should complete this activity in pairs or small groups, and the focus should be on the discussions. The statements are also provided as cut-out cards for students to physically organise.

Students should work together to follow the instructions on either the worksheet or the PowerPoint. Giving each group one worksheet to complete between them is helpful for encouraging discussion, but each member should be able to report back to the class. Listening in to the conversations of each group will often give you insights into how your students are thinking.

If there is disagreement when you take feedback, a good way to progress might be through structured class discussion. Ask one student to explain why they gave the answer they did; ask another student to explain why they agree with them; ask another to explain why they disagree, and so on. This sort of discussion gives students the opportunity to explore their thinking and for you to really understand their learning needs.

*Differentiation*

The quality of the discussions can be improved with a careful selection of groups; or by allocating specific roles to students in the each group. For example, you may choose to select a student with strong prior knowledge as a scribe, and forbid them from contributing any of their own answers. They may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

**Expected answers**

Ibrahim, Jasmine and Keira are correct. The bike lamp works the same as it would in the dark, but there is so much extra light that the additional light it provides is too small to notice.

Hannah is wrong – light from a lamp can travel through a brightly lit place. This can be more easily seen with coloured lights (e.g. traffic lights) because their colour contrasts with the surroundings.

Lewis is wrong and the light from the Sun travels a very long way. It is just that it is harder to see most lights at a distance during the day because the surrounding lights are so bright.

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG).

Images: UYSEG

**References**

Allen, M. (2014). *Misconceptions in Primary Science, Second* ednBerkshire, UK: Open University Press.

Anderson, C. W. and Smith, E. L. (1986). Childrens' conceptions of light and colour: developing the concept of unseen rays. *Annual meeting of the American Educational Research Association.* Montreal, Canada.

Fethersonhough, T. and Treagust, D. (1990). Students' understanding of light and its properties following a teaching strategy to engender conceptual change. *Annual meeting of the American Educational Research Association.* Boston.

Stead, B. F. and Osborne, R. J. (1980). Exploring students' concepts of light. *The Australian Science Teachers' Journal,* 26**,** 84-90.