Science at High Hazels

High Hazels Academy
The best in everyone™
Part of United Learning

We follow the United Learning scheme of work for our long-term and medium-term planning. Our teaching is guided by Rosenshine's principles to ensure effective instruction. This results in our children acquiring coherent substantive knowledge of the three scientific disciplines and grounding in core disciplinary knowledge.

Our Whole School Long Term Plan

EYFS

Forces and Materials

<table>
<tr><th></th><th colspan="3">Forces and Materials</th></tr>
<tr><td>Development Matters N3/4</td><td colspan="3">Use all their senses in hands-on exploration of natural materials.
Explore collections of materials with similar and/or different properties.
Talk about what they see, using a wide vocabulary.
Explore and talk about different forces they can feel.
Talk about the differences between materials and changes they notice.
Explore how things work.</td></tr>
<tr><td>Development Matters Reception</td><td colspan="3">Explore the natural world around them.
Describe what they see, hear and feel whilst outside.</td></tr>
<tr><td>ELG</td><td colspan="3">- Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.</td></tr>
<tr><td>Nursery</td><td>Polar Express
Make boats.
On the Move
Explore the forces. Sort toy vehicles.
Once Upon a Time 1
Observe changes through baking.
Sort materials according to their properties.</td><td>Bears
Explore the natural materials linked to the bear stories.
Special Days
Explore Christmas themed materials using the 5 senses.
Toys
Explore how toys work. Explore magnets.
Once Upon a Time 2
Building bridges for the goats.
Sorting materials.
Observe changes through baking.</td><td>Milestones
Children will:
• Use their senses in hands on exploration.
• Explore and talk about different forces they can feel.
• Sort collections of materials with similar and/or different properties
• Begin to use vocabulary such as hard, soft, rough, smooth, heavy, light, springy, firm, shiny or dull to describe materials.</td></tr>
<tr><td>Reception</td><td colspan="2">Science Detectives
Changing materials.</td><td>Milestones
Children will:
• Describe what they see, hear and feel when exploring forces and materials.
• Talk about changes they observe e.g. melting and freezing, cooking.</td></tr>
<tr><td>Y1 Links</td><td colspan="2">Year 1 Spring 1 Chemistry
Everyday materials
Distinguishing objects from the material it's made from, and describing simple properties</td><td>Curriculum Goals
Use accurate vocabulary to describe the properties of materials and talk about forces they have experienced.</td></tr>
</table>

Our Whole School Long Term Plan

EYFS

The Natural World

	The Natural World		
Development Matters N3/4	Use all their senses in hands-on exploration of natural materials. Talk about what they see, using a wide vocabulary. Plant seeds and care for growing plants.		Understand the key features of the life cycle of a plant and an animal. Begin to understand the need to respect and care for the natural environment and all living things.
Development Matters Reception	Understand the effect of changing seasons on the natural world around them.		Explore the natural world around them. Describe what they see, hear and feel whilst outside.
ELG	- Explore the natural world around them, making observations and drawing pictures of animals and plants; - Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.		
Nursery	**It's Getting Cold Outside** Sort clothing to wear in different climates/ types of weather. **Polar Express** Explore melting and freezing. **On the Move** **On the Farm** Plant and care for vegetables. Life cycles / animals and their young. **Once Upon a Time 1** Observe changes through baking. **All Creatures Great and Small 1** African animals and their young.	**Bears** Explore the natural materials linked to the bear stories. **Special Days** Explore Christmas themed materials using the 5 senses.. **Food Glorious Food** Grow beans. Life cycles/ animals and their young. **Once Upon a Time 2** Observe changes through baking. **All Creatures Great and Small 2** African jungle animals. Life cycle of a fish.	**Milestones** Children will: • Use their senses in hands on exploration. • Sort clothing to wear in different climates/ types of weather. • Dress appropriately to go outside in wet, cold and windy weather. • Match animals to their young. • Plant seeds and look after growing plants with support. • Identify that certain animals live in different environments.
Reception	**It's Getting Cold Outside** Explore the weather using their senses. Find out about hibernation. **Spring in Our Step** Spring/ nature walks. Bean dairy **Science Detectives** Seasons and weather		**Milestones** Children will: • Identify some key signs of each season. • Can talk about what a plant needs to survive • Care for the natural world and living things. • Sequences and talk about the life cycles of living things. • Talk about changes they observe e.g. melting and freezing, cooking. • Describe some the effects of changing seasons on the natural world. • Begin to understand what they can do to help the environment.
Y1 Links	**Year 1 Autumn 1 Biology** Plants *Identifying and naming common plants and describing basic structures* **Year 1 Autumn 2 Biology / Physics** Seasonal changes *Observing changes across four seasons and describing associated weather*		**Curriculum Goals** **Explore, make observations, and ask questions about the natural world, gaining a developing understanding of important processes and changes they observe.**

