

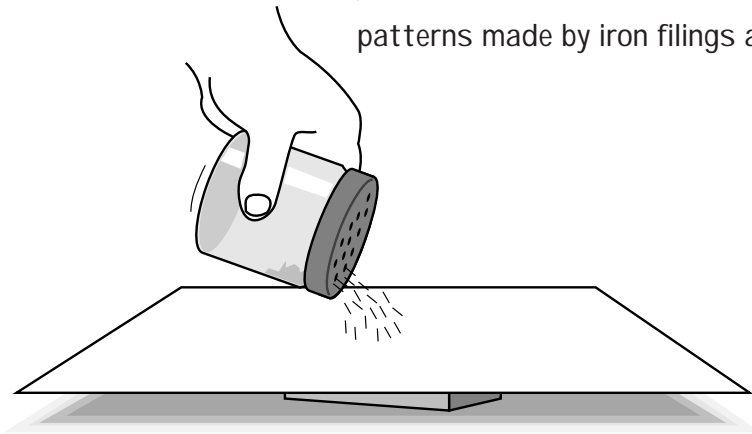
Team games: Magnets make patterns



45 mins

Students are introduced to the skills and concept of co-operative learning.

They work in teams of three to discover and record the patterns made by iron filings around two magnets.



At a glance

Student book pages 1–3

- Introduce the team skills and team jobs.
- Form teams and allocate jobs.
- Outline the team investigation.
- Students carry out the investigation.
- Discuss questions in the student book.



Lesson outcomes

- 1 **Students are aware of the team skills.**
They show their awareness by:
 - moving into their teams quickly and quietly;
 - speaking softly;
 - staying with their teams;
 - taking turns; and
 - doing their jobs.

- 2 **Students discover that iron filings close to a magnet become arranged in definite patterns.**
They show this by displaying the patterns they have made.



Equipment and preparation

For the class team skills chart (BLM 4.1)
team jobs chart (BLM 4.2)

Team investigation

For class demonstration

1 small bar-shaped magnet, covered with plastic

1 A4 sheet of light-coloured card

either

1 shaker, holding 2 teaspoons of iron filings

This activity will not work satisfactorily with fridge magnets.

Iron filings are available from school science suppliers.

or

1 container (eg, yogurt), holding 2 teaspoons of iron filings
1 teaspoon

For the class 1 plastic spray-gun bottle, filled with vinegar solution

For each team newspaper, to cover work areas
2 small bar-shaped magnets, each covered with plastic
3 A4 sheets of light-coloured card

Managers will find it easier to collect the equipment if you put the items for each team into a separate container.

either

1 shaker, holding 2 teaspoons of iron filings

or

1 container (eg, yogurt), holding 2 teaspoons of iron filings
1 teaspoon

job badges for director, manager and speaker

Preparation **C**over each magnet with plastic wrap (or put in a small resealable plastic bag) so that it is easy to remove any stray iron filings.

To make shakers, use a hammer and a small nail to perforate the lids of small, wide-mouthed screw-top jars. The holes should be a little larger than the iron filings.

Make the vinegar solution by mixing one part vinegar with three parts water.

Practise making patterns with iron filings before the lesson.

Arrange space for the completed patterns to be left to dry for at least two hours.

BLMs Make one copy each of 4.1 and 4.2.



Teaching strategies

- 1 Introduce and explain the team skills chart and team jobs chart.

If children are using Primary Investigations for the first time, provide them with a full explanation of team skills and team jobs. Emphasise that each team member will contribute to the team investigations and that the team jobs will be rotated during the year.

- 2 Show the children the equipment table and discuss its use. Explain that this is where team managers will collect and return the equipment.

Make sure children understand that only the manager of each team collects or returns equipment from the equipment table.

Remind children to wear their job badges. This makes it easier for you to identify which job each child should be doing—and easier for the children to remember what they and their team members should be doing.

- 3 Outline the team investigation: *What patterns can we make with our magnets?*

Demonstrate how to sprinkle iron filings carefully onto a sheet of card with a magnet positioned underneath.



Form teams and allocate jobs.
Ask managers to collect team equipment.

- 4 Ask students to carry out steps 1 to 7 in the student book.

You may need to demonstrate how to lift the card straight off the magnet without disturbing the pattern of filings. Do not pull the card over the magnet.

When you spray the patterns, only spray enough vinegar solution to make the card slightly damp. The water and vinegar will cause the iron filings to rust, and the rust will leave a permanent pattern on the paper after about two hours. When the patterns are dry, gently shake off the iron filings and discard them.

- Step 1** Put a sheet of card over one of your magnets.
- Step 2** Carefully sprinkle about half a teaspoon of iron filings onto the card, over the magnet. Don't use too many filings—you will get clearer patterns with a light sprinkling.



- Step 3** Gently tap the edge of the card and observe the pattern that is formed.
- Step 4** Lift up the card and roll it slightly so that you can pour the iron filings back into the container. Take it in turns to sprinkle the iron filings onto the card.
- Step 5** See what pattern you can make if you put two magnets close to each other.
- Step 6** Take turns to produce different patterns. Try turning your magnets on their sides or putting them on top of each other.
- Step 7** When you each have a pattern you want to keep, ask your teacher to spray your cards with vinegar solution and then leave them undisturbed for at least two hours. Make sure your name is on your card.

5 Discuss the questions in the student book:

- 1 How many different patterns did you make?
- 2 How did the patterns change when you placed two magnets near each other?
- 3 What do you think will happen to the iron filings when they are sprayed with vinegar solution?
- 4 Which team skills did you find easy?
- 5 Which team skills did you find difficult?
- 6 How could you do your team job better?



Background information

Iron and a few other materials have strong magnetic properties that are the combined effects of their individual atoms, each of which is a tiny magnet. In an ordinary piece of iron these atomic magnets point in random directions and there is no overall effect. It is possible, however, to align all the atomic magnets in a piece of iron (or iron oxide ceramic) so that their combined effects are discernible and a permanent magnet is formed.

Magnets always have two poles (usually called North and South). In a bar magnet each pole is near one end of the magnet, while in a flat disc magnet they are on the top and bottom surfaces.

A magnet is surrounded by a magnetic field—strong near the poles and weaker at greater distances from them. Iron filings become temporarily magnetised by the field and stick together in chains which show the direction of the magnet's field.

The field is most interesting for bar magnets (singly or in combination) because the two opposite poles are clearly separated.



Extensions

Repeat the investigation with magnets of different shapes, such as horse-shoe shaped and flat disc-shaped magnets.

Place the iron filings in a screw-top jar and form three-dimensional patterns by placing the magnet on the outside of the jar.

Place a small iron object (such as a nail) on a plate. Hold a magnet opposite it, on the underside of the plate. Move the magnet around so that the nail moves. 🌀