More Examples of the Bright Ideas Time: Odd One Out

Explorify have worked with us and used our research to develop a whole range of Odd One Outs that are available at: https://explorify.uk/

This is the easiest prompt to use when beginning the Bright ideas Time with your children. In this activity, which should be kept verbal, there are no correct answers. What is expected is that children can give clear, reasoned arguments to support their ideas. It is occasionally good to ask the children to give a reason for each one to be the Odd One Out. There are notes by the examples to give an idea of the direction in which the discussion might flow, but part of the joy of this activity is that it is open and so there will be unexpected answers! You can have 3 or 4 objects to choose from. It can be helpful to use real objects, especially for younger children.

Ready-to-go Odd One Out slides are freely available on the PSTT website here: https://pstt.org.uk/resources/bright-ideas/

Which is the Odd One Out and Why?		
National Curriculum	**Prompt**	**Subject knowledge/ideas**
Life processes & living things	A spring, summer, autumn and winter scene	KS1: The seasons
	A child dressed in spring, summer, autumn and winter clothes	KS1: The seasons
	A cow, a sheep, a dog and a lion	KS1: farm animals, wild animals, herbivore, omnivore, carnivore
	A teddy bear, a dog and a monkey	KS1: things that are living and things that have never been alive
	A teddy bear, a dog and a tree	KS1: Often young children do not think that a plant is alive, so this may spark some interesting debate
	A root, a stem and a flower	KS1/2: They may consider the external appearances & progress to consider their functions
	A dog, a bird, a fly, a frog	KS2: Time to think about the characteristics and behaviour of these animals
	A baby, a child, a teenager and an adult	KS2: Growth and development of humans

Which is the Odd One Out and Why?		
National Curriculum	**Prompt**	**Subject knowledge/ideas**
Life processes & living things	Very young animals: a bird in a nest, a lion cub, a tadpole and a baby	KS2: Life cycles, comparing how different animals reproduce and grow
	Fire, a tree and a dog	KS 2: A fire seems to exhibit many of the characteristics of living things, such as growth, movement but, of course, is not alive.
Materials and their properties	Plastic spoon, ball of wool and a wooden block	KS1: Properties of materials, vocabulary building, synthetic and natural materials
	Kitchen foil, paper, cling film, bin liner	KS1: Properties of materials
	Chocolate, milk, ice cubes, bread	KS1/2: Properties of materials. Change of state, food sources…
	Chocolate, water, paper	KS1/2: Properties of materials: liquids solids, changes of state, reversible and not reversible changes
	Bubble wrap, aluminium foil and a tissue	KS2: Electrical conductor or insulator, thermal conductor or insulator, metal and non-metal, strength, shiny
	Sand, iron filings, sawdust	KS2: Properties of materials: magnetic materials, metals and non-metals
	Sand, salt, iron filings	KS2: Properties of materials: solubility, response to magnets etc
	Chocolate, a stone and water	KS2: Liquids, change of state, reversible changes
	Coal, wood, paper and stone	KS2: Can be burnt (non-reversible change), natural and manufactured
	A magnet, an iron nail and a piece of copper	KS2: Properties of materials, magnetic materials, metals etc

Which is the Odd One Out and Why?		
National Curriculum	**Prompt**	**Subject knowledge/ideas**
Physical processes	Ice skates, a scooter and a skateboard	KS2: Forces to make something speed up or slow down, friction etc
	The real things or pictures showing the soles of football boots, ice skates, trainers and snow boots	KS2: Forces, friction etc
	Photos of these swimming in water: a fish, a penguin, and a dog	KS2: Water resistance and adaptation to environment
	A basketball, a golf ball, a squash ball and a ball made of plasticine.	KS2: Forces: what affects how high a ball bounces. N.B. Much better to have the real objects and not photos!
	A parachutist, a sycamore seed and a conker	KS2: Air resistance, seed dispersal
	A battery, a light bulb and a motor	KS2: The battery is the only one that will 'go flat', the light bulb glows, the motor moves, the battery is the only necessary for the other two to work
	A guitar, a piano and a drum	KS2: Characteristics of different musical instruments & how sound is produced.
	A torch, a glow-worm, a lit candle, the Moon	KS2: Sources of light, reflected light
	The Moon, a torch and a lit light bulb	KS2: Sources of light, reflected light
	The Earth, the Moon and the Sun	KS2: The Sun is the only star – it generates ins own heat & light. The Earth because it is the only one that supports life. The Moon is the smallest etc

More Examples of the Bright Ideas Time: PMI

Again in this activity there are no correct answers. The PMI involves considering in turn the positives, minuses and interesting points related to a specific scenario. It was originally developed by de Bono. It encourages children to look at both sides of a situation and also to be creative when considering the interesting possibilities. The examples below give ideas and some possible answers but what emerges depends on the children!