Our Whole School Long Term Plan

Year – Year 6

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Autumn 1	**Biology** Plants *Identifying and naming common plants and describing basic structures*	**Biology** Plants *Plants grow from seeds, and require water, light and a suitable temperature*	**Chemistry** Rocks *Comparisons of types of rocks and how fossils are formed*	**Biology** Living things & their environment *Introduction to classifying animals and their environment*	**Chemistry** Properties of materials *Relationship between materials and their uses; difference between reversible and non-reversible changes*	**Biology** Evolution and inheritance *Fossils; introduction to the idea that adaptation may lead to evolution*
Autumn 2	**Biology / Physics** Seasonal changes *Observing changes across four seasons and describing associated weather*	**Biology** Needs of animals *Animals need water, food and air to survive and to have offspring*	**Physics** Light *Relationship between light and how we see; the formation of shadows*	**Biology** Digestion *The human digestive system and simple food chains*		**Physics** Electricity *Investigating variations in series circuits*
Spring 1	**Chemistry** Everyday materials *Distinguishing objects from the material it's made from, and describing simple properties*	**Biology** Living things & their habitats *Basic introduction to habitats and micro-habitats, and simple food chains*	**Biology** Living organisms *The role of muscles and skeletons; the importance of nutrients*	**Chemistry** States of matter *Solids, liquids and gases and the role of temperature in changing states*	**Biology** Life cycle *Life cycles of a mammal, amphibian, insect and bird, and some reproduction processes*	**Physics** Light *How light travels and is reflected, and how this allows us to see*
Spring 2			**Biology** Plants *The key features of flowering plants and what they need to survive*	**Physics** Sounds *Relationship between strength of vibrations and volume of sound*	**Biology** Human development *Human development to old age*	**Biology** Classifying living things *Further classification of living organisms based on characteristics*
Summer 1	**Biology** Animals *Identifying and naming fish, amphibians, reptiles, birds and mammals; recognising carnivores, herbivores and omnivores*	**Chemistry** Uses of everyday materials *Comparisons of an object's material with its use; impact of bending, twisting etc. on solid objects*	**Physics** Forces & magnets *Magnets have poles which attract or repel*	**Physics** Electricity *Simple series circuits*	**Physics** Forces *Gravity, air and water resistance and friction; introduction to pulleys*	**Biology** Functions of the human body *Human circulatory system; transport of nutrients within the body*
Summer 2					**Physics** Earth and space *Movements of planets and the Moon, and relationship to day and night*	**Chemistry** Chemical reactions *Reactions of substances with water, fire and acid*

Y1-6: Before planning and teaching a Science unit, teachers will consider the outcomes that will be achieved, including Scientific knowledge (substantive knowledge) and Scientific skills (disciplinary knowledge), and how these will be assessed for progression.

All objectives from the National Curriculum programmes of study are taught by the end of each unit. Children are then assessed on these KPIs.

Scientific enquiry is a focus throughout our units of work. During the 'main investigation' at least one relevant working scientifically objective will be taught taken from the appropriate phase.

Outcomes

By the end of this unit all pupils should know:

- That objects move differently on different surfaces due to the amount of friction between the two surfaces.
- That magnetic forces can act at a distance and in different ways (repel or attract).
- That some materials are magnetic, and others are not.
- Not all metals are magnetic. Only iron, cobalt and nickel (and their alloys) are magnetic.

By the end of this unit pupils should work scientifically by:

Main activity: Investigating which materials are magnetic and which are not.

- Observing whether a material is attracted to the magnet and making notes on the strength of the attraction.
- Analysing and evaluating the findings by identifying patterns, drawing simple conclusions and using these to make predictions about the magnetism of other objects based on the material it is made from.

Progression

Prior learning

- Pupils know that forces can change the shape of materials, such as by pushing, pulling, twisting or stretching the material (e.g. playdough).
- Pupils can identify the material common objects are made from (metal, plastic, wood, etc.).
- Pupils know that water and oil (or grease) can make things slippery (e.g. slipping on water on the floor).

