**Seeing stars**

On a clear night there are lots of stars in the sky.

We can usually see about two-thousand stars.



**What do we know about the stars in the sky?**

Which of these statements do you think are right?

For each statement, tick (✓) **one** column to show what you think.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | I am **sure** this is right | I think this is right | I think this is wrong | I am **sure** this is wrong |
| **A** | We can see all the stars that there are |  |  |  |  |
| **B** | Dim stars are all further away than bright stars |  |  |  |  |
| **C** | Some stars are so dim we can’t see them |  |  |  |  |
| **D** | We can see *more* stars with a telescope |  |  |  |  |
| **E** | There are many more stars further away in space |  |  |  |  |

*Physics > Big idea PES: Earth in space> Topic PES1: Solar System and beyond > Key concept PES1.3: Night sky, stars and galaxies*

|  |
| --- |
| **Diagnostic question** |
| **Seeing stars** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | The Sun is one of billions of stars in our galaxy and our galaxy is one of many billions of galaxies in the universe. |
| Observable learning outcome: | * Explain why only a few thousand stars can be seen at night with the naked eye |
| Question type: | Diagnostic, confidence grid |
| Key words: | Stars, telescope |

**What does the research say?**

This question investigates students’ ideas about the evidence we have for the numbers of stars that there are. Stars further than a few hundred light-years away are too faint to be seen with the naked eye, but there are many, many more stars further away than this that we can’t see. Their existence is essential to our understanding of galaxies.

Large structures in the universe can be difficult for students to comprehend. A study found US college students (aged 17-19, n=199) commonly provide incomplete definitions of common objects: Solar System, galaxy and the Universe itself, often conflating the terms (Bailey et al., 2012).

The BEST key concept: *PSL1.1* *Characteristics of light* contains the learning objective: *explain why light gets dimmer farther from a light source*.

**Ways to use this question**

Students should complete the confidence grid individually. This could be a pencil and paper exercise, or you could use an electronic ‘voting system’ or mini white boards and the PowerPoint presentation.

If there is a range of answers, you may choose to respond 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*

You may choose to read the questions to the class, so that everyone can focus on the science. In some situations it may be more appropriate for a teaching assistant to read for one or two students.

**Expected answers**

C, D and E are correct.

A and B are wrong

**How to respond - what next?**

Students who are aware we can see many more stars with a telescope (D) are likely to have experienced telescopes either directly or indirectly, and those who think that these two-thousand stars are all the stars that exist (A) probably have not.

Some stars are dim because they are further away than similar stars, others look dim because they are just not very bright. B is wrong because *all* dim stars are not further away.

If students have misunderstandings about why only a few thousand stars can be seen with the naked eye, it can be helpful to show images from telescopes or video-clips showing the vast numbers of stars in space. Students should be able to describe how objects look smaller as they move further away. The following BEST ‘response activity’ shows how moving stars further away change their size and brightness until they can’t be seen, and could be used in follow-up to this diagnostic question:

* Response activity: Counting stars

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG)

Images: Peter Fairhurst (UYSEG)

**References**

Bailey, J., et al. (2012). A multi-Institutional Investigation of Students' Preinstructional Ideas About Cosmology. *Astronomy Education Review,* 11 (1).