Ready-to-go PMI slides are freely available on PSTT website here: https://pstt.org.uk/resources/bright-ideas/

PMI		
National Curriculum	**Prompt**	**Subject knowledge/ideas**
Life processes & living things	A skeleton made of a flexible material	KS1/2: This is great fun. They can think about folding themselves into a drawer, never being able to break a bone etc. The discussion can then lead to the very special properties of bone and how it protects our inner organs, as well as providing the rigidity we need to walk etc
	Plants can walk	KS2: It is interesting to realise that plants do not need to move because they make their own food by photosynthesis – animals have to move in order to forage for food. P: the plant could move where there is more light or water M: the plant would waste energy by moving I: Garden make-over programmes would go out of business because the plants would move after planting!
	Only humans are left in the world.	KS2: Interdependence P: No more mosquito bites M: No plants because no pollination, so no food I: Industries to develop alternative methods of pollination

PMI		
National Curriculum	**Prompt**	**Subject knowledge/ideas**
Materials and their properties	An umbrella made of glass	KS1/2: Each of these scenarios link to the fitness of materials for purpose and will require the pupils to draw on their understanding of the properties of the materials in question.
	A house made of steel	
	Windows made of wood	
	The freezing point of water becomes 10^0C	KS2: Water is an amazing substance. If it froze at a higher temperature, icy weather would be more frequent. What would it feel like? P: Better for ice skating M: Too much ice on the tracks most of the time for the trains to run! I: Permanent ice sculptures in the winter
	The ice caps melt	KS2: Pertinent, possible and sad!
Physical processes	A world without electricity	KS1: This could be the focus for a cross-curricular link to history
	A world with no friction	KS2: This helps the pupils to realise that friction is useful, as well as hindering motion. P: We would all become expert skaters! M: Cars would not be able to start or stop! I: We would need to design something that would stop our tea sliding off the plate.
	Gravity is reduced by a half	KS2: P: We could jump much higher M: Our muscles would lose their tone – like the astronauts experience when they return to Earth I: We would have to redesign our sports pitches – players could bound down the field far more easily
	The Earth stops spinning	One side of the Earth would have permanent daylight, the other permanent darkness. Gravity would not change though – many people think it is caused by the spin of the Earth but not so!

More Examples of the Bright Ideas Time: The HOT Question

This is an exciting way of encouraging the children's thinking skills. It can seem scary as we, as teachers, do not know all the answers but the joy is in the finding out! **Ready-to-go HOT Question slides** (previously called Big Questions) are freely available on PSTT website: https://pstt.org.uk/resources/bright-ideas/

The HOT Question		
National Curriculum	**Prompt**	**Subject knowledge/ideas**
Life processes & living things	Is a tree alive?	KS1: It is harder for children to understand a plant is alive, as it does not obviously move and certainly does not talk!
	How do you know the person next to you is alive?	KS1/2: Whether or not something is alive and how it is possible to know is one of the big ideas in science. This discussion will lead to an exploration of the characteristics of living things.
	Is a flame alive?	KS2: A flame appears to exhibit many of the life processes: • Nutrition - it uses fuel • Growth – fires become larger • Movement – flames flicker • Reproduction – flames can leap from one place to another • It produces 'waste' – ash and smoke • It needs oxygen Of course, a flame is not living as it is not made up of cells and it is not growing, reproducing or producing waste in a biological sense. This can form the basis of a very interesting discussion.
	Why do plants need to spread their seeds about?	KS2: Thinking about why spreading seeds far and wide is advantageous
	Is it better for a wind dispersed seed to fall quickly or slowly? Why?	KS2: A point to debate
	Why do people get old?	KS2: a debate about the ageing process.

