# *Magnetism and electrostatics* **Teacher background notes**

**In this investigation, non-contact forces are investigated in the context of magnetism and electrostatic electricity to show that some forces can move objects without directly touching them.**

## [Australian Curriculum: Science links](http://assist.asta.edu.au/resource/3436/magnetism-and-electrostatics-cle)

## Learning intentions

Students will be able to:

* use contact and non-contact forces to describe interactions between objects
* identify when science is used to ask questions and make predictions
* follow instructions to identify investigable questions about familiar contexts and predict likely outcomes from investigations
* discuss ways to conduct investigations and safely use equipment to make and record observations
* use tables and simple column graphs to organise their data and identify patterns in [data](http://www.australiancurriculum.edu.au/glossary/popup?a=S&t=Data)
* suggest explanations for observations and compare their findings with their predictions
* suggest reasons why their methods were fair or not
* complete simple reports to communicate their methods and findings.

## Suggested time for this CLE

The time needed to complete the *Magnetism and electrostatics* CLE will depend on the depth of the prior knowledge of students, the time to perform the investigation ‘What can magnets attract?’ and the activity stations ‘Exploring properties of magnets’ and the ‘Electrostatic force’ investigation and also the time to participate in the pre- and post-investigation activities. Allow 8–9 hours.

## Prior conceptual knowledge

Science / Year 2 / Science Understanding/ Physical Sciences

Content description

*A push or a pull affects how an object moves or changes shape* [*(ACSSU033)*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACSSU033)

## New concepts to be introduced

The concepts of magnetism and electrostatics can be challenging for primary students. Because young students are not ready to delve into the movement of electrons, much of the explanation of magnetic and electrostatic forces is inaccessible to them. Nevertheless, primary students are capable of exploring magnetic and electrostatic forces through observations and qualitative, developmentally appropriate explanations. In fact, the idea that objects can be moved without touching is quite well known by most children due to the abundance of toys and household objects that make use of magnets. During these initial explorations, teachers will encounter various student misconceptions. Purposeful teaching will help prepare students tackle more advanced concepts (as they come across them) in the upper primary grades and beyond.

## Possible misconceptions

Students may hold and express a range of understandings about ‘from a distance’ forces such as magnetism. Students may think that because they believe that all metals are attracted to magnets, that if a material is non-magnetic, then it could not be a metal.

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| **STUDENTS MAY THINK…** | **INSTEAD OF THINKING…** |
| All metals are attracted to a magnet. | Only iron/steel (alloys of iron) nickel and cobalt can stick to magnets. Iron and steel are the metals most often used in making household objects. |
| Magnets only ‘attract’. | Magnets can both attract and repel. |
| Forces have to touch an object to push or pull. | Some forces can act on another object ‘from a distance’. Magnetism and electrostatic force are two such forces. |
| Electrostatic forces and magnetic forces are the same force. | Electrostatic and magnetic forces both act from a distance. They have some similarities and some differences. In later years, students will learn about electromagnetism and the relationship between electricity and magnetism. |

## Links to further information

Further background information can be found in the following comprehensive teaching activities:

**Contact forces**

* Queensland Curriculum and Assessment Authority. 2013, ‘The force of friction, Australian Curriculum Year 4 Science Sample assessment | Teacher guidelines’ <https://www.qcaa.qld.edu.au/downloads/p_10/ac_sa_sci_yr4_force_of_friction.pdf>
* Academy of Science PrimaryConnections ‘Smooth Moves’ <https://www.primaryconnections.org.au/resources-and-pedagogies/curriculum-units/smooth-moves>

**‘At a distance’ forces**

* ‘Forces without contact’, Victoria Department of Education and Early Childhood Development website <http://www.education.vic.gov.au/school/teachers/teachingresources/discipline/science/continuum/Pages/forcescontact.aspx> (Accessed October 2015)
* ‘Magnetism: A Non-Contact Force’, Victoria Department of Education and Early Childhood Development website <http://www.education.vic.gov.au/school/teachers/teachingresources/discipline/science/continuum/Pages/magnetism.aspx#3> (Accessed October 2015)
* ‘Electrostatics: A Non-Contact Force’, Victoria Department of Education and Early Childhood Development <http://www.education.vic.gov.au/school/teachers/teachingresources/discipline/science/continuum/Pages/electrostatics.aspx> (Accessed October 2015)