Science at Newtown Community Primary School

Excellence in Learning for Excellence in Life








Intent: What we want for children at Newtown

We want children to experience high quality science learning that develops a sense of excitement and curiosity about scientific phenomena. The children will learn that science has changed our lives and is vital to the world's future prosperity. They will also learn how to work scientifically so they are able to predict and hypothesise, observe and collect information, analyse and interpret, and draw out and explain rational conclusions on the basis of their research. Developing scientific knowledge and conceptual understanding is a key aim of the curriculum we teach. This is reflected in how the curriculum builds towards a broad base of knowledge and conceptual understanding, complimented by science enquiries that help children answer scientific questions about the world around them. We want children to recognise the relevance, use and implications of their scientific learning now, and for the future.

The Newtown Curriculum enables children to develop scientific knowledge, understanding and skills though an explicit approach to the learning process.

At all ages children develop their ability to:

- Ask relevant questions about what they are learning
- Find out information that will help them answer their questions
- Make sense of the information that they find out
- Use and apply the information they have found within science but also within the broader curriculum

Think and Work Like a Scientist

Implementation: How we deliver the Science Curriculum and what it looks like in practice

Curriculum planning	The national curriculum and EYFS is the starting point for the science curriculum. Our translation of these starting points is through a progressively sequenced curriculum that builds towards explicit, age-appropriate yearly end points. *Each unit of science learning is planned to build coherently across a series of sessions. Children develop component scientific knowledge and conceptual understanding in an order that allows them to secure and retain understanding of key concepts, how they relate to each other; and how they may relate to other concepts both scientific and beyond science.*
For example:	*In Year 1 when looking at plants, children identify deciduous and evergreen trees. They also identify the relationship between seasons and how trees' leaves may or may not change colour. They also apply knowledge to colour mixing leaf colours in art.* *In Year 5 when looking at forces, children learn how air resistance is like other forces they have investigated before. They also identify similarities to the resistance created by water and question whether these resistances can be used to create propulsion. During design technology children reinforce their knowledge of air resistance when building sails on a model boat.*
Build on prior learning, embedding most useful content	'Golden Threads'; the most useful content within science has been identified and the curriculum is structured to enable revisiting of this content throughout the curriculum progression and within other subject areas.
For example:	*Each year children learn how to ask questions which focus on cause and effect in a scientific context recognising the role that constants and variables play in this.* *In Year 3, children learn: light is needed to see, light is reflected, and shadows are formed when light is blocked.* *In Year 6 children learn: how light travels; how this affects how our eyes see things and why shadows are the same shape as the objects that cast them.* *In art children use and retrieve knowledge about light when using shadows in their compositions and when learning how to draw using perspective.*
Relevant contexts for learning	Contexts for science learning are identified and planned for as they are purposeful, relevant and engaging for children.
For example:	*Children build mechanical cam toys in Year 3. Alongside this design technology learning the children build their knowledge and understanding of forces in science including pushing, pulling and turning forces.*
Teaching	Children are taught how to work scientifically. The curriculum embeds a systematic and precise approach to working scientifically, enabling purposeful science investigation. A consistent investigation process is in place across all year groups. This builds children's skills in posing questions, planning investigations, collecting and analysing information and data, summarising results and drawing conclusions. Access to a significant range of resources ensures children are taught to measure, observe and collect data and information accurately. Children also incorporate maths, design technology and computing understanding within their science learning.
For example:	*In Year 2 children ask, 'What makes a difference to how well a plant grows?'. They plan an investigation; they learn about making it 'fair' and consider conditions; they use calendars, rulers and thermometers to measure time, height and temperature. They collect and analyse the data, then explain their conclusions.*
Vocabulary and language use	Children are taught relevant vocabulary and definitions during sequences of lessons. It is explicitly included within the sequenced curriculum end points, unit learning sequences and through knowledge organisers used to deepen children's disciplinary knowledge.
For example:	*In Year 1 children are taught about plants. They learn the definitions for and use vocabulary such as: conifer, deciduous, evergreen, leaves, flowers (blossom), petals, fruit, roots, bulb, seed, trunk.*
Assessment	Authentic assessment is used to enable, both children and teachers to understand success. In all year groups a blend of product self-assessment criteria and low stakes quizzes are used.
For example:	*Children reflect on and regularly retrieve the knowledge and understanding they are building over a sequence of lessons. Children retrieve key knowledge and understanding through end of unit quizzes. This information is also used to identify gaps that need to be planned for in future learning.*
Reading culture	Newtown has a reading culture: Where possible teachers capitalise on opportunities to embed reading as a technical skill and for enjoyment within the science curriculum.
For example:	*In Year 6 children read the 'Kensuke's Kingdom', alongside scientific learning about evolution, inheritance and* adaptation. In lessons across the whole school children read and use scientific vocabulary, and access secondary sources, such as non-fiction books and websites for research.

