Playground planets

Modelling the relative sizes of the planets and their distances from the Sun

Ask the pupils to name the planets in our Solar system from the sun outwards. It can be useful to use a mnemonic to help to remember the order.

Mercury	Most
Venus	Volcanoes
Earth	Erupt
Mars	Marmalade
Jupiter	Jam
Saturn	Sandwiches
Uranus	Under
Neptune	Normal
Pluto*	Pressure

**Pluto is now considered to be a dwarf planet made of rock and ice, the largest member of the Kuiper belt*

Explain that the planets closest to the Sun (Mercury to Mars) are rocky planets and those further away (Jupiter to Neptune) are made mostly of gas.

Ask the pupils to try to match the balls provided to the planets and to the Sun. The correct sizes are provided in the following table:-
The scale is approximately 2 billion to 1

Planet	Diameter (km)	Model diameter (mm)
Mercury	4,879	2
Venus	12,106	6
Earth	12,756	6
Mars	6,792	3
Jupiter	142,984	71
Saturn	120,536	60
Uranus	51,120	26
Neptune	49,528	25
Pluto	2,300	1
Sun	1,392,000	696

In the playground or school field, ask the pupils to position the planets at their correct distances from the Sun. One pupil holds the 'Sun' and a looped end of rope. The other pupils position themselves along the rope at the metre distances from the end of the rope shown by the figures in bold in the second table:-

Planet	Distance from Sun (km)	Distance along rope from Sun (m) c.100 billion to 1	*Distance from Sun (m) c.2 billion to 1*
Mercury	46,000,000	**0.46**	*23*
Venus	109,000,000	**1.09**	*54.5*
Earth	150,000,000	**1.5**	*75*
Mars	235,000,000	**2.35**	*117.5*
Jupiter	780,000,000	**7.8**	*390*
Saturn	1,400,000,000	**14**	*700*
Uranus	2,700,000,000	**27**	*1350*
Neptune	4,500,000,000	**45**	*2250*
Pluto	7,370,000,000	**73.7**	*3685*

Pupils at Ysgol Brynhyfryd, Ruthin, Denbighshire
Photo: Steve Blakesley

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The back up:

Title: Playground planets

Subtitle: Modelling the relative sizes of the planets and their distances from the Sun

Topic: The Earth and beyond

Age range of pupils: 8 to 16 years

Time needed to complete activity: 45 minutes

Pupil learning outcomes: Pupils can:

- list the correct order of the planets from the Sun;
- identify the relative sizes of the planets and the Sun using scaled models;
- place the planets at the correct scaled distances from the Sun
- appreciate the enormous distances involved and the enormous size of the Sun relative to the planets.

Context:
This activity can be used in any lesson about space and astronomy. It can also be used in mathematics for work on large numbers and scale. The scale of

2 billion to 1 demonstrates very well the enormous size of the Sun compared with the planets. For the distances of the planets from the Sun, however, it is best to use a scale of 100 billion to 1 so that the activity can be carried out within school grounds. Figures for the scale of 2 billion to 1 are given in the second table; Pluto is then over 3km away from the Sun.

Following up the activity:
If there is enough space when the pupils are the correct distances from the Sun, they would walk around the Sun simulating the orbits of the planets. The planets revolve around the Sun at different speeds and their orbits vary from circles to ellipses. A discussion could follow about year length and day length on the planets. Research could be carried out on their composition and the number of moons they have.
There could also be discussion about the frequent misrepresentations of planet size and distances in books, models and on TV programmes, such as 'Star Trek'.

Underlying principles:
- The solar system is made up eight planets (nine including Pluto) which travel round the Sun in elliptical movements.
- 98.8% of the mass of the solar system consists of the Sun.
- The Sun is one of billions of stars that make up our galaxy, the Milky Way. There are billions of galaxies in the known Universe.
- The solar system is 4·6 billion years old.
- The Universe from the Big Bang to the present day is about 13 billion years old.

Thinking skill development:
Relating the models to the planets in the solar system involves bridging.

Resource list:
- 2 x 2mm dia. silver dragee - cake decoration (Mercury and Pluto)
- 1 x 3mm dia. ball bearing (Mars)
- 2 x 7mm dia. ball bearings (Earth and Venus)
- 2 x 23mm dia. balls, e.g. hi-bounce power balls, (Uranus and Neptune)
- 1 x 56mm dia. ball, e.g. spherical fishing float, with card ring disk (Saturn)
- 1 x 66mm dia. ball, e.g. tennis ball, (Jupiter)
- 1 x 6500mm dia. ball e.g. beach ball, Pilates exercise ball (Sun)
- 75 metres of thin rope or a metre trundle wheel

(Note: some of the balls will have to be close approximations to the actual diameter required and can be made from modelling clay.)

Useful links:
www.spacerocketroadshow.co.uk
www.conceptcartoons.com
www.nasa.gov/audience/forkids/kidsclub/flash/index

Source:
Adapted by the Earthlearningidea Team from an idea by Steve Blakesley (Blakesley Consultants http://blakesleyconsultants.com).