Electricity and Magnetism: Teaching and Learning Issues 07

Contents

This is the ‘Teaching and Learning Issues’ that explains the particular challenges. To develop your expertise in the episode, work with the ‘Physics Narrative’ and the ‘Teaching Approaches’. Navigate to any part of the topic using the Topic Menu, or use the tabs below to stay within this episode. .

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Approaching electromagnets

- Challenge 1: Magnets and electromagnets
- Challenge 2: Where is the electric current?
- Challenge 3: Making stronger electromagnets

These challenges reflect research into alternative conceptions.

Challenge 1: Magnets and electromagnets

Wrong track: Bar magnets are different to electromagnets, it's a different kind of magnetism.

Right lines: Permanent magnets and electromagnets give rise to the exactly same kind of magnetic force.

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Challenge 1: Magnets and electromagnets

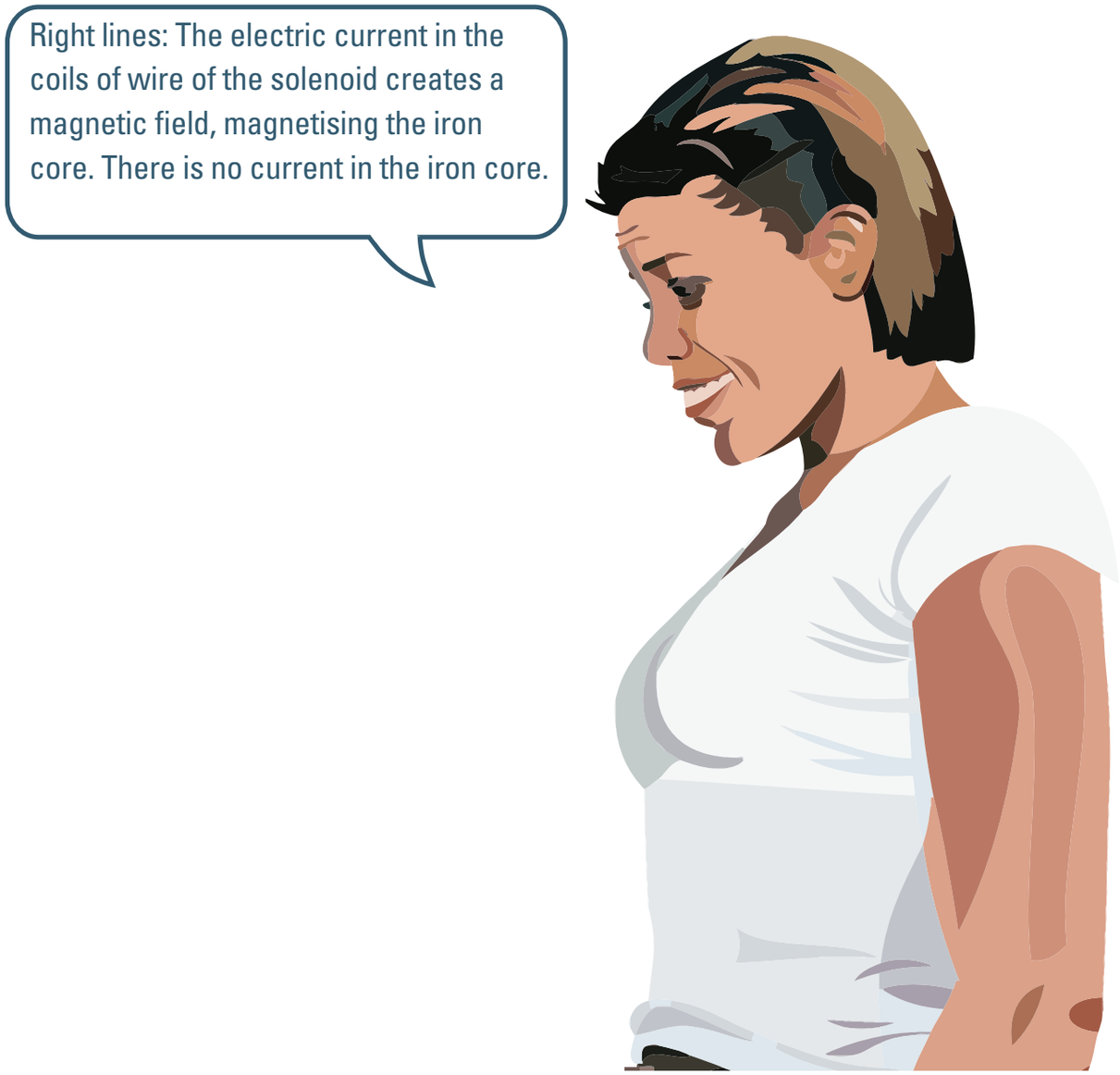
Thinking about the learning

An electromagnet certainly looks quite different to a permanent bar magnet. It is therefore understandable that learners might believe that the two sources produce quite different kinds of magnetism.

