**ACTIVITY: Making an electromagnet**

**Activity idea**

In this activity, students build a simple electromagnet.

By the end of this activity, students should be able to:

* build a simple electromagnet
* explore the influence of different variables on the effectiveness of the electromagnet
* work methodically to adapt their design to improve the electromagnet function.

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**Background information for teachers**

Magnetism and electricity are forces generated by the movement of electrons. They are electromagnetic forces – moving electrically charged particles produce magnetic forces, and moving magnets produce electric forces.

Electromagnets can be created by wrapping a wire around an iron nail and running current through the wire. The electric field in the wire coil creates a magnetic field around the nail. In some cases, the nail will remain magnetised even when removed from within the wire coil. Electromagnets are fundamental to many modern technologies.

There is ample scope for experimentation in this activity. It requires fine motor skills, perseverance and an ability to analyse and make adjustments to the variables involved. For example, the number of wire coils, strength of the battery, type and gauge of wire and type and size of nail will all influence the effectiveness of the electromagnet.

With younger students, it is worth spending time to make a demonstration model and discuss the construction with them, explaining the variables involved and the influence these may have on the functioning of the device before asking students to build their own. Younger students may also struggle with the fine motor skills required, so inviting extra adult help for this activity is useful.

**Equipment required** 

* Thin gauge, coated copper wire
* Nail
* Sandpaper
* D size battery
* Paperclips
* Tape

**Student instructions**

1. Sandpaper 1 cm of the coating off both ends of the copper wire.
2. Wind the wire around the nail as many times as you can, leaving the ends free.
3. Tape the ends of the wire to the battery.

**Safety note:** Electricity will now be running through the coil and nail. It will get hot and may burn if touched. Use a pen to push the magnet off the battery and let the coil cool before adjusting the set-up or dismantling.

1. See how many paperclips your magnetised nail can pick up.

1. Experiment with your equipment, changing one thing at a time to make your electromagnet pick up as many paperclips as it can. (You may have to ask your teacher for more equipment). Try changing:
* the number of wire coils
* how tight the coils are around the nail
* the strength of the battery
* the type of wire
* the gauge of wire
* the type of nail
* the size of nail.
1. Discuss your findings and try to explain your results.