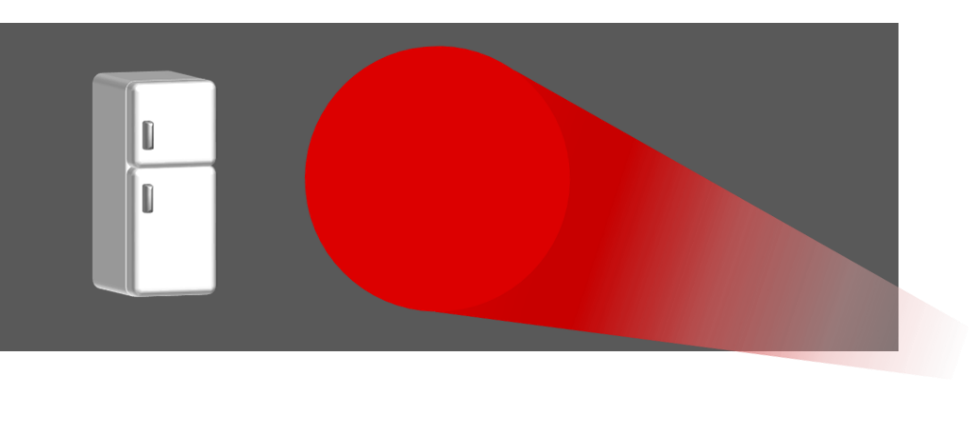
**Red fridge light**

Red light contains no other colours, just red.

In daylight the fridge looks white.



Some students are discussing what colour the fridge looks in red light.

**Georgia:** It reflects the red light into our eyes

**Harvey:** The fridge looks red

**Kyle:** The fridge always looks white

**Isaac:** The red and white mix together

**Jasmine:** White doesn’t reflect any colours

**To answer**

1. Who do you think is right about the fridge in red light?

*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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| Cards for  **Red fridge light** | **Georgia:** It reflects the red light into our eyes |
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*Physics > Big idea PSL: Sound, light and waves > Topic PSL2: How we see > Key concept PSL2.2: Seeing in colour*

|  |
| --- |
| **Response activity** |
| **Red fridge light** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Light has colours that are seen when reflected by bodies. |
| Observable learning outcome: | Describe how white objects reflect all the colours in white light. |
| Activity type: | Talking heads |
| Key words: | Reflect |

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

* Diagnostic question: White stuff

**What does the research say?**

To understand why objects look the colour they do students need first to understand the scientific explanation of how we see non-luminous objects. Students’ development of these ideas are illustrated below and are considered in the key concept: *PSL2.1 The ‘passive eye model’ of vision*.



*The progression in conceptions of vision encountered among 13- to 14-year-olds, towards that of a physicist (Guesne, 1985)*

This activity builds on the understanding that a white object appears white in white light because it reflects all colours of light, and it gives students the opportunity to consider how the colour of an object depends on the colour of the light that reflects off it.

About 8% of a sample of secondary students (n=86) think that the colour is an intrinsic property of an object and will not change in different colours of light (Martinez-Borreguero et al., 2013).

**Ways to use this activity**

This task is intended for discussion in pairs or small groups. It can be done as a pencil and paper exercise or projected onto a screen.

Students should read the statements and follow the instructions on either the worksheet or the PowerPoint. Listening in to the conversations of each group will often give you insights into how your students are thinking. Each member of a group should be able to report back to the class.

Feedback from each group can be used, with careful teacher questioning, to bring out a clear description or explanation of the science.

*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 the 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.

NB in any class, small group discussions typically improve over time and a persistence with this strategy is often very successful in the medium to long term.

**Equipment**

For the class:

* Torch (or other bright light)
* Red filter
* White object of screen

A white object can be shown to appear red in red light. Guidance notes in the key concept: Seeing in colour describe how colour effects can be clearly seen in a school science laboratory.

**Expected answers**

Georgia and Harvey are correct, the others are wrong.

1. The fridge reflects the red light into an observers eyes.

2. Isaac: to see a mix of red and white (pink or pale red), then along with the red light white light must reflect off the fridge as well. There is no source of white light, which needs blue and green as well as red.

Jasmine: white reflects all the colours for us to see it. Jasmine may be thinking that ‘red colour’ is added to white light to make red. Red is a pure colour that does not contain any other colours.

Kyle: thinking the fridge is intrinsically white suggests that Kyle may be thinking that the fridge adds its colour (all the colours of the spectrum) to the red light to make white. Or he may misunderstand how non-luminous objects are seen by light reflecting off them into the eye.

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG).

Images: Peter Fairhurst (UYSEG).

**References**

Guesne, E. (1985). Light. In Driver, R., Guesne, E. & Tiberghien, A. (eds.) *Children's Ideas in Science.* Milton Keynes: Open University Press.

Martinez-Borreguero, G., et al. (2013). Detection of Misconceptions about Colour and an Experimentally Tested Proposal to Combat them. *International Journal of Science Education,* 35:8**,** 1299-1324.