Building towards

- Main vertical concept: Objects can affect other objects at a distance.
- Some forces can act at a distance; magnetic force is one such force, but there are others too (e.g. gravity).
- The link between magnetism and electricity.

Assessment

- Multiple choice quiz

Teachers assess prior learning before beginning the new learning within the unit. This then informs teachers if any gap teaching is required.

Formative assessment takes place using a pre and post learning quiz.

Sequence of a Unit

At High Hazels all our science units follow a structure with a focus of Scientific Enquiry throughout.

Pre-learning task & Quiz. Introduce Knowledge Organiser

- A pre-learning task to be carried out before begining the sequence of lessons. This should be practical with lots of discussion.
- A quiz should go alongside this to assess what knowledge children have of the unit from previous year groups.
- The knowldege organiser should be discussed during the lesson looking at the learning that will take place, including how we will work scientifically and a focus on vocabulary. **KOs should be stuck in books at the start of the unit.**
- Evidence of the pre-learning task can be either photographs or a short reflection under **L.O: pre-learning task.** (After KOs) and with quiz.

Gap lesson or activity

- If during your pre-learning task, the children have gaps in their prior learning (scientific knowledge they should know before their year group) teachers should account for this using gap teaching.
- This might be done as a short activity during the pre-learning lesson eg reviewing vocabulary, or may need to be a gap teaching lesson.

Scientific knowledge/ Substanstive knowledge

- Lessons from the unit plan to be taught covering scientific knowledge and key concepts.
- All objectives from National Curriculum programme of study to be taught by the end of the topic/ half term. KPIs covered and used to inform assessment.
- All lessons should have an aspect of inquiry- following learning scientifically objectives where appropriate

Investigation/ Disciplinary knowledge

- At least one investigation is to be carried out per half-term, meeting at least one relevant working scientifically objective form your KS/Phase.
- Please see your key stage's investigation pro-forma to help you plan the investigations (including predictions, variables, results and conclusions).
- KS2- the investigation must be written-up in books and must have a satistical chart to show results. Upper ks2 children must evaluate how they carried out their experiement.

Post-assessment-quiz

- This can be completed at the start of the pre-learning lesson of next unit.
- The quiz should contain at least one question on each scienctifc knowledge KPI.
- The lesson should be evidenced in your books and inform your assessment of the children's scientific knowledge.

Knowledge Organisers

Knowledge organisers are used for the benefit of the children therefore are written in child friendly language and appropriate for the year group. Children are given these at the start of the unit and referred to throughout.

Children are told what they will learn during the unit (substantive knowledge).

Children are given key facts for engagement.

Children can use visuals to support learning throughout the unit.

Children are also told which scientific skills they will be focusing on (disciplinary knowledge).

Key vocabulary is provided for the children to support learning throughout the unit. These are separated into anchor, goldilocks and step on words.

Living Organisms – Knowledge Organiser

This unit we will learn:

- The nutritional needs of animals, including humans, demonstrating knowledge of simple food groups (e.g. dairy, fruit and vegetables, fats and sugars, carbohydrates, protein) in a healthy diet.
- The names, functions and locations of different parts of the musculoskeletal system in humans and other animals, including the skull (cranium), ribcage, spine and pelvis.

Working scientifically, we will:

- Grouping and comparing features of animals with/without a skeleton.
- Identify patterns, similarities and differences between the animals and use these to draw conclusions and justify their groupings.
- Present their findings, including oral and written explanations, displays or presentations of results and conclusions.

Key facts

There are 206 bones in an adult body.

There are 206 bones in an adult body.
Our bodies need a variety of food in order to function properly. This includes to build muscles and bones and to repair any damage. **Water** is needed to make your body function (work) properly

The main food groups are carbohydrates, protein, dairy, fruit and vegetables and fats and sugars.

Vitamins and minerals also help your body to work properly. If your body does not get enough vitamins, you might get some diseases.

Key Vocabulary

Anchor words	Goldilocks Words	Step on Words
Food What we need to eat	**Diet** Your diet is the food that you eat.	**Carnivore** A carnivore is an animal that will only eat other animals.
Water What we need to drink	**Balanced** When even or in the correct proportions	**Herbivore** A herbivore is an animal that will only eat plants.
Body Humans and animals are made up of organs, flesh and bones	**Skeleton** A skeleton is the bones in our body.	**Omnivore** An omnivore in an animal that will eat both plants and animals.