Thinking about the teaching

When moving on from permanent magnets to electromagnets it is worth emphasising the point that you are exploring a new way of producing the same kind of magnetic effect. Avoid giving the impression that you are starting a brand new topic.

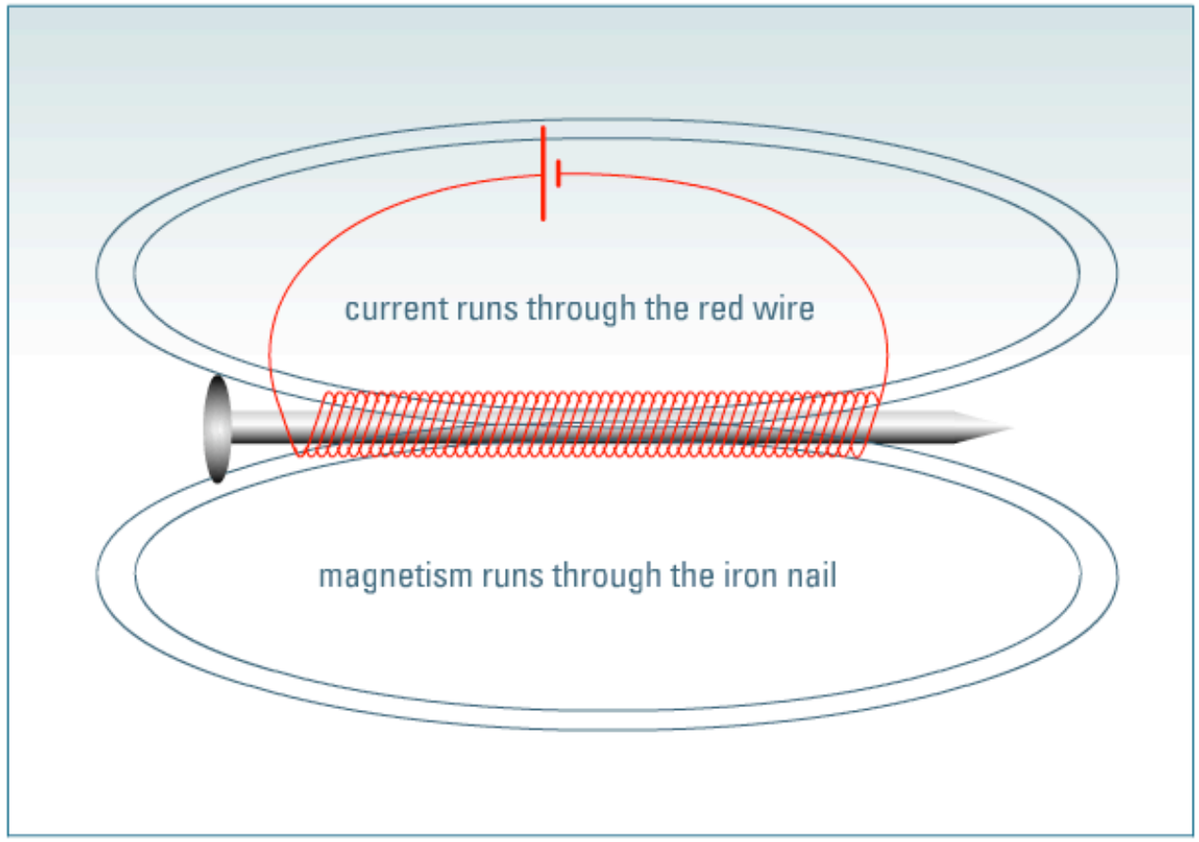
Challenge 2: Where is the electric current?



Challenge 2: Where is the electric current?

