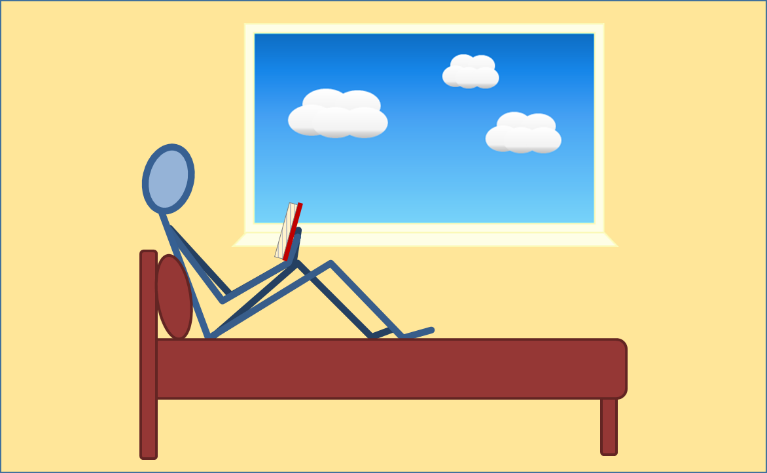
**Explaining seeing**

Imagine you are reading a book in your bedroom.

It is a sunny day and the curtains are open.



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.

light from the Sun fills the room

some of the light falls on the book

light is scattered by the book

the book emits light

light is absorbed by the book

light travels from my eyes to the book

light travels out in all directions from the Sun

some of the light travels from the book to my eyes

light from the Sun goes into my eyes

light from the Sun passes through the window into the room

I am sitting in my bedroom. It is sunny outside and I am reading a book.

I can see my book because......

Explaining seeing cards

light from the Sun fills the room

some of the light falls on the book

light is scattered by the book

the book emits light

light travels from my eyes to the book

light travels out in all directions from the Sun

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*Physics > Big idea PSL: Sound, light and waves > Topic PSL2: How we see > Key concept PSL2.1: The ‘passive eye’ model of vision*

|  |
| --- |
| **Response activity** |
| **Seeing an explanation** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Objects are seen when light reflects off them into our eyes. |
| Observable learning outcome: | Explain how non-luminous objects can be seen when sunlight reflects off them and into our eyes. |
| Activity type: | Explanation story |
| Key words: | Sunlight, absorbed, emits, scattered |

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

* Diagnostic question: Seeing an explanation

**What does the research say?**

To help students develop the scientific explanation that non-luminous object are seen because some of the light scattered off them enters the eye, it can help to remind students of how light reflects off a mirror before considering how objects reflect light from an obvious light source. Students can then be guided to apply this understanding to explain how we see non-luminous objects in more diffuse light (Allen, 2014; Driver et al., 1994).



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

Studies by Ramada and Driver (1989) and Andersson and Karrqvist (1983) found that just 31% of fifteen-year-olds (n=456 and n=166 respectively) described how a girl sees a book using the idea of light going from book to eye. Almost as many either used the non-explanation that ‘light helps us to see’ or gave no explanation at all. Anderson and Smith’s study (1986) showed that 6% of 10- to 11-year olds in their sample held the scientific view of vision, Boyes and Stanisstreet’s study (1991) showed this increases to 10% of 11- to 12-year-olds and 33% of over-14s.

This activity challenges students to create a clear explanation of how a non-luminous object is seen in diffuse sunlight. Irrelevant statements of common misunderstandings make this more difficult. In the picture, the window has been deliberately placed so that it cannot be treated as a clearly defined ‘point source’ of light.

**Ways to use this activity**

This task is intended for discussion in pairs or small groups. It is best done as a card sort exercise and cards have been provided to use with the PowerPoint or worksheet.

Students should read the statements and follow the instructions on the worksheet. 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.

After completing this activity the cards can be collected in and students allowed to write their own individual explanations.

*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.

**Expected answers**

I am sitting in my bedroom. It is sunny outside and I am reading a book.

I can see my book because...

…light travels out in all directions from the Sun.

Light from the Sun passes through the window into the room.

Some of the light falls on the book [and] is scattered by the book.

Some of the light travels from the book to my eyes.

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG), from York Science activity 3.2c: Explaining seeing

Images: Peter Fairhurst (UYSEG)

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