Playing with science (Foundation & KS 1)

SUPPORT NOTES

Playing with science **is an interactive science show that uses toys to explore science concepts from a range of topics relating to forces.**

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, 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.

format of the show

In this interactive show the pupils are encouraged to help the presenter tidy up each toy into the correct box according to how it works. Each toy in the show moves due to a push or a pull (a force) because of:

1) air
2) magnets
3) gravity pulling down
4) electricity
5) elastic or springs

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.

process objectives

The show uses simple toys to hook the attention of the pupils and to provoke questions about how familiar objects around us work. An important process objective of the show is to convey the idea that science is really all about asking questions. This is what scientists do continually. We need to encourage children to use their natural curiosity to develop ways of asking different kinds of questions – for example "how does this work?"; "what would happen if I changed this?"; "do these two toys work the same way?" Sometimes it may be difficult to answer some of the

questions they raise at an accessible level. Again this reflects how science actually works in practice – it raises questions that we often can't answer immediately. The important thing, however, is to keep asking new questions.

Another important skill in science is in recognising patterns and similarities in how objects work and then grouping these objects together. This allows us to make predictions about how other similar toys might work. We can then do an experiment with the new toy to test out if our idea is correct.

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. The way that the activities are explored also develops the abilities of pupils to ask questions and test out their ideas.

toys that use air to move

Air is all around us. Although we can't see it or normally feel it, air pushes equally in all directions. We don't usually notice these pushes because the air and liquids inside our bodies push back just as hard.

jumping spider – What makes the spider jump? How can we make the frog jump faster or higher?

pump rocket – There is air trapped inside the tube; when we squeeze the tubes together the air pushes the rocket off the end of the tube. Air is quite hard to squeeze. How can we make the rocket move faster? At what angle is it best to hold the tubes to make the rocket move furthest?

sound tube – Whirling the tube around our head pushes the air through the tube. The bumps on the tube make the air shake backwards and forwards very quickly, and we all hear this air shaking as a sound. How does the sound change when we spin the tube faster and faster?

super soaker – When we pump the handle we push air into the gun with the water. Then when we press the button the squeezed air gets released, pushing the water out of the gun. Why does the gun fire further when we pump it up with more air?

toys that use magnets to move

Magnets can make objects move at a distance - without touching the objects. Sometimes the magnets will pull towards each other, and other times they will push apart.

magnetic fishing – How did we pick up the fish from the water? Where were the magnets on the string and on the fish?

magic pennies – How many pennies can we balance on the side of the metal object? Can we feel the strength of this magnet pulling on the coins. Do all 1p and 2p coins pull towards magnets?

dancing frogs – Magnets under the mirrored top of the pond move to make the frogs twist and dance. To make the magnets move, however, we first need to wind up the springs holding the magnets. As the springs slowly uncoil the music box inside the toy moves and the dance begins. How could we make the frogs dance for longer?

Sally the sunflower – Magnets can push or pull an object depending on which pole is facing the other magnet. Sometimes the bees get pulled towards (attracted to) the sunflower - when the magnets in the bees and the sunflower have their opposite ends (or poles) pointing towards each other. At other points of the petal, however, the bees push the flower away (repel it) – when the two magnets have the same pole pointing towards each other (both North poles and both South poles).

toys that use gravity to pull them down

Everything feels a pull down towards the ground – we call this pull gravity. Without gravity where do you think we would all be? Floating in space. Can you think of a place where we don't seem to fall down? Yes, in space, where we are already falling, it seems as if we are weightless.

Jacob's ladder - This classic toy fools our eyes and brain – the way each block is painted and joined to the next block makes it look as if the top block is flip-flopping all way down to the bottom when it is given a push. In fact gravity simply pulls each block over so that it twists to show the opposite face.

Circus Sam – Every object has a centre of gravity or balance point (the point where all of the weight of an object is assumed to act). Sam has weights of equal size on each side of his pole – this helps him balance. If the centre of gravity of any object is directly over the point where it is being supported then the object should be balanced. These weights actually mean that the centre of weight is below the point where Sam is resting on top of the pole – in this case Sam is actually "hanging" rather than "balancing". This is why he is so hard to push off.

Acrobatic clown – Spinning the clown gives him some energy that he uses to wind the rope around the bar as he climbs. Each time gravity pulls the clown down he doesn't have quite as much energy to climb up the rope again.

Pizza Chef – This works just like a circular see-saw. We need to work out how heavy each topping is and how far away from the centre of the pizza we need to place it to keep the overall centre of gravity over the Chef's finger, so that the pizza stays balanced. Where is it easier to place the toppings – near the centre or on the edge of the pizza?

toys that use electricity to move

Some toys need electricity to make the motor inside them move. These kinds of toys get electricity either from a battery or from plugging them into an electrical socket in the wall. Batteries store something we call "energy" inside them. All objects (including us) need energy if they are to move. Electricity is said to flow around "electrical circuits" – but it can only flow if there are no breaks in the circuit.

buzz wire game – The aim of this game is to move the metal loop around the wire shape without touching the wire. If we touch the wire then there is a complete circuit between the battery, the wire, the loop and the buzzer – so the buzzer sounds. As soon as contact with the wire is stopped the circuit is broken and the buzzer stops.

cosmic ball and human circuit – The electricity can only flow in the human circuit of volunteers when they are all touching. If two of the volunteers let go of each other (like turning a switch off in a circuit) then no electricity can flow and the bulb goes out. How many volunteers in a circuit do you think this will work with?

kangaroo and jitter bug – These toys use batteries to provide energy for the motors, bulbs and speakers and sensors inside them. How many of our toys at home need batteries to work?

toys use elastic/springs to move

Elastic materials can be stretched to store energy, which we then use to make toys move. Also, springs can be squeezed to store energy to move toys. The more that we stretch or squeeze the material the more energy we will store in it and the further or faster the toy will travel.

can of nuts – What makes the snake jump out of the can?

elastic gun – How far can we make the balls travel? Can we make a smaller version of this toy with an elastic band and small balls of paper?

clockwork toys – Clockwork toys contain springs that we squeeze by winding them up. Once we let the spring go, it pushes out again and this moves the toy. This is how all watches used to work – we had to wind them up every couple of days to keep them on time.

Slinky – This toy is really a big spring. We can also try setting one of these carefully at the top of some steps and watch how gravity flips the toy over so that it falls down each step.

flapping bird – Winding up the thick elastic band stores energy inside it. Once we press the button the band starts to unwind and this moves the wings up and down. The wings press down on the air and the air presses back up – this lifts the bird up. So this toy really depends both on an elastic band and the air.

activities to do after the show

- Ask the pupils to draw 3 of their favourite toys from the show and label them to explain how they work;
- Encourage pupils to bring in a couple of their own small toys from home and challenge them in small groups to experiment with them to figure out how they work. They can then explain their ideas to the rest of the class. Can the class come up with a way of grouping all of the toys depending on how they work?
- Challenge your pupils to find a toy that uses more than one of air, electricity, elastic, magnets, or gravity to move.
- As pupils explore toys it is useful to get them to think about how this process is like what we do in science – observing or watching carefully; asking questions; coming up with possible ideas about how things work; making predictions; testing ideas out; and then changing our ideas based on the results of the experiment;
- Help pupils to build simpler versions of some popular toys – for example the frazzle electric circuit game can be built very simply with a battery, a light bulb, some wire and a wooden board.

sources of toys and more ideas

Start to collect a range of toys that you can use in your science classes for demonstrations or investigations.

books:

- *The Big Bang Book – toys and games to make*, D Pitt, Granada
- *Science in seconds with toys*, J Potter, Wiley, New York
- *Teaching Chemistry with TOYS*, Terrific Science Books, www.terrificscience.org
- *Teaching Physics with TOYS,* Terrific Science Books, www.terrificscience.org

toy shops and companies:

- local toy shops
- Hawkin's Bazaar – one of the best sources of simple toys – available online at www.hawkin.com
- Science Museum store – www.sciencemuseumstore.com