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From infants to Leaving Certificate – the science continuum.

Calling all science teachers. The 1999 primary curriculum included science as one of three subjects in the area of Social Environmental and Scientific Education. This means that by the time students enter first year in post-primary school they have already studied human biology, plant and animal biology, light, sound, heat, magnetism, electricity, forces, properties and characteristics of materials and environmental studies. And, as the content at primary level is similar to much of the content at Junior Certificate level, so the way in which the science that children learn at different stages in their schooling links together is very important to the overall development of their understanding. An awareness of what pupils have done before, and what students should be prepared for in the future, helps to develop a better sense of the continuous nature of learning in science, or in any subject or curriculum area for that matter.

Now, here's the science. Look at the diagram on page 19 to see how you can follow the topic of magnetism from primary school right up to the end of junior cycle in post-primary.

Notice how the primary curriculum takes a spiral approach; the knowledge, understanding and process skills of science are developed and extended as the child progresses through from infants to sixth class. The revised junior science syllabus introduced in 2003 continues this skills development.

Continuing with magnetism as the example you notice the following kind of progression. In the infant classes children **play** with magnets. They **discover that magnets cause some things to move even before you touch them**. Then, when slightly older, they **design and make** a simple magnet fishing game, they **find out** that not all materials are attracted to magnets, they can use their fishing rods to **sort materials into magnetic objects and non-magnetic objects**.

This is an early introduction to 'sorting' or classification.

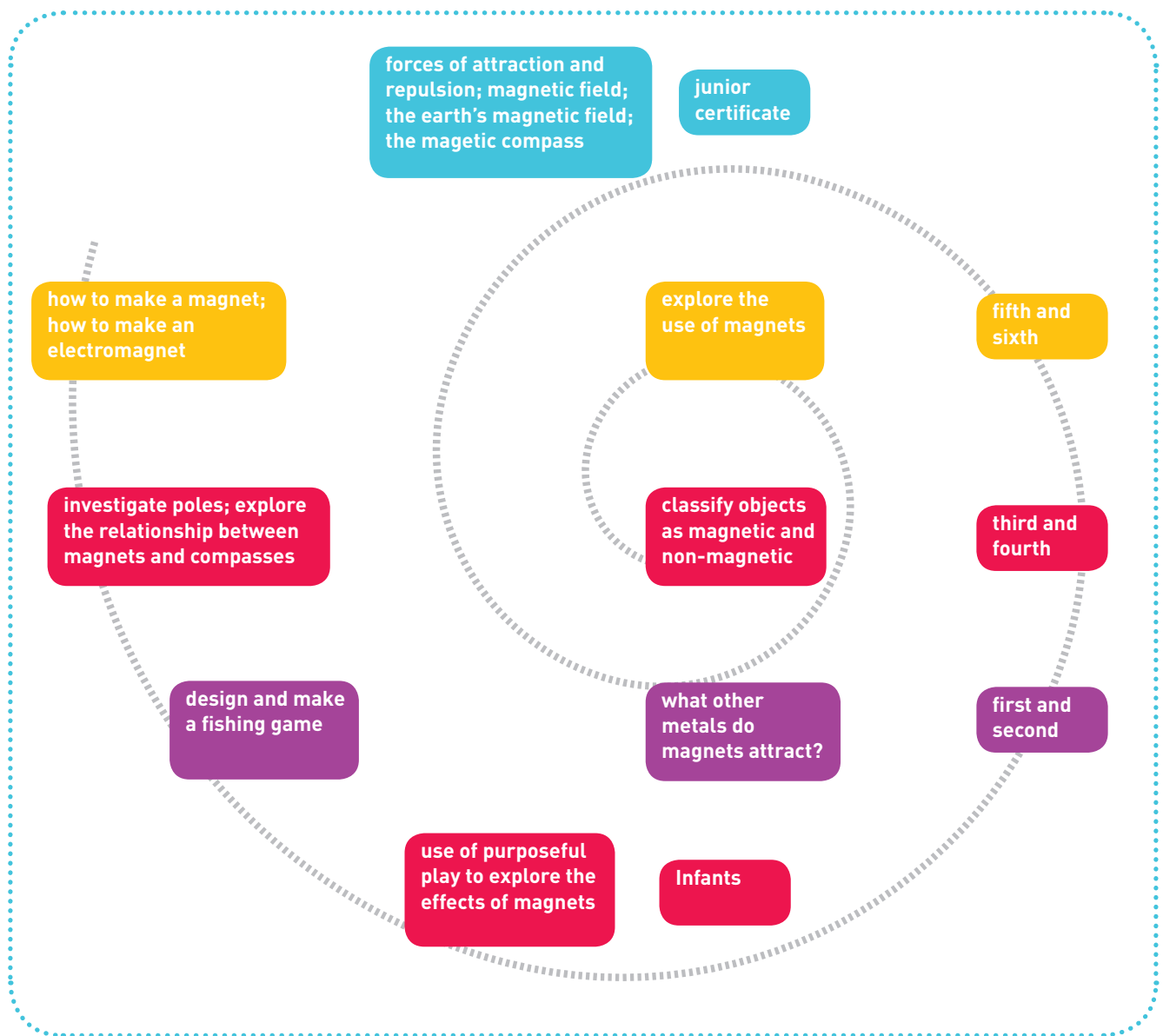
As their investigations into magnets continue, children discover that each end of the magnet behaves differently, and that the magnets can act as compasses. Using the relationship between magnets and compasses they discover that the earth acts like a giant magnet. This concept is developed in Junior Certificate science when students use a compass to plot the magnetic field of a bar magnet and learn about the earth's magnetic field. Addressing the concept of magnetic fields in such an advanced way might not be appropriate for primary school children, but they are building up a familiarity with and understanding of the way magnets behave. By the time they progress to post-primary school they are ready to use this prior knowledge and to build on it. The investigations that children do in infant and junior classes are appropriate to their stage of development; they think about how to solve problems such as the sorting of magnetic and non magnetic material. In the middle and senior classes, investigating and experimenting extends to planning and conducting

