Marking stickers for Unit 3E: Magnets and springs

Science Year 3

ABOUT THE UNIT

This unit gives children experience of forces, including attraction and repulsion between magnets, compression and stretching of springs and stretching of elastic bands. They learn that these forces have direction and can vary in size. They also learn which materials are attracted to magnets.

Experimental and investigative work focuses on:

- making simple predictions
- planning what evidence to collect
- interpreting evidence and using it to draw conclusions.

Work in this unit also offers many opportunities to relate science to everyday things *eg magnets for toys and household appliances,* and to discuss sorting materials for recycling.

This unit takes approximately 9 hours.

WHERE THE UNIT FITS IN

Builds on Unit 1C 'Sorting and using materials', Unit 1E 'Pushes and pulls', Unit 2E 'Forces and movement' and Unit 3C 'Characteristics of materials'

Children need:

- to know that pushes and pulls are examples of forces
- to know vocabulary describing simple forces and movements
- to know that metal is a distinct type of material
- to be able to measure length using standard measures
- to be able to construct a bar chart.

Links with Units 1C, 4E, 4F, 6E.

VOCABULARY

In this unit children will have opportunities to use:

- names for some metals *eg iron, copper, aluminium*
- terms relating to magnets *eg attract, repel, magnetic, non-magnetic, attraction, repulsion*
- nouns and related verbs *eg attraction/attract, repulsion/repel*
- expressions making generalisations.

RESOURCES

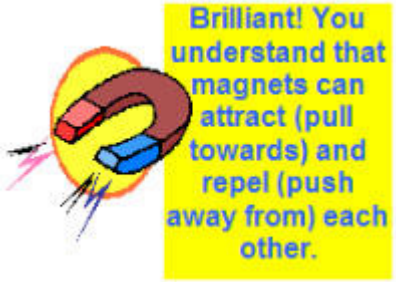
- variety of magnets (type and size)
- paper clips
- rulers or tape measures
- variety of materials for testing magnetic attraction (including iron and steel)
- springs, elastic bands
- secondary sources *eg reference books, CD-ROMs*

EXPECTATIONS

at the end of this unit

most children will:	recognise that a force acts in a particular direction; describe the direction of forces between magnets or between a spring and someone compressing it; classify materials as magnetic or non-magnetic and describe some uses of magnets; decide how to test an idea, explaining how to make a simple test fair; identify patterns in results and use these to draw conclusions
some children will not have made so much progress and will:	describe what happens when some materials are put near a magnet; with help test an idea and make a comparison between results
some children will have progressed further and will also:	describe the difference between a magnet and a magnetic material and explain results in terms of their scientific knowledge and understanding

Ref: QCA/98/210W

LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	MARKING STICKERS from www.effectivemarking.co.uk
	Review children's understanding of forces and movement eg by asking them to recognise and label pushes/pulls in pictures or around the classroom and talking about their ideas. POINTS TO NOTE In some cases a clear answer, 'push' or 'pull', cannot be given. These cases provide a useful point for discussion. Children's responses to this activity will indicate their knowledge and understanding of forces and movement. Teachers will need to take this into consideration in their short-term planning.		
• that there are forces between magnets and that magnets can attract (pull towards) and repel (push away from) each other • to make and record careful observations of magnets • to make generalisations about what happens when magnets are put together	♦ Give children a variety of magnets eg wand, bar, horseshoe, ceramic, circular to handle and explore. Using magnets with clearly labelled ends, ask children to investigate and record what happens when they are put together. POINTS TO NOTE It is helpful for children to handle magnets which are strong enough for them to be able to feel the repulsion between them. It is not necessary, at this stage, to introduce the idea of 'poles'. When children are investigating magnets, it may be helpful to use magnets on dishes floating on water or 'ring doughnut' shaped magnets as movements, resulting from attraction and repulsion, are more clearly seen.	• given a magnet of unfamiliar shape, or with unlabelled ends, demonstrate how it is attracted to, or repelled by, another magnet • generalise about what happens when magnets are put near one another or together, using scientific terms eg attract, repel	 