The HOT Question		
National Curriculum	**Prompt**	**Subject knowledge/ideas**
Life processes & living things	I planted a tree in my garden 4 years ago. It now weighs 250kg more. Where did this 250kg come from?	KS2: It is amazing to consider the fact that the mass of the tree has been produced due to photosynthesis. KS2 pupils are not expected to understand photosynthesis but they are expected to know that plants make their own food. It is a common misconception to think that the roots take in the food for the plant, not helped by the fact that some fertilisers are labelled 'plant food'! The roots take in the necessary minerals but the 'food' is provided by the Sun's energy which is captured in the leaf and causes an irreversible reaction between the carbon dioxide and water to form the mass of the plant.
Materials and their properties	What are the properties of a solid?	KS1/2: This is quite a challenging question - children often describe a solid as hard and can then be shown a sponge and asked if that is then a liquid. It is worth pointing out that we tend to recognise quickly which materials are liquids and which are solids but we find it very hard to pin down how our brain carries out this categorisation (see below).
	What are the properties of a liquid?	KS1/2: Children will often describe a liquid as wet but what exactly does wet mean? They will tend to say that you can 'put your hand through a liquid' but then I can put my hand through sand in a sandpit. Children tend to be able to arrive at the concept of a solid having a fixed shape whilst a liquid will take the shape of its container. They may well lead them to point out that sand or flour will take the shape of its container. However, of course, one grain of sand will have a fixed shape. In scientific terms, the definitions can be made short and sharp: • a solid has a fixed volume and a fixed shape; • a liquid has a fixed volume and no fixed shape

The HOT Question		
National Curriculum	**Prompt**	**Subject knowledge/ideas**
Materials and their properties	Where does a puddle go?	KS2: This is an example of evaporation, i.e. the change of state of the water in the puddle from a liquid to a gas. The liquid water in the puddle evaporates and becomes water vapour which is a gas. Evaporation is different from boiling! It takes place at a lower temperature and is much less vigorous. Evaporation takes place more rapidly when there is a large surface area, so a puddle is ideal.
	Where does salt go when it is dissolved in water?	KS2: When a solid dissolves, it appears to disappear but where has it gone? This can lead to the big idea of atoms as the solid breaks down into very, very small particles which are spread throughout the particles of the liquid. They are so small that they cannot be seen.
	Where does the wax go when a candle burns?	It would be good to burn a tea-light and for the pupils to see that there is no wax left when it finally stops burning. Some think that the wax has evaporated. When water evaporates and something cold (like a glass beaker) is held in the steam (water vapour), it turns back to water droplets on the beaker. Hold a glass beaker over a burning tea-light and no droplets of wax are seen – in fact, black soot appears. The wax does not evaporate. The wax burns, so the atoms in the wax react with oxygen in the air and cause heat to be released; carbon dioxide and water are the new products and go off as gases.
Physical processes	What can you see when there is absolutely no light? Why?	KS1: Being in pitch darkness, where a hand literally cannot be seen in front of a face, brings home the concept that there needs to be a source of light in order to see. This then leads on to the following question.
	Why do we see 'history' whenever we look at the stars?	KS2: We see the stars as they were when the light left them. This means that there is a slight chance that some of the stars that we see no longer exist. Since the light that enters our eyes left them thousands or millions of years ago, it is possible that some have undergone a catastrophic happening and no longer exist as stars.

The HOT Question		
National Curriculum	**Prompt**	**Subject knowledge/ideas**
Physical processes	Why are insulators as important as conductors?	KS2: It is interesting to realise that electricity would be unusable if insulators did not exist, as well as conductors. Turning on any switch would a shocking experience!
	When/why is friction useful?	KS2: Forces
	When/why is friction not useful?	KS2: Forces
	Why is a glider shaped like this?	KS2 Forces: The pupils need to see a photo of a glider
	Why do the Sun and the Moon look the same size in the sky?	KS2: The Sun appears the same size as the Moon because it is further away. The diameter of the Sun is 400x the diameter of the Moon but it is also 400x further away. This is an amazing co-incidence which means that the disc of the Sun, as we see it from the Earth, is almost identical in size to the disc of the Moon. The Moon can therefore just cover the Sun and obscure it completely during a total eclipse.
	What is between the Earth and the Sun?	KS2: Admittedly, there are two other planets between the Earth and the Sun but these are relatively tiny and are in constant orbit around the Sun. Children tend to have quite a crowded picture of space and tend to think that there are other stars between the Earth and the Sun. They may also mention meteorites, asteroids etc. They will be very small amounts of matter but basically, there is just about nothing between the Sun and us. Nothingness is a very difficult concept to grasp.
	If the Earth is spinning, why don't we sense the motion?	KS2: We teach children that we live on a spinning Earth. We are expected to believe that all this motion is going on and yet when we look out of the window, everything looks very still! It is equally interesting to ask adults the same question - a common reply is, 'We are moving so slowly that we cannot feel it.' If the size of the Earth is considered and the fact that it turns all the way around once every 24 hours, then it cannot be moving slowly -–in