fair tests. This approach is central to the scientific process and children will learn to apply these skills to more complex concepts as they move through primary into post-primary school and beyond.

In fifth and sixth class children design and make an electromagnet which, although it links electricity and magnetism, does so at a macroscopic level. It is not until post-primary junior cycle that they learn about the nature of electricity and about what is happening at an atomic level inside the current carrying wire of the electromagnet. In primary school they discover that coiling a current carrying wire around an iron nail turns the nail into a magnet and in post-primary school they start to learn why.

Fifth and sixth class children carry out investigations such as 'what affects the strength of the electromagnet?'. They may predict that it is the length/thickness of the nail, the number of coils of the wire, the type of wire, etc. The emphasis here is on **enjoying the process of science**, and the design of a fair test. When they are older and doing a similar investigation they can build on their knowledge of the effects

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of an electric current to reason that increasing the current in the wire around the electromagnet increases its strength. Now, they are able to perform a more sophisticated analysis and evaluation of their data and make the investigation quantitative rather than qualitative.

During the early years of science education the emphasis is on doing, looking and discussing. There is a gradual move to predicting, hypothesizing, investigating, experimenting, interpreting, recording

and communicating results as children tackle more open-ended problem solving tasks appropriate to their age and cognitive ability. These skills are further developed as students move into the more structured curriculum of Junior Certificate where data manipulation and analysis are also included, in line with their mathematical skills development.

The introduction of science in the primary curriculum and the revision of Junior Certificate science have created a continuum of learning that

did not exist previously. Children transfer their knowledge and skills as they make the transition into post-primary school laboratories. Being seasoned investigators by the time they reach first year should make the transition to Junior Certificate science less daunting than previously, when many students were put off science within the first term because it was too new and seemed over-theoretical to them, adding to the popular myth that science was a 'hard' subject.