The Eat Well Plate

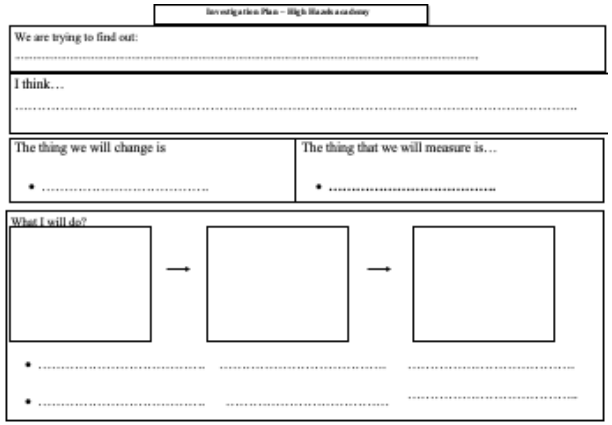
The Skeleton

The Digestive System

Scientific Enquiry write up formats

Scientific Enquiry write up formats are used to ensure consistency during the write up of a scientific enquiry. An appropriate level is used by each phase to include predictions, variables, results and conclusions.

KS1


Investigation Plan – High Heath academy

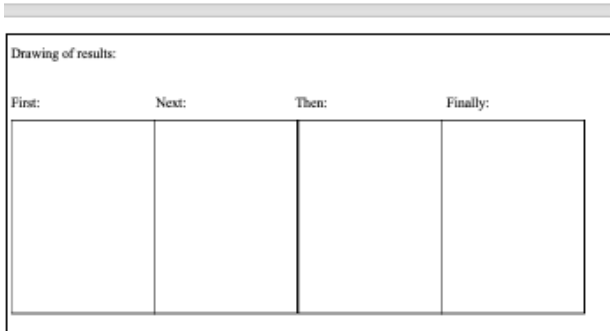
We are trying to find out:

I think…

The thing we will change is

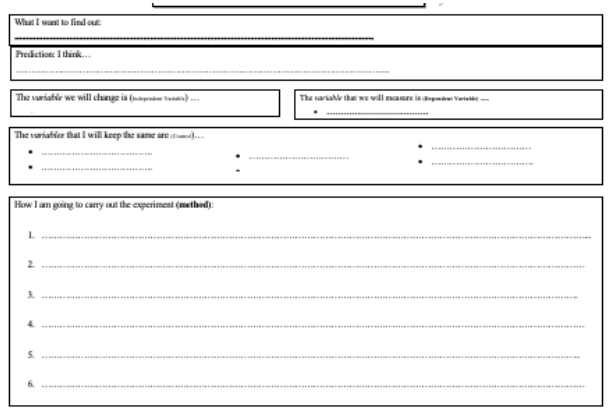
The thing that we will measure is…

What I will do?


Drawing of results:

First: Next: Then: Finally:

Lower KS2


What I want to find out:

Prediction: I think…

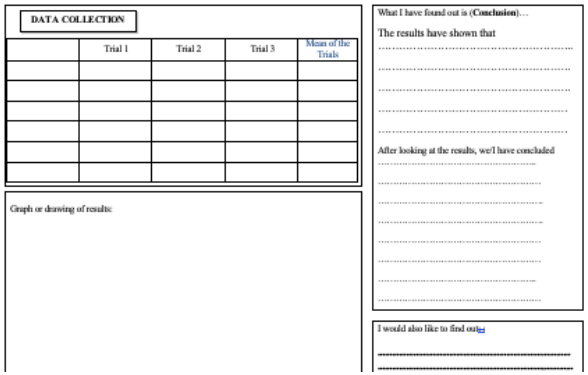
The variable we will change is (Independent Variable) …

The variable that we will measure is (Dependent Variable) ….

The variables that I will keep the same are (Control)…

How I am going to carry out the experiment (method):

1.
2.
3.
4.
5.
6.