The HOT Question		
National Curriculum	**Prompt**	**Subject knowledge/ideas**
Physical processes		fact, quite the reverse. The Earth is also moving on a huge orbit around the Sun once a year so it is, in fact, moving very fast indeed. The fact is that everything is moving **with** us and so we do not sense the motion. This is relativity! It is rather like being on a train at a station and the train next to you seems to move off. The only way to tell if it your train moving or the one next to you is to look at an external frame of reference – the station platform! If everything moves with you, e.g. being on a plane with the blinds down, there is no sense of being in motion, unless the plane changes its speed.
	Why don't Australians drop off the Earth? What causes gravity?	It is likely that the answer comes quickly: 'Gravity', but follow it up with the second, much more challenging question – what cause gravity? This is such a big question that it has not yet been answered by scientists! It is so good for children to realise that science does not explain everything and that it continues to develop. People tend to think that gravity is caused by magnetism, or by the spinning of the Earth, but it is not. The fact is that anything that has mass is attracted to anything else that has mass (but we do not understand why). Gravity is quite a weak force, but if there are large masses then it becomes very noticeable. Hence the Moon and the Earth are attracted to each other, as are the Earth and the Sun, and this force means that the orbits are maintained.
	How do you know that the Earth is a sphere?	This is the most brilliant big question - it is so good that we have added on an extra page at the end of this section to do it justice!

How do you know the Earth is a sphere?

(Tell them that they are not allowed pictures from space because they could be forged and the ancient Greek philosophers had worked out that it is sphere, long before space travel.) It is best to ask them to think, pair and share so that they have time to think about this carefully.

The pupils may come up with all sorts of ideas – here are some responses from Year 5 pupils:

- 'If it's flat, when you make the foundations for a temple why doesn't it go through?'
- 'Why doesn't water fall off the edge if the Earth is flat?'
- **'**Because gravity comes from the centre of the earth, because a sphere is the smallest shape you can make from the centre, it would most likely be pulled up into a sphere.'

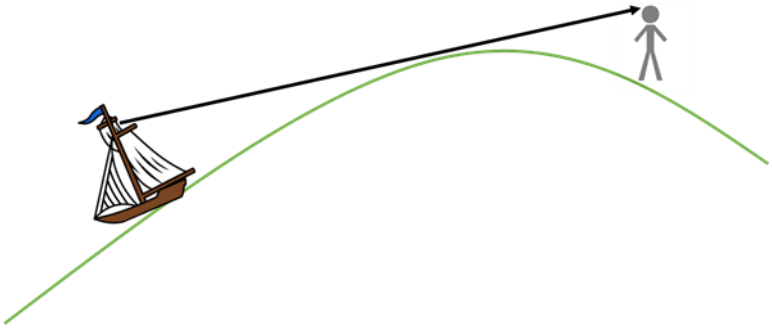
All these answers are good but the last one is awesome and shows very advanced thinking, well beyond most primary pupils. This shows that using big questions in this way is an excellent tool for formative assessment.

The ancients saw that the Moon and the Sun appear to be circular and understood that a sphere looks like a disc when seen from far away, and so thought that the Earth too might be spherical. However, the most convincing evidence for a spherical Earth is something that the pupils might never have seen:

- When a ship appears in the distance, the first thing to be seen is always the top of it.

Tell/show them this if needs be (but only after they have a good length of time to come up with their own ideas) and they can then discuss why this observation suggests that the Earth is a sphere.

This (totally out of scale) ray diagram shows that this only happens if the approaching ship is coming up over the curvature of the Earth:



A further question is: What would the approaching ship look like if the Earth were flat?

It would look like a tiny toy which just gets bigger and bigger, as the following diagram shows: