Science at the circus (Foundation & KS 1)

SUPPORT NOTES

Roll up, roll up!
Science at the circus **is an interactive science show that uses some of the tricks and skills you might see at a circus to explore science concepts from a range of topics relating to forces and sound.**

purpose of these notes

These notes are intended to provide teachers with a brief overview of the main demonstrations and concepts presented in the show, and to suggest some topics for discussion or follow-up after the show. We hope that the show will encourage teachers to integrate some of the ideas and techniques that they find useful into their own teaching. If you would like any more information about any of these topics please get in touch with us.

safety information
Although every demonstration presented in the show involves only commercially available toys and equipment, each activity has been subject to the normal risk assessments. It is important to emphasise that if any of the activities are to be used or adapted for classrooms they should, of course, be thoroughly assessed by each teacher in advance.

A wide variety of common toys will be used in the show – the exact demonstrations used will depend on the length of the show, the age and background of the audience, and any particular topics requested by the teachers.

Curriculum connections

Our shows are designed to support and enrich the science strand of the revised NI curriculum learning area *The World Around Us* for Foundation Stage and Key Stage 1.
The topics covered in the show are concerned with movement and energy – how things move; how things work; sources of energy; how sounds are made and how they travel. The way that the activities are explored also develops the abilities of pupils to ask questions and test out their ideas.

Lucky, the floating pig

key ideas

- the air around us is a gas and even though we cannot see it and it doesn't feel very heavy it does have weight;
- if an object is lighter than the space of air it takes up then it will **float**, and if the object is heavier than that amount of air then it will **sink**;

- some gases, like **helium**, are lighter than air for their size eg helium-filled balloons that float.
- because the buoyant or **lift** force from floating in the heavier air is bigger than the downwards pull of **gravity** on the helium-filled pig, it will move upwards.

more activities

- Do you think the pig would stay at the top of the ceiling forever if no-one pulled it down? What would happen to the pig if some helium started to leak out of the balloon slowly?
- You can make your own small airships by sticking 2-3 helium balloons together in a horizontal line and then working out how many small weights you need to hang from each side of the blimp to get it to just float in the air. Be careful you tie a light thread to the blimp so that you can pull it down if you make a mistake with your weights (the ballast).

Barney, the balancing bear

key ideas

- **gravity** is a force that pulls all objects down towards the ground;
- every object has a **centre of gravity** (or balance point) – it's where the you can assume that the force of gravity acts on the whole object;
- An object can only **balance** if it can keep its centre of gravity directly above the point where it is being supported. At the start it's very difficult to keep the centre of Barney exactly over the string, so he keeps falling off.
- it's important to put the same weight on each side of Barney so gravity is pulling equally strongly on both sides - the forces are **balanced**;
- although we often say Barney is balanced like this, he is actually **hanging** – because his centre of gravity with the low weights is now actually below the string he is on. This is why it so hard for him to fall off.

more activities

- Look how you move your arms for balance when you walk across a low beam in PE. Would it be easier to carry a large bendy pole as you walk across the beam?

musical straws

key ideas

- whenever an object wobbles or **vibrates** fast enough it makes the air shake backwards and forwards all the way to our ears – we call this a **sound wave**;
- by vibrating your lips you can make the cut ends of the straw wobble enough to shake the air in the straw – these vibrations in the air can travel all the way to our ears;
- a shorter straw has less air in it, so it can wobble faster – this means the note we hear will sound higher (or squeakier) than the note from a longer straw that has more air shaking more slowly;
- often you need to be determined and keep trying to learn a new skill.

more activities

- Pupils should not be allowed to cut and blow their straws at the same time for reasons of safety, but they can make a small trombone by sliding a straw over a slightly narrower straw and making the instrument get longer and shorter as they blow.
- If you are careful you can also cut small holes along a single straw to make an instrument a bit like a flute - by moving your fingers to cover different holes you can play a simple tune.

the amazing "skewer through balloon and bag" trick

key ideas

- the balloon is made of **rubber**. This material is stretchy (scientists call it **elastic**) – it you pull it, it will return to its original shape when you let go.
- the rubber at the top and bottom of the balloon is stretched slightly less than the rest of the balloon. You can see this from its darker colour in these areas, where it is thicker.
- when you push the skewer through the top or bottom carefully, the rubber seals around the hole tightly so not much air can escape past the skewer. The balloon will often slowly deflate if you let it sit like this though.
- You can make the trick easier for yourself by putting some cooking oil on the skewer first so that it becomes more slippery, so there is less **friction** with the rubber of the balloon as it passes through. This means the balloon is less likely to burst.
- The plastic of the bag full of water works in a similar way. In this case, though, there is another force at play – the **surface tension** of the water doesn't allow it to leak through any small gaps around the skewers.

more activities

- You could experiment with different types of balloons and plastic bags to see which ones work the best. Examine each material first and make a prediction about how well it will work and then test it out. Be careful with the sharp point on the cocktail sticks or skewers.

plate spinning

key ideas

- it is hard to balance a plate on a point because you have to keep its centre of gravity exactly above the point it is sitting on – otherwise the pull of gravity on the object is unbalanced and it will fall;
- when you spin an object it will tend to keep spinning in that direction for a long time – think of spinning tops and yo-yos. Spinning the plates makes them much easier to balance on the end of the poles as the spinning motion tend to keep the plates flat.

more activities

- Experiment with some plastic plates and poles. With a bit of practice you can start to do tricks like using the pole to throw the plate straight up into the air and then catching it on the end of the pole.

Marvin, the flying monkey

key ideas

- the arms of the toy are made of strong elastic cords – like really thick elastic bands – so when you stretch them they will return to the same length as before with a large force. This force is big enough to catapult the toy through the air.
- the more you stretch his arms the bigger the force that throws the toy forward. This is how we can make Marvin travel so far the second time.

more activities

- Can you use some elastic bands stretched over two of your fingers to fling the band a certain distance towards a target on the floor? What difference does the thickness of the band make to the distance the band travels. If you pull the band back twice as far, does it travel twice as far forward when you release it?

activities to do after the show

- Ask the pupils to draw some of their favourite experiments and toys from the show and label them to explain how they work;
- Let the pupils practice some simple circus tricks so that they can put on a show for the rest of the class or even for the rest of the school at assembly. Discuss ways that they pupils can explain the science behind some of the tricks.

sources

books:

- *Dr Mark's Circus Science* – available from TTS Active Science
- *The Big Bang Book – toys and games to make*, D Pitt, Granada
- *Teaching Physics with TOYS,* Terrific Science Books, www.terrificscience.org

toy shops:

- local toy shops
- Hawkin's Bazaar – one of the best sources of simple toys – available online at www.hawkin.com
- Butterfingers circus equipment www.butterfingers.co.uk