Working Scientifically

Think and work like a scientist at EYFS

Linking to our understanding of the world the children: verbally ask questions about their surrounding environment, investigate changes in matter, observe changes in plants and weather linking to the seasons, compare the homes of different animals and discuss the reasons why some animals are suited to different habitats. With all their learning across the year the children make links between their new knowledge and existing knowledge and use this to build on their understanding of the world.

Think and work like a scientist at KS1 (Disciplinary Knowledge)

Asking questions	Finding things out	Making sense of what you found out	Using what you found out
Design and create simple questions to investigate. Know there are different ways to answer scientific questions. Identify what might be a good way of answering a scientific question.	Observe closely, using simple equipment. Performing simple tests to investigate practically. Record by identifying, naming, drawing structures found in science. Gathering and recording data and changes over time. Use secondary sources	Comparing and contrasting Identifying, grouping and classifying Using their observations, ideas, data and changes to suggest answers to questions. Using scientific language, they have learned, talk and write about what they found out.	Make connections across scientific ideas. Recognise, retrieve and use scientific knowledge and understanding within other subject areas.

Think and work like a scientist at KS2 (Disciplinary Knowledge)

Asking questions	Finding things out	Making sense of what you found out	Using what you found out
Design and create relevant questions. Plan different enquiries to answer questions.	Set up simple practical enquiries. Use comparative and fair tests, recognising variables where necessary (controlled, independent and dependent). Systematic, careful and repeated observations. Measure accurately using standard units and a range of equipment including data loggers. Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.	Gathering, recording, classifying and presenting data to help answer questions. Identifying differences, similarities or changes related to simple scientific ideas and processes. Draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. Report findings: oral/written explanations/displays/presentations of results and conclusions. Using straightforward scientific evidence to answer questions or to support their findings.	Make connections across scientific ideas Recognise, retrieve and use scientific knowledge and understanding within other subject areas

Think and work like a scientist at UKS2 (Disciplinary Knowledge)

Asking questions	Finding things out	Making sense of what you found out	Using what you found out
Design and create relevant scientific questions in response to scientific data, observations and ideas. Design and plan different enquiries to answer questions.	Plan comparative and fair tests, recognising and controlling variables where necessary (controlled, independent and dependent). Systematic, careful and repeated observations. Measure accurately using standard units and a range of equipment including data loggers. Record findings using scientific language, drawings, labelled diagrams, classification keys, bar charts, scatter graphs tables and line graphs.	Gathering, recording, classifying and presenting data to help answer questions. Identifying differences, similarities or changes related to simple scientific ideas and processes. Draw conclusions, including causal relationships and explanation and degree of trust in results. Report findings: oral/written explanations/displays/presentations of results and conclusions. Use test results to make predictions to set up further comparative and fair tests. Identifying scientific evidence used to support or refute ideas and arguments.	Make connections across scientific ideas Recognise, retrieve and use scientific knowledge and understanding within other subject areas

