

Inside the Atom

connections to the primary curriculum for England

Introduction

The statutory requirements of the primary curriculum in England can be enriched and enhanced through connections to particle and nuclear physics. Many of the stories from these research communities reinforce the aims of the national curriculum for science that pupils should:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

Years 1 – 6

At the beginning of infant school students are helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including:

- observing changes over a period of time
- noticing patterns
- grouping and classifying things
- carrying out simple comparative tests
- finding things out using secondary sources of information.

By the end of primary school pupils have been taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.



Curriculum Connections

Everyday materials – Year 1.

Pupils are taught to:

- distinguish between an object and the material from which it is made
- identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock
- describe the simple physical properties of a variety of everyday materials
- compare and group together a variety of everyday materials on the basis of their simple physical properties.

'Everyday Materials' and subsequent materials modules teaches students to think about 'what things are made of'. This unit is a good starting point for a discussion about the smallest building blocks of the Universe. Prompted by questions like 'what is the smallest thing you can think of?', students can be introduced to concepts like atoms, protons & neutrons and quarks.

Light – Year 3.

Pupils should be taught to:

- recognise that they need light in order to see things and that dark is the absence of light
- notice that light is reflected from surfaces
- recognise that light from the sun can be dangerous and that there are ways to protect their eyes
- recognise that shadows are formed when the light from a light source is blocked by an opaque object
- find patterns in the way that the size of shadows change.

Light – Year 6.

Pupils should be taught to:

- recognise that light appears to travel in straight lines
- use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye
- explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes
- use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

The 'Light' units in year 3 and 6 teach students that our eyes use the light that bounces off objects to see them. Extending this to talk about 'looking' at things smaller than the human eye can see allows a discussion about microscopes and examining the microscopic world. To go one step further and examine the atomic and sub-atomic world we need to go beyond light – using beams of tiny particles in a particle accelerator to bounce off objects to study them.

Forces and magnets – Year 3.

Pupils should be taught to:

- compare how things move on different surfaces
- notice that some forces need contact between two objects, but magnetic forces can act at a distance
- observe how magnets attract or repel each other and attract some materials and not others
- compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials
- describe magnets as having two poles
- predict whether two magnets will attract or repel each other, depending on which poles are facing.

Forces – Year 5.

Pupils should be taught to:

- explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
- identify the effects of air resistance, water resistance and friction, that act between moving surfaces
- recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

The 'Forces and magnets' and 'Forces' units teach students how forces can act without direct contact and how they can be attractive and repulsive. This can be used to talk about the four fundamental forces, (using gravity as a link), and how they influence the building blocks of the Universe.

