**Magnets: what can magnetism pass through?**

**Levels:** 3-4 **NoS achievement aims:** Investigating in science   
**Topic:** Magnetism **Contextual strands:** Physical world

**Rationale**

A magnetic field is affected as it passes through different materials.

By carrying out an investigation with a small number of variables, students can learn about the scientific requirements of a fair test.

**What you need**

For each research group (four students per group):

* A bar magnet (the stronger the better).
* Approximately ten paper clips.
* A range of sheets of different materials **of varying thickness**, including: paper, card, wood, plastic, glass, aluminium, steel, and a beaker of water (fill to approx. 5mm).
* A range of sheets of different materials **of uniform thickness** (approx. 2mm), including: a stack of paper, card, wood, plastic, glass, aluminium, and steel.
* Investigation record sheets. – see p2 & 3

**Focus**

* What is a magnetic field?
* Can magnetic fields pass through air? What about through solid and liquid materials?
* What could we do to find out how different materials affect a magnetic field?
* How do scientists know what other scientists think about an idea?
* How important is it that science ideas get discussed and debated?
* What determines if an investigation is ‘fair’?
* What could researchers do if they recognised weaknesses or limitations in their own investigations, or other scientists’ investigations?

**Exploration**

1. Divide the class into research teams, with four students per team.
2. Explain that each research team will test a range of materials. By placing the material between the magnet and the paper clips, the students will test how the material affects the ability of the magnet to attract paper clips (demonstrate with paper).
3. Ask the students to record their predictions on Investigation record sheet 1 as to whether they think each material of **varying thickness** will affect the strength of the magnetic field, and how they think each material will affect the strength of the magnetic field.
4. Issue the magnets, paper clips, and materials of varying thickness to the students.
5. When the investigation is completed, collect the equipment (this removes the temptation to fiddle). Ask each research team to report what they did and what they found out.
6. Ask, “Is it fair if the thickness of the material is not the same?” Explain to the students that the aim is to repeat the investigation to make it even more ‘fair’ than before. Ask the students to repeat their investigation using different materials of **uniform thickness**. Students record their predictions and observations on Investigation record sheet 2.

**Reflection**

* Do you think your second investigation was more ‘fair’ than your first investigation? Why?
* What factors are needed for an investigation to be determined ‘fair’?
* How useful was reporting back to the class? Did you learn anything from other groups? Do you think your comments helped any other groups? What opportunities do you think scientists have to look at each other’s work?

This activity is based loosely on Activity 5, p. 89 in Ministry of Education (1999). *Making Better Sense of the Physical World*. Wellington: Learning Media.

### Investigation record sheet 1 – using materials of varying thickness

Predictions

In table 1, list the materials you are using in your investigation. Record your predictions of whether each material will affect the strength of the magnetic field. Then record how you think the materials will affect the strength of the magnetic field.

**Table 1: Predictions**

|  |  |
| --- | --- |
| **Item/Material** | **How will it affect the strength of the magnetic field?** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

Conduct your investigation. Record your observations in table 2.

**Table 2: Observations**

|  |  |  |
| --- | --- | --- |
| **Item/Material** | **What happened?** | **Does it affect the strength of the magnetic field?** |
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|  |  |  |
|  |  |  |
|  |  |  |

### Investigation record sheet 2 – using materials of uniform thickness

Predictions

In table 1, list the materials you are using in your investigation. Record your predictions of whether each material will affect the strength of the magnetic field. Then record how you think the materials will affect the strength of the magnetic field.

**Table 1: Predictions**

|  |  |
| --- | --- |
| **Item/Material** | **How will it affect the strength of the magnetic field?** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |