



How magnets work

SEQUENCE 1

Age group	6-9 y.o.
Prior knowledge	None
Material needed	The « How magnets work » box
Subjects	Magnetism, astronomy
Skills involved	Learning to learn
Time to carry out the sequence	1-2h

Step 1: Discovering the box

Use the contents of the box to familiarise your pupils with the concept of magnets. The goal is only to have them test with various items either from the box or from their direct environment, such as what lies in their pencil case, what they can find in their bags, etc. Foster a scientific atmosphere by bringing your pupils to test their magnets with everything they have at hand! The STEAM approach allows for mistakes: pupils must be led to make hypotheses and test their veracity.

Here is what to expect:

Magnetic elements include...	Non-magnetic elements include...
Steel, nickel, cobalt, iron (developed in the next sequence), and a few more metals	Plastic, glass, wood, gold, silver, copper, etc.

Step 2: What is magnetic?

At this stage, your pupils should be able to understand a few things: first of all, as seen during the testing phase with the box, magnetic items attract or repel each other.



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When nothing happens, at least one of the two items isn't magnetic. Since we know the magnet is magnetic, then the other item is not.

Focus on the observations from your pupils: what is and is not magnetic?

Your pupils may list several elements as non-magnetic: paper, wood, plastic, cloth...

Do not hesitate to remind them that some items are made of several materials: for example, a pen can have both a plastic and a metal part.

Then, ask your pupils what is magnetic: the obvious answer will be that metals are magnetic, which is not entirely true. Some metals are, like cobalt or nickel, iron is partly magnetic and the rest of the metals are not. If you are interested in discovering how iron reacts to magnets, this is very shortly explained in the next sequence.

If you have some, don't hesitate to show children a piece of magnetite, which is a naturally magnetic mineral that can be found in Eastern Europe and America. This magnetic rock will blow away your pupils!

Step 3: Create a compass

To go further – and show that magnetism has more diverse applications – you may create a compass with your class. This experiment will be explained in further detail in the notice, but the most important subject is to introduce pupils to the concepts of magnetic north and magnetic south: the Earth is polarised, too!

As you recreate the experiment, make sure to use a STEAM approach: your pupils must make hypotheses and check if they are true. They may believe at first that the water or the basin is magnetic or that the alignment of the needle is only a stroke of luck. Let them do the same experiment and see if they obtain the same result as you do.



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So, why? Since the needle on the water has little to no pressure on it, it will turn to the strongest magnetic component it can find, in this case, the magnetic north. Put a magnet close to the needle, and you will notice that it will change directions to move towards the magnet: since it is closer, its attraction force is stronger.



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MY BOX OF STEAM (project nr. 2022-2-EE01-KA220-SCH-000099273) is funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

SEQUENCE 2

Age group	10-12 y.o.
Prior knowledge	Magnetism basics (Sequence 1)
Material needed	The « How magnets work » box, a small iron bar for the extra activity
Subjects	Magnetism
Skills involved	Learning to learn
Time to carry out the sequence	1h

Step 1: Discovering the box

Use the box so your pupils can become more familiar with the concept of magnetism. They should understand how magnetism works, but you may challenge them a little bit more by adding some “obstacles” between some objects. For example, what happens when you put a piece of paper between a magnet and a magnetic object? As a reference for your magnetic object, you can use the white or blackboard in your classroom if they are magnetic. Otherwise, use the contents of the box.

Step 2: Hypotheses

Now is the time for your pupils to make hypotheses about the experiment. What did they notice? Some of the pupils might say that putting a non-magnetic item between two magnetic items does not change anything. Some might say that two magnetic items separated by a non-magnetic one cannot attract each other anymore. Some might say that non-magnetic items become magnetic when they are caught between two magnetic items.

You may test the hypotheses by changing some of the parameters of the tests: what happens when you add more layers of a non-magnetic item between two magnets?



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If you have several magnets of various powers, you may also show how some can attract heavier items. Additionally, you may show that a magnet's power is not only related to its size!

Step 3: A very brief introduction to what your pupils will learn in secondary school

Magnetic items contain particles that allow them to attract or repel other magnetic items, although they do not interact with non-magnetic items. This is schematised as magnets having a “north” half and a “south” half: a north and a south attract each other, two north or two south repel each other.

Additionally, you may create a short experiment with an iron bar: the iron is not magnetic, until it is brought close to a magnet. In that case, the iron bar will become magnetic, too and start attracting other items.



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