Science Project Overview Year 5 Forces

Subject Knowledge (PoS) **Substantive knowledge** • unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. • air resistance, water resistance and friction slow or stop objects moving easily. • mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	**Working Scientifically** (PoS+Overview) **Disciplinary knowledge** **During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:** • Asking their own questions about scientific phenomena • Select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources. • 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. • Draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings	**Working Scientifically Methods** **Using different types of scientific enquiry to answer their own questions, including**: • observing changes over different periods of time, • noticing patterns, • grouping and classifying things, • carrying out comparative and fair tests • finding things out using a wide range of secondary sources.
Previous learning: • Compare how things move on different surfaces. (Y3 - Forces and magnets) • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets) • Observe how magnets attract or repel each other and attract some materials and not others. (Y3 - Forces and magnets) • Compare and group together a variety of	**Preparing for learning:** • Forces as pushes or pulls, arising from the interaction between two objects. (KS3) • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (KS3) • Moment as the turning effect of a force. (KS3) • Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. (KS3) • Forces measured in Newtons, measurements of stretch or compression as force is changed. (KS3)	**Bespoke to our school:** A huge emphasis is placed on the teaching of vocabulary.

everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. (Y3 - Forces and magnets) • Describe magnets as having two poles. (Y3 - Forces and magnets) • Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 - Forces and magnets)		

Misconceptions:

- the heavier the object the faster it falls, because it has more gravity acting on it
- forces always act in pairs which are equal and opposite
- smooth surfaces have no friction
- objects always travel better on smooth surfaces
- a moving object has a force which is pushing it forwards and it stops when the pushing force wears out
- a non-moving object has no forces acting on it
- heavy objects sink and light objects float

Vocabulary:

Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears

Maths links:

Measurement: Know how to measure and calculate the perimeter of composite rectilinear shapes (cm/m)- linked to parachute investigation

Use estimating, calculating and comparing to find the area of rectangles (including squares) and estimate to find the area of irregular shapes- linked to parachute investigation

Statistics : Use line graphs to solve comparison, sum and difference problems- linked to investigations around pulleys etc

Identify the necessary information in tables (including timetables) and be able to complete them

Famous Scientists to possibly study:

Pioneering female engineers: http://www.wes.org.uk/content/pioneering-women-engineers

Isaac Newton(Lincolnshire)1642–1727 (gravity) on his scientific method and how he made one of his biggest discoveries – gravity ,formulated the laws of motion

http://www.bbc.co.uk/history/historic_figures/newton_isaac.shtml

http://bpes.bp.com/primary-resources/science/ages-7-to-9/light/super-scientists-isaac-newton/

http://www.bbc.co.uk/programmes/articles/2bnTHtTcyLfdKk7BtCtjbhf/scitube-scientists-and-scientific-method?dm_i=3YNL,BHOK,2VWQKN,16RVJ,1

Albert Einstein- physicist https://www.yumpu.com/en/document/view/63100712/read-pdf-on-a-beam-of-light-a-story-of-albert-einstein-albert

Galileo - gravity on his legendary force experiments from the top of the Leaning Tower of Pisa.BBC http://www.bbc.co.uk/programmes/articles/2bnTHtTcyLfdKk7BtCtjbhf/scitube-scientists-and-scientific-method?dm_i=3YNL,BHOK,2VWQKN,16RVJ,1

https://bpes.bp.com/super-scientists-galileo-galilei
History/Geography links: What is local business doing to tackle climate change? Link to gears, levers and pulleys re wind turbines
Explorify links: Pole position Bounce and turn Fancy footwork Paper planes Cogs in the kitchen Build an egg parachute Gears Video- https://www.youtube.com/watch?v=oauDyIu_swM Links to pulleys, gears, levers and wheels videos https://www.stem.org.uk/elibrary/list/20488/gears-an-pulleys
Possible careers/jobs: Aeronautical engineer (designs, develops, manufactures and maintains aircraft), Architect (designs buildings), Astronautical engineer (develops spacecraft), Astronomer (studies space), Builder (builds structures), Pilot (pilots planes), Renewable energy engineer (works on environmentally-conscious energy production)