Magnet Maze

Making a maze game from a bottle and a magnet

Subject(s): D&T, Science

Approx time: 40 – 60 minutes

Key words / Topics:
- Attract
- Iron
- Magnet
- Magnetic materials
- Maze
- Non-magnetic materials
- Plastic
- Steel

Suggested Learning Outcomes

- To understand what makes a material magnetic.
- To be able to give examples of magnetic and non-magnetic materials.
- To be able to make a maze game using a bottle and a magnet.

Introduction

This is one of a set of resources developed to support the teaching of the primary national curriculum. They are designed to support the delivery of key topics within science and design and technology. This resource focusses on developing understanding of magnetic materials by producing a maze game.

Magnets can be used to attract other magnetic materials, which makes them incredibly useful for use in products, such as toys and games. Can you successfully make and test a magnetic maze game?

Purpose of this activity

In this activity learners will draw a maze layout on a plastic bottle and use a magnet to guide objects, such as a 1p coin, around the maze. They will learn about how magnets attract certain materials and apply this knowledge in an engaging practical context.

This could be used as a one-off activity or as part of a wider unit of work focussing on magnets and magnetism. It can also be used in conjunction with the IET Faraday ‘Magnet Madness’ resource, developed alongside the School of Engineering at Cardiff University.

Activity

1. Introduction to the activity (5 minutes)

Teacher to explain that learners are going to produce a maze where a coin is guided round the track by a magnet. Teacher to introduce the equipment and materials that will be used.

2. Magnetic materials (5 - 10 minutes)

Teacher to demonstrate a pre-made example of the magnet maze and explain the following:

- Magnets can stick to some metals, but not others.
- Magnetic materials include iron, nickel and metals that contain them. This includes some steels.
- A 1 pence coin is made from copper-plated steel.
- Magnets do not stick to plastic, such as the bottle.

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3. Making a magnetic maze (20 - 30 minutes)

Learners to complete the following steps to produce their magnet maze:

- Use a marker pen to mark the start and finish points of the maze on the bottle.
- Draw a maze or track layout linking the start and finish points, using different coloured pens to make the design look more interesting.

The maze drawn should be slightly wider than a 1p coin. Teacher to remind learners to use all sides of the bottle (i.e. go around the bottle, not just up one face) and to think about how challenging they want their maze to be to complete!

4. Testing the maze (10 – 15 minutes)

Learners to place their 1 pence coin into the bottle at the start point and the magnet on the outside of the bottle, also at the start point – the magnet should attract the coin.

They should use the magnet to guide the coin along the track to complete the maze.

Teacher notes

This activity could be completed as individuals or in small groups depending on the equipment that is available.

Magnetic and non-magnetic materials

1p coins are made from copper-plated steel. This means that it is steel coated with a thin layer of copper. This is magnetic as steel contains iron (note that if a pre-1992 1p coin is used then this will not be magnetic, as these were made from copper-plated bronze, so it will not work for this activity).

Further information for extension activity:
Ball bearings and paper clips are made from steel, so contain iron, and thus will also work. Plastic and wood are non-magnetic and so will not work. To illustrate the effect any small plastic or wood piece can be used.

Creating the maze

Ensure bottles have been washed and are clean prior to use. All branding, labels etc and the bottle top should be removed in advance. Different coloured marker pens can be used to add visual interest.

The end of the maze could be the exit / top of the bottle if desired.

Further discussion points (for use throughout the activity, during testing or during an additional plenary session)

Discuss how magnetic forces can act at a distance.

The teacher could also discuss sustainability issues – e.g. re-use of plastic bottles to save plastic waste and how this benefits the environment.

Differentiation

Basic

A template could be provided for the learners to trace around. This could be cut, by the teacher, from a similar plastic bottle using a craft knife, so that it fits over the bottle being used.
An exemplar could be provided for the learners to copy.

Extension

Replace the coin with a ball bearing, a paper clip, a plastic coin and a small piece of wood. List which ones work well and which do not - explain why this happens.

Draw different maze layouts and use different sized bottles to create a range of puzzle products.

Use stopwatches to record how long it takes different learners to complete the maze. Compare who is fastest.

Resources

Parts:

- Pre-made exemplar
- Magnets
- 1 pence coins (post 1992)
- Plastic drinks bottles
- Paper clips (for extension activity)
- Ball bearings (for extension activity)
- Plastic coins (for extension activity)
- Small pieces of wood (for extension activity)

Tools and equipment:

- Different coloured marker pens
- Stopwatches (for extension activity)

Required files

DOC PDF PPT

PPT Teacher presentation – Magnet Maze

Additional websites

- **BBC Bitesize – Which materials are magnetic:** Video and Interactive activity to sort examples of products into categories of ‘magnetic’ and ‘non-magnetic’. https://www.bbc.com/bitesize/articles/zw889qt
- **BBC Bitesize – What is a magnet:** Video explaining what magnets are and how they work, with supporting video. https://www.bbc.com/bitesize/articles/zpvcrdm
- **Wikipedia – Plastic pollution:** Information about how plastic waste impacts on the environment. https://en.wikipedia.org/wiki/Plastic_pollution
- **IET Faraday Resources – Magnet Madness:** Lesson activities and resources focussing on magnets and magnetism. https://faraday-secondary.theiet.org/resource-pages/magnet-madness

Related activities (to build a full lesson)

Starters (Options)
- > Discuss what is meant by a magnet and handle examples of magnets.
- > Discussion of the difference between magnetic and non-magnetic materials.
- > ACTIVITY: Magnetic materials

Extension (Options)
- > Replace the coin with different magnetic and non-magnetic materials and record what happens.
- > ACTIVITY: Magnet Madness
- > ACTIVITY: Marvellous Magnets

Plenary
- > Suggest ideas for other new products that use magnets.

The Engineering Context

Engineers need to know the properties of magnets, which materials are magnetic and which materials are non-magnetic. This knowledge could be used when identifying and creating potential solutions to future engineering problems.

Curriculum links

England: National Curriculum

Design and Technology
- > KS2: 1b

Science
KS2 Forces and magnets:
- > notice that some forces need contact between two objects, but magnetic forces can act at a distance
- > observe how magnets attract or repel each other and attract some materials and not others
- > compare and group together a variety of everyday materials based on whether they are attracted to a magnet, and identify some magnetic materials

Northern Ireland Curriculum

Science and Technology
- > Movement and energy: The causes and effect of energy, forces and movement

Scotland: Curriculum for Excellence

Technologies
- > TCH 2-09a, TCH 2-10a, TCH 2-11a, 2-12a

Sciences
- > SCN 2-08a

Wales: National Curriculum

Design and Technology
- > KS2 Designing: 5

Science:
- > KS2 How things work: 2

Assessment opportunities

- > Formal teacher assessment of completed magnet mazes.
- > Peer and/or self-assessment of completed magnet mazes.