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LEARNING OBJECTIVES CHILDREN SHOULD LEARN	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES CHILDREN	MARKING STICKERS from www.effectivemarking.co.uk
• to make and test predictions about whether materials are magnetic or not • to make careful observations • that magnets attract some metals but not others and that other materials are not attracted to magnets • to use results to draw conclusions, indicating whether they were right in their prediction about which materials were magnetic	♦ Present children with a collection of materials, including materials found in and around the classroom, and ask them to suggest which are magnetic and how they can find out whether they are right. When children consider their results, they should be asked to group the materials into magnetic and non-magnetic and to make a relevant generalisation. POINTS TO NOTE Children often think that all metals are attracted to magnets whereas it is only iron and some iron alloys eg steel, cobalt and nickel that are attracted. Some stainless steels are not magnetic. Some 1p and 2p 'copper' coins are attracted to magnets as they have a thin copper coating over a steel disc. Aluminium cans are not magnetic whereas 'tins' are largely made of iron and are magnetic. Children often find the distinction between a magnet and a magnetic material difficult to understand. It is helpful to illustrate the distinction between a magnet and a magnetic material by showing children what happens when two magnets are put together, ie attraction and repulsion, and contrasting this with what happens when a magnet and a magnetic material are put together, ie just attraction.	• classify a range of materials, including metals eg gold, copper, aluminium, as magnetic or non-magnetic and explain how their work enabled them to do this • make a generalisation about magnetic behaviour eg iron is magnetic but other metals aren't, materials that aren't metals aren't magnetic, only some metals are magnetic	
• that magnets have a variety of uses	♦ Ask children to use secondary sources eg reference books, CD-ROMs to find out about everyday uses of magnets eg in recycling materials, in the home.	• describe and explain how magnets can be used eg in recycling, you can sort iron from other things because it is magnetic	

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• to investigate an aspect of the behaviour of magnets • to plan a fair test and decide what to measure and what equipment to use • to make and record measurements • to draw conclusions	♦ Present children with several magnets and ask them to find out whether they are all equally strong. Ask children to suggest how they will decide which magnet is strongest eg by seeing how many paper clips a magnet can hold in a chain or by finding out how close a paper clip has to be to a magnet and help them to carry out an investigation. OR Present children with a magnet and a variety of materials eg card, fabric, aluminium foil, thin wood, water, iron and ask them to find out whether magnets work through these materials. Help them to decide what they will do and help them to carry out an investigation. Ask children to tell others about what their investigation showed. POINTS TO NOTE This activity gives children the opportunity to carry out a whole investigation. It may be helpful in the work to concentrate on the aspects of investigation highlighted in the learning objectives. Although children may think that bigger magnets are stronger, this is not necessarily so. Children often think that magnets do not work through water. SAFETY – Possible sharp edges on metals must be avoided.	• explain how their test is fair eg using the same size paper clips or the same magnet each time • make accurate observations or measurements eg of the number of paper clips picked up or of the distance between the magnet and the paper clips • explain what their results show eg I thought the biggest magnet would be strongest but it only picked up six clips. The smallest magnet picked up eight so it was strongest, I tried different thicknesses of card but the magnet worked through them all but it didn't work through an iron can lid	

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• that springs are used in a variety of ways	♦ Ask children to make a list of examples of where springs are used at school or at home.	• name a variety of examples eg stapler, mattresses, chairs, retractable pens where springs are used	
• that when a spring is stretched or compressed upward, it exerts a downward force on whatever is compressing or stretching it, and that when an elastic band is stretched downward, it exerts an upward force on whatever is stretching it • that forces act in particular directions	♦ Ask children to pull springs and elastic bands and to push springs and to describe the direction of the force on their hands. POINTS TO NOTE SAFETY – Care needs to be taken when using springs and stretching elastic bands. If over-stretched, elastic bands may break and flick back very painfully.	• describe the effect of the elastic band or spring eg when I stretch the band down, I feel a pull up on my hand or when I squash the spring down, it pushes up on me	