Animals including humans and evolution and inheritance: Most useful content (Substantive Knowledge)						
EYFS	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Identify the basic needs of living things (including humans). Understand the importance of healthy food choices and exercise.	Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. Identify and name a variety of common animals that are carnivores, herbivores and omnivores.	Notice that animals, including humans, have offspring which grow into adults. Understand reproduction at a basic level in animals. E.g. Egg, chick, chicken; egg, caterpillar, pupa, butterfly; spawn, tadpole, frog; lamb, sheep. Understand growing into adults includes baby, toddler, child, teenager, adult. Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	Describe the simple functions of the basic parts of the digestive system in humans. Identify the different types of teeth in humans and their simple functions. Construct and interpret a variety of food chains, identifying producers, predators and prey.	Describe the changes as humans develop to old age.	Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function Describe the ways in which nutrients and water are transported within animals, including humans. Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

Livings things and their habitats: Most useful content (Substantive Knowledge)						
EYFS	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Identify and name a variety of common animals and where they might live. Discuss where different animals live and possible reasons why.		Explore and compare the differences between things that are living, dead, and things that have never been alive. Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. Identify and name a variety of plants and animals in their habitats, including micro-habitats. Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.		Recognise that living things can be grouped in a variety of ways Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment Recognise that environments can change and that this can sometimes pose dangers to living things.	Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird Describe the life process of reproduction in some plants and animals.	describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals give reasons for classifying plants and animals based on specific characteristics.

Plants: Most useful content (Substantive Knowledge)						
EYFS	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Identify what plants need to grow. Identify and name some of the different parts of plant.	Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. Identify and describe the basic structure of a variety of common flowering plants, including trees.	Observe and describe how seeds and bulbs grow into mature plants. Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.	Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. Investigate the way in which water is transported within plants. Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.			

Materials and Matter: Most useful content (Substantive Knowledge)						
EYFS	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Identify and name some everyday materials including wood, plastic and metal. Use vocabulary to discuss how different materials feel. Discuss the changing states of matter- linked to the seasons. Ice melting and freezing.	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.	Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. Describe in simple terms how fossils are formed when things that have lived are trapped within rock. Recognise that soils are made from rocks and organic matter.	Compare and group materials together, according to whether they are solids, liquids or gases Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic Demonstrate that dissolving, mixing and changes of state are reversible changes Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	

Seasonal Changes, Earth and Space: Most useful content (Substantive Knowledge)						
EYFS	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Observe the seasons across the year. Observe and describe the some of the key changes with the seasons.	Observe changes across the four seasons. Observe and describe weather associated with the seasons and how day length varies.				Describe the movement of the Earth, and other planets, relative to the Sun in the solar system Describe the movement of the Moon relative to the Earth Describe the Sun, Earth and Moon as approximately spherical bodies Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	

Forces, Magnets and Electricity: Most useful content (Substantive Knowledge)						
EYFS	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
			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.	Identify common appliances that run on electricity Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit Recognise some common conductors and insulators, and associate metals with being good conductors.	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.	Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches Use recognised symbols when representing a simple circuit in a diagram.

Light and Sound: Most useful content (Substantive Knowledge)						
EYFS	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Identify shadows in their surroundings. Identify sources of light e.g. torches, screens, lights, sun. Discuss natural light and man made light.			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.	Identify how sounds are made, associating some of them with something vibrating Recognise that vibrations from sounds travel through a medium to the ear Find patterns between the pitch of a sound and features of the object that produced it Find patterns between the volume of a sound and the strength of the vibrations that produced it Recognise that sounds get fainter as the distance from the sound source increases.	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.	

Equality: Most useful content (Substantive Knowledge)						
EYFS	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**

Think and work like a scientist at Newtown Examples (Disciplinary Knowledge)			
Year 1			
Asking questions	**Finding things out**	**Making sense of what you found out**	**Using what you found out**
Design and create simple questions to investigate. *E.g. How are our bodies similar and different to other mammals?* **Know there are different ways to answer scientific questions.** **Identify what might be a good way of answering a scientific question.** *E.g. Record the changes in leaf colour over time.* *E.g. Record differences between common animals.*	**Observe closely, using simple equipment.** *E.g. Using magnifying glasses to observe the differences between minibeasts.* **Performing simple tests to investigate practically.** *E.g. What minibeasts like to eat?* *E.g. What is the best material for an umbrella?* **Record by identifying, naming, drawing structures found in science.** *E.g. Insects, flowers, trees, mammals* **Gathering and recording data and changes over time.** *E.g. Take a photograph each week to notice changes in leaf colour over time.* **Use secondary sources** *E.g. Using photographs to compare humans and a range of mammals.*	**Comparing and contrasting** *E.g. What features do minibeast and humans share?* *E.g. How are reptiles and mammals different?* **Identifying, grouping and classifying** *E.g. Can we identify the deciduous and evergreen trees in the school grounds?* **Using their observations, ideas, data and changes to suggest answers to questions.** *E.g. Present differences between common animals in a Carrol diagram.* **Using scientific language they have learned, talk and write about what they found out.**	**Make connections across scientific ideas** *E.g. Seasons and their relationship to plants/trees.* **Recognise, retrieve and use scientific knowledge and understanding within other subject areas** *E.g. Colour mixing and petal and leaf colour.* *E.g. Recapping materials knowledge in design technology.*