DATA COLLECTION

	Trial 1	Trial 2	Trial 3	Mean of the Trials

Graph or drawing of results:

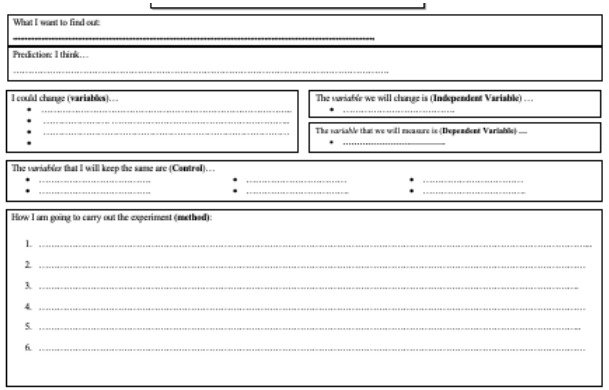
What I have found out is (Conclusion)…

The results have shown that

After looking at the results, we/I have concluded

I would also like to find out…

Upper KS2


What I want to find out:

Prediction: I think…

I could change (variables)…

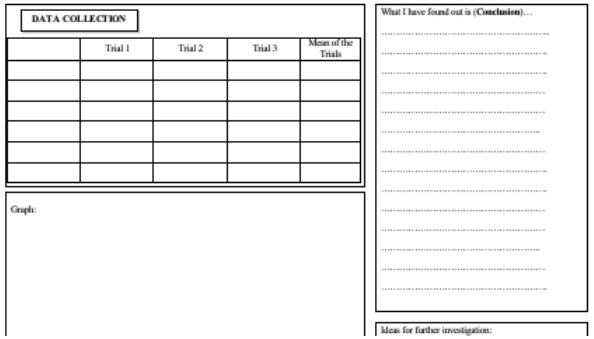
The variable we will change is (Independent Variable) …

The variable that we will measure is (Dependent Variable) ….

The variables that I will keep the same are (Control)…

How I am going to carry out the experiment (method):

1.
2.
3.
4.
5.
6.


DATA COLLECTION

	Trial 1	Trial 2	Trial 3	Mean of the Trials

Graph:

What I have found out is (Conclusion)…

Ideas for further investigation:

We also use a SEN format that can be adapted to meet individual needs on CIP

Assessment

Teacher assessment is carried out throughout the units both on substantive and disciplinary knowledge. Formative assessment is used in the form of a quiz prior and at the end of each unit.

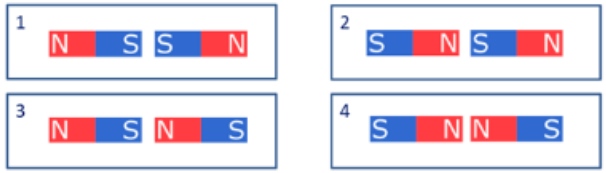
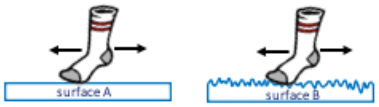
The purpose of the pre-learning quiz is to allow the teacher to assess the learning in previous year groups in relation to the unit. This allows teachers the opportunity to gap fill if and when necessary

The post learning quiz will include at least one question on each area of the scientific knowledge covered throughout the unit to allow teachers to assess the relevant KPIs.

Pre-learning Quiz

	ey made of?		2. What material are these Lego bricks ma
			
A	fabric	A	rubber
B	plastic	B	glass
C	wood	C	plastic
D	metal	D	metal
3. What material are these socks made of?		**4. On which surface are you most likely to slip on?**	
			
A	fabric	A	carpet
B	rubber	B	grass
C	plastic	C	icy ground
D	rock	D	concrete
5. Look at each of the pictures. Which surfaces would you describe as rough?			
A	surface of a pavement 	B	surface of a plate 
C	surface of a sheet of paper 	D	surface of a plastic bag

Post-learning Quiz

	oes a magnet have?		2. Sally holds 2 magnets. She places the ends of them together and they attract. What does "attract" mean?
A	1	A	The magnets become weaker.
B	2	B	The magnets become stronger.
C	3	C	The magnets are pulled towards each other.
D	4	D	The magnets are pushed away from each other.
3. Which pairs of magnets will repel?			
			
A	2 and 4 will repel	B	1 and 4 will repel
C	2 and 3 will repel	D	1 and 3 will repel
4. Which of the following materials are magnetic?		**5. Which of these forces can act at a distance (is a non-contact force)?**	
A	wooden spoon	A	magnetic force
B	ceramic bowl	B	push force
C	plastic plate	C	pull force
D	steel fork	D	twist force
6. Dan is wearing socks. He slides his foot along 2 different surfaces. Why is it harder for Dan to move his foot along surface B than surface A?			
			
A	There is **more** friction between the sock and surface B.	B	There is **less** friction between the sock and surface B.
C	There is the **same amount of friction** between the sock and surface A, and the sock and surface B.	D	There is **no friction** between the sock and surface B.