Thinking about the learning

When making an electromagnet in class, pupils are likely to wrap a coil of insulated wire around a nail or some other piece of iron. Pupils often assume that when the circuit is switched on the electric current flows from the wire and into the nail (despite the wire being insulated). This is not the case. The electric current remains in the wires wrapped around the nail. It is the magnetic field due to the electric current that affects the nail.



Challenge 3: Making stronger electromagnets

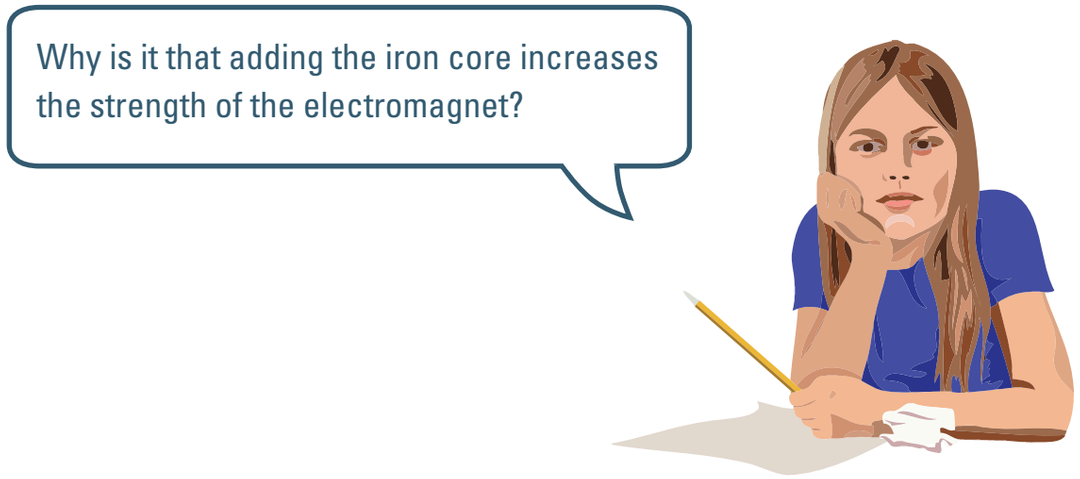
Thinking about the learning

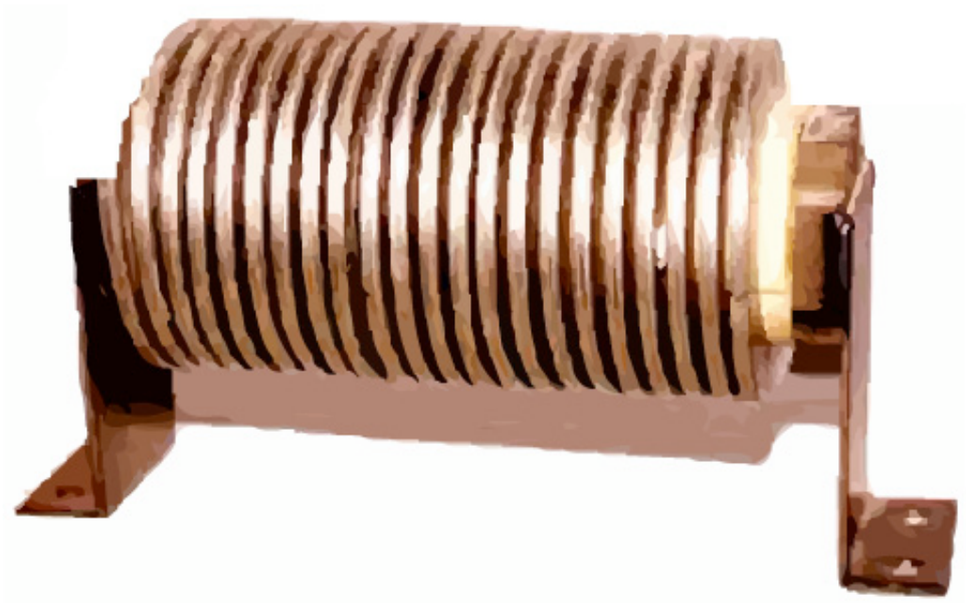
The idea that an electromagnet can be made stronger by:

- increasing the number of coils (or turns) of wire
- increasing the electric current through the coil
- placing a magnetic material inside the solenoid coil

is one which makes sense to most pupils.

Some may ask:





The simple idea here is that the iron becomes magnetised so that now, not only do we have the magnetic field due to the electric current passing through the coils of wire, but also the additional field due to the magnetised iron.