Think and work like a scientist at Newtown Examples (Disciplinary Knowledge)			
Year 2			
Asking questions	**Finding things out**	**Making sense of what you found out**	**Using what you found out**
Design and create simple questions to investigate. *E.g. What can help a plant grow successfully?* **Know there are different ways to answer scientific questions.** **Identify what might be a good way of answering a scientific question.** *E.g. Observe how a plant grows in different condition.*	**Observe closely, using simple equipment.** *E.g. Using a thermometer to measure the temperature differences in different around school.* **Performing simple tests to investigate practically.** *E.g. Grow plants in different areas of the school* **Record by identifying, naming, drawing structures found in science.** *E.g. Draw and label a simple food chain.* **Gathering and recording data and changes over time.** *E.g. Plant growth in different conditions, using rulers to measure the height of a plant over time.* **Use secondary sources** *E.g. Internet research, plant growth in other countries.*	**Comparing and contrasting** *E.g. What features do minibeast and humans share?* **Identifying, grouping and classifying** *E.g. Present information in a lifecycle table to show egg, new-born, young and adults of chickens, frogs, butterflies and humans?* **Using their observations, ideas, data and changes to suggest answers to questions.** *E.g. Looking at the different sets of measurements (data) can we say what helps a plant grow successfully?* **Using scientific language they have learned, talk and write about what they found out.**	**Make connections across scientific ideas** *E.g. Seasons and animal behaviour such as hibernation.* *E.g. Wood as part of a tree and knowing why it can withstand strong wind – flexibility and strength* **Recognise, retrieve and use scientific knowledge and understanding within other subject areas** *E.g. During art based on Van Gogh's Sunflowers, retrieving the knowledge of the parts of a plant that the children will be painting* *E.g. When using fruit and vegetables in cooking*

Think and work like a scientist at Newtown Examples (Disciplinary Knowledge)			
Year 3			
Asking questions	**Finding things out**	**Making sense of what you found out**	**Using what you found out**
Design and create relevant questions. *E.g. How do shadows change length during the day?* *E.g. What happens to shadow if I move an opaque shape closer to the light source?* **Plan different enquiries to answer questions.** E.g. Measure how a shadow length changes during the school day.	**Set up simple practical enquiries.** E.g. Trace around the shadow of an object during the day. **Use comparative and fair tests.** **Recognise variables where necessary (controlled, independent and dependent).** **Systematic, careful and repeated observations.** *E.g. When measuring the shadow length use same object, same position, same time interval* **Measure accurately using standard units and a range of equipment including data loggers.** *E.g. Using a 1 cm marked metre rule to measure the shadow, checking the measurement twice for accuracy.* **Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.** *E.g. Record shadow measurement data in a whole class Excel spreadsheet.*	**Gathering, recording, classifying and presenting data to help answer questions.** *E.g. Using shadow Excel data, create an Excel whole class line graph.* **Identifying differences, similarities or changes related to simple scientific ideas and processes.** **Draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.** *E.g. Use the shadow line graph to answer the initial question and pose further questions around the rate of change and the significant values (shortest/longest).* *E.g. Why is the shadow longest early morning and late afternoon/shortest around lunchtime?* **Report findings: oral/written explanations/displays/presentations of results and conclusions.** **Using straightforward scientific evidence to answer questions or to support their findings.**	**Make connections across scientific ideas** *E.g. Retrieving learning on seasons to understanding how shadow length changes in different parts of the year.* *E.g. Use knowledge of forces such as pulls and pushes to measure strength of a magnetic – use a force meter (newton meter) to measure how much force it takes to pull a paper clip of different magnets.* **Recognise, retrieve and use scientific knowledge and understanding within other subject areas** *E.g. Using mirrors to draw self portraits* *E.g. In art using knowledge of how shadows are formed to support when drawing and painting still life.* *E.g. Make compasses for geography by magnetising needle and floating on cork.*