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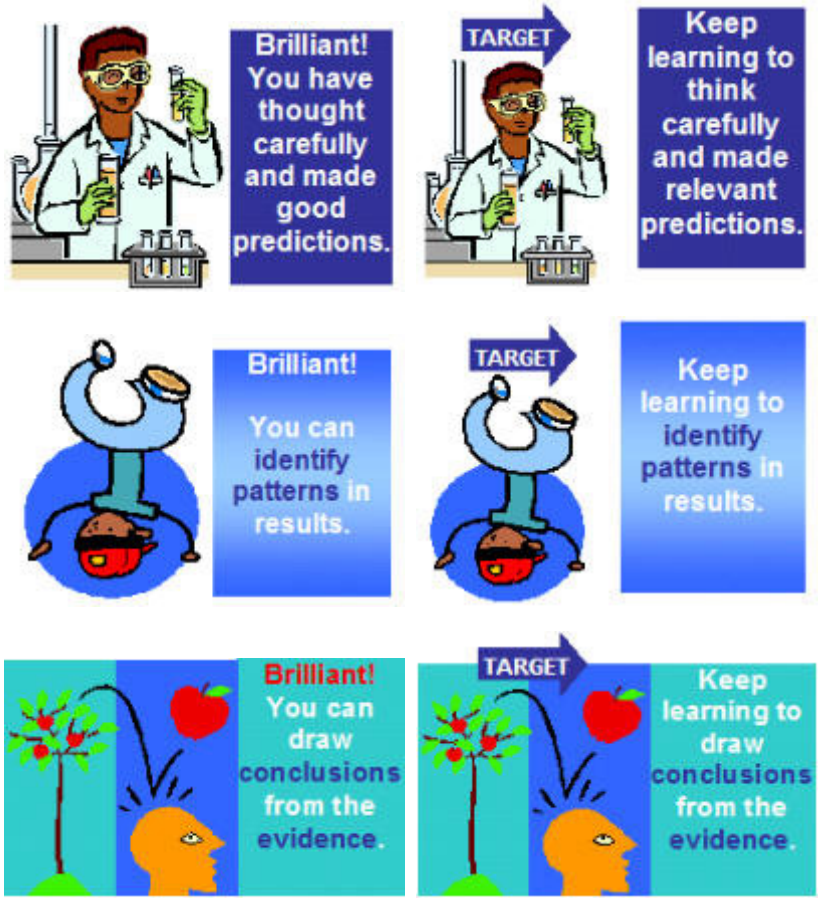
• to make predictions of the effect of stretching elastic bands by different amounts • to make comparisons and identify patterns in results • to draw conclusions and indicate whether the prediction was supported • to explain the conclusions in terms of the size of the force	♦ Show children how to make a catapult or 'push meter' using elastic bands to propel a toy car or weighted container along a flat surface and ask them to predict what will happen if the bands are stretched by different amounts. Help children to decide how to test their predictions. Ask children to record measurements in a prepared table and to look for patterns in the measurements. Ask children to explain why stretching the band more made the toy car or the container move further. POINTS TO NOTE A flat board with an elastic band stretched between two nails at one end works well. This activity gives children the opportunity to carry out a whole investigation. It may be helpful to concentrate on the aspects of investigation highlighted in the learning objectives.	• make a prediction eg I think if I stretch the band more, it will go further • make comparisons eg when I used a big force it went further and identify patterns eg the more I stretched it, the further it went • explain that the more the band is stretched, the bigger the force eg when I pulled the band a long way out, the car went further because there was a big push on it	

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	Ask children to make a concept map involving ideas such as magnet, repel, attract, force, spring, elastic, pull towards, push up on, direction, stretch, compress, size of force, push harder. Ask children questions about their maps with them emphasising the idea of force. POINTS TO NOTE A concept map shows the connections between different ideas in a particular topic and is a useful source of information about children's understanding. Children will need to be taught how to make a concept map. It may be helpful to have labels showing the terms to be used and to relate these to particular ideas to be emphasised.		