Amport CE (Aided) Primary School

COURAGE COMPASSION RESPECT

Science Progression

(From HIAS Science Team)

PHYSICS
Forces

	Substantive Knowledge from Learning Journeys	*National Curriculum Statutory Requirement*
Year 1		

Year 2	**Year 2- Pushes and pulls** **Knowledge Block 1** • Objects can move (be in **Motion**) in various ways-roll, slide and bounce **Knowledge Block 2** • 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. **Knowledge Block 3** • The larger the push/pull the bigger the effect on motion	***Year 3 Forces and Magnets*** ***Pupils should be taught to:*** • *compare how things move on different surfaces* • *notice that some forces need contact between two objects* ***HIAS Science team guidance*** 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.
Year 3	**Magnets** **Knowledge Block 1- What magnets do** • Magnets exert **attractive forces** on some **metals** **Knowledge Block 2- Magnets don't need to touch** • 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** **Knowledge Block 3- Magnets attract and repel** • 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. **Knowledge Block 4- what affects magnetic strength** The strength of magnetic forces is affected by: • The strength of the magnet. • The distance between the magnet and the object. • The material the object is made from.	***Year 3 Forces and Magnets*** ***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.*

	Substantive Knowledge from Learning Journeys	*National Curriculum Statutory Requirement*
Year 4		

Year 5	**Forces that oppose motion** **Knowledge Block 1: Water and air resistance.** • 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. **Knowledge Block 2: Friction** • **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: • 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 **Knowledge Block 3: Managing Forces** • 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 (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)	***Year 5 Forces and Magnets*** ***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.*
Year 6		