**Which season?**

Days are longer in summer because the Earth tilts towards the Sun.

The diagram shows summer in York (England).



Not to scale

What do you think happens in other countries?

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** | When it is the middle of summer in some countries, it is the middle of summer in every country. |  |  |  |  |
| **B** | When it is the middle of summer in some countries, it is the middle of winter in some other counties. |  |  |  |  |
| **C** | When it is the middle of summer in some countries, it is the middle of autumn in some other countries. |  |  |  |  |

*Physics > Big idea PES: Earth in space > Topic PES2: Earth and Sun > Key concept PES2.1: Days and seasons*

|  |
| --- |
| **Response activity** |
| **Which season?** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | The temperature is higher in the summer because the tilt of the spinning Earth increases the length of a day *and* increases the heating effect of the Sun’s radiation. |
| Observable learning outcome: | Explain why days are longer in summer and shorter in winter. |
| Activity type: | Confidence grid |
| Key words: | Equator, hemisphere, season, tilt |

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

* Diagnostic question: Summer days

**What does the research say?**

One consequence of the Earth tilting towards the Sun in summer is the increase in the length of the day. Depending at which latitude students live, they are likely to have different perceptions of changes to day length. In Greece, Bakas and Mikropoulos (2003) found just 17% (n=102) of 11- to 13-year-olds realised day lengths changed through the year, whereas the phenomenon would be obvious to students in Scandinavia. Students are often able to suggest that this is caused by the tilt of the Earth, without being able to explain the mechanism (Baxter, 1989; Dunlop, 2000; Lelliott and Rollnick, 2009).

Constructivist teaching strategies that challenge student misunderstandings were shown to significantly improve knowledge about the causes of seasons (Trumper, 2006) and elicit longer retention of the scientific concepts (Tsai and Chang, 2005).

This question investigates how students apply understanding that days lengths change because of the tilt of the Earth and its movement around the Sun.

**Ways to use this activity**

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**

A is wrong because when the northern hemisphere is tilted towards the Sun, the southern hemisphere is tilted away from the Sun. In the south days are shorter and it is winter.

B is correct for the same reasons as A.

C is wrong, again for the reasons above. Three months after summer in the north and winter in the south, it will be autumn and spring. Seasons in opposite hemispheres are always six months out of sync.

The model used in the response activity *Long days of summer* can be used to illustrate these ideas.

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Developed by Peter Fairhurst (UYSEG).

Images: Peter Fairhurst (UYSEG); globe: https://pixabay.com/illustrations/globe-world-green-blue-earth-1579177/

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