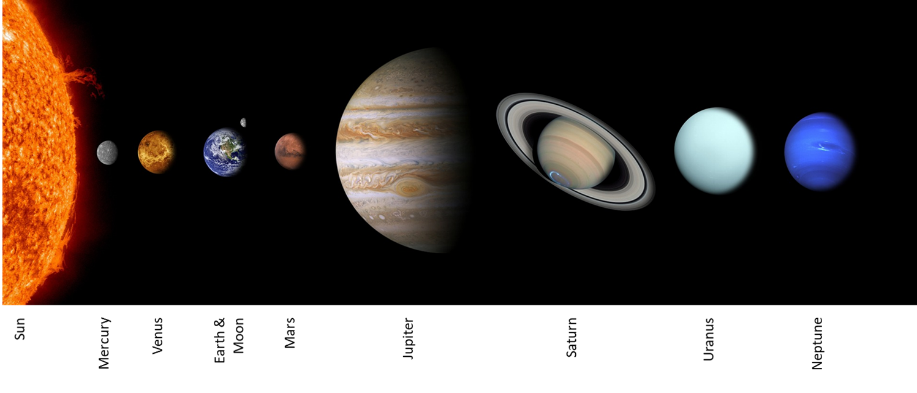
**The Solar System**

Some students are making a poster about the Solar System.

They have found this picture to help.



The students are discussing the picture.

**Ruby:** It shows all the planets to scale

**Umar:** The planets are all too close to each other

**Tom:** The planets are in a straight line that shows how they move around the Sun

**Vicky:** It shows the Sun as a huge ball of fire

**Sam:** Most of the planets should have moons

**To answer**

1. Who do you think is right about the picture of the Solar System?

*Explain your answer*

1. What mistakes do you think the other students have made?

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

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*Physics > Big idea PES: Earth in space > Topic PES1: Solar System and beyond > Key concept PES1.1: Planets and the Solar System*

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| --- |
| **Response activity** |
| **The Solar System** |

**Overview**

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| Learning focus: | In the Solar System: eight planets orbit a star called the Sun; moons orbit most of the planets; and the planets spin on their axes. We live on the Earth where: a year is defined as the time for the Earth to orbit the Sun; a day as the time it takes the Earth to spin on its axis; and the Moon orbits in about 28 days. The planets are very small compared to the huge distances between them. |
| Observable learning outcome: | * Describe the sizes of the Sun, Moon, Earth and other planets and the distances between them |
| Activity type: | Response, talking heads |
| Key words: | Earth, Sun, Moon, planets, axis, orbit |

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

* Diagnostic question: The size of space

**What does the research say?**

It can be tempting to keep work on the Solar System simple and descriptive when in fact it is conceptually demanding (Osborne, 2011). In the sky the Sun appears to be smaller than the Earth but in fact is much bigger and very far away. The Moon looks to be the same size as the Sun, but is much, much smaller and also much closer.

One problem with models of the Solar System is the difficulty of scale. If the Earth is modelled as the size of a soccer ball, the Moon would be the size of a tennis ball orbiting at 6.6m from the Earth, and on the same scale the Sun would be the size of a (spherical) ten storey building about 2.6 kilometres away.

Diagrams of the Solar System in books and on posters are often poorly drawn and not to scale which can lead to persistent misunderstandings (Taylor, Barker and Jones, 2003). There is evidence that students typically have a poor understanding of the scale of space and it is recommend that there is a greater focus on the teaching of distance and size to help explain astronomical phenomena more clearly (Lelliott and Rollnick, 2009).

**Ways to use this activity**

Students should complete this activity in pairs or small groups, and the focus should be on the discussions. The statements are also provided as cut-out cards for students to physically organise.

Students should work together to follow the instructions on either the worksheet or the PowerPoint. Giving each group one worksheet to complete between them is helpful for encouraging discussion, but each member should be able to report back to the class. Listening in to the conversations of each group will often give you insights into how your students are thinking.

If there is disagreement when you take feedback, a good way to progress might be 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*

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 a 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**

Ruby, Sam and Umar are all correct.

Tom is wrong because the planets are all orbiting the Sun at different speeds and are spread out around the Sun. They do (mostly) orbit on the same plane. Some students who suggest Tom is correct may have the correct understanding. It can be useful to examine how the way he has phrased his point can be misinterpreted.

Vicky makes a common error in thinking that the Sun is a ball of fire. If it were it would have used all of its fuel several billion years ago. It is a star that is powered by energy released in nuclear reactions. (Near to its centre it is fusing hydrogen into helium through nuclear fusion reactions.)

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG).

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**References**

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