

HIAS OPEN ACCESS RESOURCE

Hampshire Science Team

Progression of Substantive Knowledge in Physics- Forces

Year 1-6

HIAS Science Team
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Overview

This document contains...

A progressive list of the substantive knowledge within the Hampshire Science Learning Journeys with reference to the related National Curriculum statutory requirements.

Points to consider when using this resource

The Learning Journeys provide schools with clearly sequenced substantive knowledge across chemistry, biology and physics. Where possible, the links to the National Curriculum statutory and/or non- statutory requirements have been identified.

Suggested sequence of learning

Year	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
1	Describing materials	Animal survival	Habitats	Seasons	Plants	
2	Animal life cycles	Changing materials	Pushes and pulls	Making New Plants		
3	Magnets	Animals, Skeletons and Movement	Solids, Liquids and Gases	Plants and their food production	Light	Rocks and soils
4	Mixtures and separating them	Digestion	Plant Reproduction	Making electrical circuits work	Living things	
5	Fossils, geological time and classification	Space and gravity	Making new substances	Forces that oppose motion	Circulation	
6	How light behaves	Classification and Evolution	Controlling electrical circuits	Sound		

BIOLOGY | CHEMISTRY | PHYSICS

PHYSICS

Forces

PHYSICS Forces		
Year 1	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
Year 2	<p><u>Year 2- Pushes and pulls</u></p> <p>Knowledge Block 1</p> <ul style="list-style-type: none"> Objects can move (be in Motion) in various ways-roll, slide and bounce <p>Knowledge Block 2</p> <ul style="list-style-type: none"> The pushing or pulling of an object can affect its motion. Pushing or pulling can do three things, slow down, speed up or change the direction of an object. <p>Knowledge Block 3</p> <ul style="list-style-type: none"> The larger the push/pull the bigger the effect on motion 	<p><u>Year 3 Forces and Magnets</u></p> <p>Pupils should be taught to:</p> <ul style="list-style-type: none"> compare how things move on different surfaces notice that some forces need contact between two objects <p><u>HIAS Science team guidance</u></p> <p>The first-time forces are mentioned in the National Curriculum is in year 3 in the topic on magnets. Magnets are a non-contact force which may appear almost magical if children have not first had a firm grounding in the idea that objects can be made to move differently through the physical acts of pushing and pulling. For this reason, we have constructed a topic that we think should be taught in key stage one that teaches the idea of contact forces changing how things move.</p>
Year 3	<p><u>Magnets</u></p> <p>Knowledge Block 1- What magnets do</p> <ul style="list-style-type: none"> Magnets exert attractive forces on some metals <p>Knowledge Block 2- Magnets don't need to touch</p> <ul style="list-style-type: none"> Magnetic forces work through other materials including air, so magnets don't need to be touching to exert their force. It is called a non-contact force <p>Knowledge Block 3- Magnets attract and repel</p> <ul style="list-style-type: none"> Each end of a magnet is called a pole, opposite poles are called north and south. Magnets exert attractive forces on each other when the poles facing each other are north and south (opposites). Magnets exert repulsive forces on each other when the poles facing each other are the same. <p>Knowledge Block 4- what affects magnetic strength</p> <p>The strength of magnetic forces is affected by:</p> <ul style="list-style-type: none"> The strength of the magnet. The distance between the magnet and the object. The material the object is made from. 	<p><u>Year 3 Forces and Magnets</u></p> <p>Pupils should be taught to:</p> <ul style="list-style-type: none"> 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.

Year 4	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
Year 5	<p><u>Forces that oppose motion</u></p> <p>Knowledge Block 1: Water and air resistance.</p> <ul style="list-style-type: none"> • When objects move through air and water, they have to push it out of the way. The water and air push back with forces called water resistance and air resistance. The harder it is to push the material out of the way the greater the resistance. • Gases weigh less than liquids and so water resistance is greater than air resistance. <p>Knowledge Block 2: Friction</p> <ul style="list-style-type: none"> • Friction is a force against motion caused by two surfaces rubbing against each other. It occurs because no surfaces are perfectly smooth; they have bumps and undulations that can interlock when placed on top of each other. • To move one interlocking surface over another, one of three things must happen: <ul style="list-style-type: none"> • The surfaces must rise slightly • The bumps on the surface must bend • The bumps on the surface must break • All of these actions require a force, this is what causes friction <p>Knowledge Block 3: Managing Forces</p> <ul style="list-style-type: none"> • Some objects require large forces to make them move; gears, pulley and levers can reduce the force needed to make things move. • The use of levers can reduce the force needed to move things. The object you are lifting is called the load, and the force you apply to the arm to make the object move is called the effort. • The use of pulleys can reduce the force needed to move things <p>(These are particularly complex ideas. It might be better to teach them through a design technology project where children make toys using cogs, pulleys and lever)</p>	<p><u>Year 5 Forces and Magnets</u></p> <p><i>Pupils should be taught to:</i></p> <ul style="list-style-type: none"> • <i>explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</i> • <i>identify the effects of air resistance, water resistance and friction, that act between moving surfaces</i> • <i>recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.</i>
	Year 6	

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