Think and work like a scientist at Newtown Examples (Disciplinary Knowledge)			
Year 4			
Asking questions	Finding things out	Making sense of what you found out	Using what you found out
Design and create relevant questions. *E.g. What factors can make a difference to how quickly water evaporates?* **Plan different enquiries to answer questions.** E.g. Measure the rate of evaporation of water in different locations around the school. (temperature)	**Set up simple practical enquiries.** E.g. Measure the volume of water in containers in different locations at regular intervals over a week. **Use comparative and fair tests, recognising variables where necessary (controlled, independent and dependent).** Same volume of water, location, container (controlled), different location (independent), measured volume (dependent) **Systematic, careful and repeated observations.** *E.g. Use of measuring cylinder at the same time for all locations, measuring to the nearest 5 ml.* **Measure accurately using standard units and a range of equipment including data loggers.** *E.g. use of thermometers to measure the ambient temperature that the water is exposed to.* **Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.**	**Gathering, recording, classifying and presenting data to help answer questions.** *E.g. Record using line graph to track 4 different locations so they can be easily compared* **Identifying differences, similarities or changes related to simple scientific ideas and processes.** **Draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.** *E.g. Use the volume line graph to answer the initial question and pose further questions around the rate of change and the significant values (shortest/longest).* *E.g. Are there additional factors that might make a difference to rate of evaporation?* **Report findings: oral/written explanations/displays/presentations of results and conclusions.** **Using straightforward scientific evidence to answer questions or to support their findings.**	**Make connections across scientific ideas** *E.g. Using condensation against a cold surface to collect evaporated water vapour (make a solar still).* *E.g. Use knowledge of materials from KS1 when exploring which materials make good conductors and insulators.* **Recognise, retrieve and use scientific knowledge and understanding within other subject areas** *E.g. In geography using knowledge of evaporation to support understanding of areas such as salt flats and concepts such as drought.*

Think and work like a scientist at Newtown Examples (Disciplinary Knowledge)			
Year 5			
Asking questions	Finding things out	Making sense of what you found out	Using what you found out
Design and create relevant scientific questions in response to scientific data, observations and ideas. *E.g. How does air resistance make a difference to the speed an object falls or travels?* **Design and plan different enquiries to answer questions.** *E.g. Measure the time taken for an object to fall with a parachute. (velocity)* *E.g. Measure the distance simple buggies with different shaped body shells travel after leaving a ramp. (velocity)*	**Plan comparative and fair tests, recognising and controlling variables where necessary (controlled, independent and dependent).** *E.g. Same object below parachute (controlled), different sized parachute (independent), rate of fall (dependent)* *E.g. Same ramp angle and weight of materials (controlled), different sized body shell (independent), distance travelled (dependent)* **Systematic, careful and repeated observations.** **Measure accurately using standard units and a range of equipment including data loggers.** *E.g. Drop all parachutes at the same time and use slow motion function on an iPad to accurately establish fall rates. Repeat the drops 5 times and establish average placing within the other parachutes.* *E.g. Do 5 runs for each buggy, discount the furthest and shortest distances and average the 3 remaining runs.* **Record findings using scientific language, drawings, labelled diagrams, classification keys, bar charts, scatter graphs tables and line graphs.** *E.g. Mathematical calculation to establish the area of the parachutes and establish relationship between surface area, increased air resistance and rate of drop.*	**Gathering, recording, classifying and presenting data to help answer questions.** *E.g. Present data table to show the relationship between increased surface area and reduced rate of drop.* **Identifying differences, similarities or changes related to simple scientific ideas and processes.** **Draw conclusions, including causal relationships and explanation and degree of trust in results.** **Report findings: oral/written explanations/displays/presentations of results and conclusions.** *E.g. Present causal connection as a conclusion and identify other evidence to support that an increase in air resistance reduces the velocity (speed) that an object can travel.* **Use test results to make predictions to set up further comparative and fair tests.** *E.g. Can we adapt our buggies, so they have varying size sails. What could we observe if we allow the buggies to 'sail' across the playground?* **Identifying scientific evidence used to support or refute ideas and arguments.** *E.g. Investigate the use of aerodynamics in car design through time.*	**Make connections across scientific ideas** *E.g. How is air resistance like other forces that they have investigated before.* *E.g. How is air resistance similar to the resistance created by water and what evidence is there that water resistance can be used to enable propulsion?* **Recognise, retrieve and use scientific knowledge and understanding within other subject areas** *E.g. In design technology can knowledge of air resistance be used to design a car that can travel using a balloon motor.* *E.g. In design technology can children design and build a windmill?* *E.g. In design technology can children design and build a windmill that could lift a weight, in a strong enough breeze (hairdryer)?*

