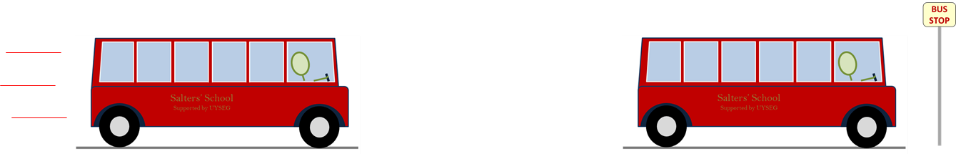
**Is it accelerating?**



Some children are talking about what happens when their school minibus slows down.

**James:** It isn’t accelerating because it is slowing down

**Katie:** It has a negative acceleration because its speed is changing to a smaller number

**Lisa:** It is accelerating because it is changing speed

**Mason:** It had a big acceleration before it started to slow down

*Talk about your answers to these questions*

1. Who do you think is right about the acceleration?

*Explain your answer*

* 1. What mistakes do you think the other children made?

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

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| --- | --- |
| Cards for  **Is it accelerating?** |  |
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*Physics > Big idea PFM: Forces and motion > Topic PFM2: Moving by force > Key concept PFM2.1: Describing speed*

|  |
| --- |
| **Diagnostic question** |
| **Is it accelerating?** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | Speed is a measure of how fast an object travels: how far it goes in a given time |
| Observable learning outcome: | Identify when speed is changing the most quickly and acceleration is biggest |
| Question type: | Response, talking heads |
| Key words: | Acceleration, speed |

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

* Diagnostic question: Speed or acceleration?
* Diagnostic question: Acceleration
* Diagnostic question: Biggest acceleration

|  |  |
| --- | --- |
| **B** | **BRIDGING**  This response activity probes understanding of ideas that are usually taught at age 14-16, to build a bridge to later stages of learning. |

**What does the research say?**

Introducing and rehearsing vocabulary that allows students to describe observations accurately is an essential first step towards understanding motion. Students do not usually make a clear distinction between speed and acceleration. Often students do not use the word acceleration outside of their science lessons, and instead talk about speeding up or slowing down. Acceleration may be seen as ‘going fast’ (Driver et al., 1994).

This activity investigates students’ understanding of acceleration when objects are slowing down. It introduces the idea of negative acceleration.

**Ways to use this question**

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.

**Expected answers**

1. Lisa and Katie are correct. The minibus is changing speed so it is accelerating. Negative acceleration means that speed is being *taken away* from the motion.

2. James has confused acceleration with meaning just speeding up, but more generally acceleration means changing speed.

Mason has confused speed with acceleration and thinks going fast means a big acceleration.

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG).

Images: Peter Fairhurst (UYSEG).

**Reference**

Driver, R., et al. (1994). *Making Sense of Secondary Science: Support Materials for Teachers,* London: Routledge.