Think and work like a scientist at Newtown Examples (Disciplinary Knowledge)			
Year 6			
Asking questions	Finding things out	Making sense of what you found out	Using what you found out
Design and create relevant scientific questions in response to scientific data, observations and ideas. *E.g. How are shadows formed and why do shadows bear similarities to the object creating them?* **Design and plan different enquiries to answer questions.** *E.g. Can we explain why shadows of the same object regularly change size, shape and position?* *E.g. Using mirrors and a light source can we prove that light travels in straight lines from a source and to our eyes?*	**Plan comparative and fair tests, recognising and controlling variables where necessary (controlled, independent and dependent).** *E.g. Same light source, same object, same line of movement from the source, same distance of projection surface from the source (all controlled) change the distance of object from the source (independent)change in shadow size/shape (dependent).* **Systematic, careful and repeated observations.** **Measure accurately using standard units and a range of equipment including data loggers.** *E.g. Move the object at equal intervals away from the light source; trace the shadows on the projection surface; use a different colour for each projection to aid ease of analysis later;* **Record findings using scientific language, drawings, labelled diagrams, classification keys, bar charts, scatter graphs, tables and line graphs.** *E.g. Record data in a table; record observations of change using relevant language such as elongated. Plot intervals on a line graph and look for patterns in the data. What do you notice?*	**Gathering, recording, classifying and presenting data to help answer questions.** *E.g. Present data table to show the relationship between size and shape of shadow and how far away from the light source.* *Form predictions based upon line graph increases; if at 10 cm the shadow was … then at 15 cm I believe it will be… because…* **Identifying differences, similarities or changes related to simple scientific ideas and processes.** **Draw conclusions, including causal relationships and explanation and degree of trust in results.** **Report findings: oral/written explanations/displays/presentations of results and conclusions.** *E.g. Present causal connection as a conclusion and identify other evidence to support that the closer the light source the sharper the shadow.* *E.g. Explain that alternative light sources create a difference in the sharpness of the outline/width of a shadow. Explore and compare sunlight, phone torch, normal torches with variety of sizes of lenses.* **Use test results to make predictions to set up further comparative and fair tests.** *E.g. If we change our light source, does the shadow change? What similarities, differences are there?* **Identifying scientific evidence used to support or refute ideas and arguments.** *E.g. Children learn that light travels in straight lines and explore how mirrors can bend light at angles. Children relate this to car mirrors.*	**Make connections across scientific ideas** *E.g. Why are car and motorcycle mirrors positioned the way they are?* *E.g. How does a periscope use mirrors to enable the eye to see?* **Recognise, retrieve and use scientific knowledge and understanding within other subject areas** *E.g. In design technology children can use the knowledge of mirrors and light to create a periscope.* *E.g. In design technology children can use electrical circuit to create a torch with varying width of lenses.* *E.g. In Bath Spa university visit, children can use what they have found out to explore light through crystals and how pixels are used in photography.*