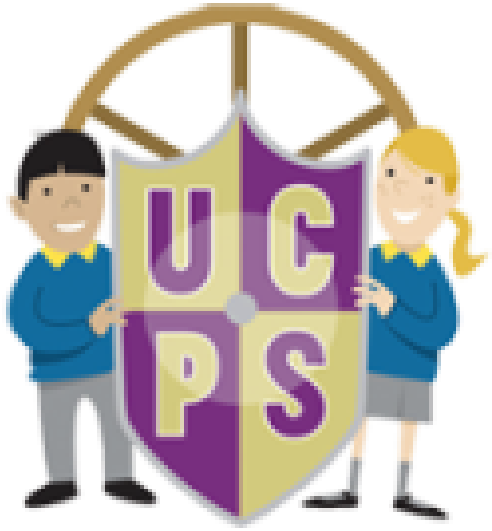


Science in Year 3

Working Scientifically

Year 3/4	Working Scientifically Skills

OBJECTIVES

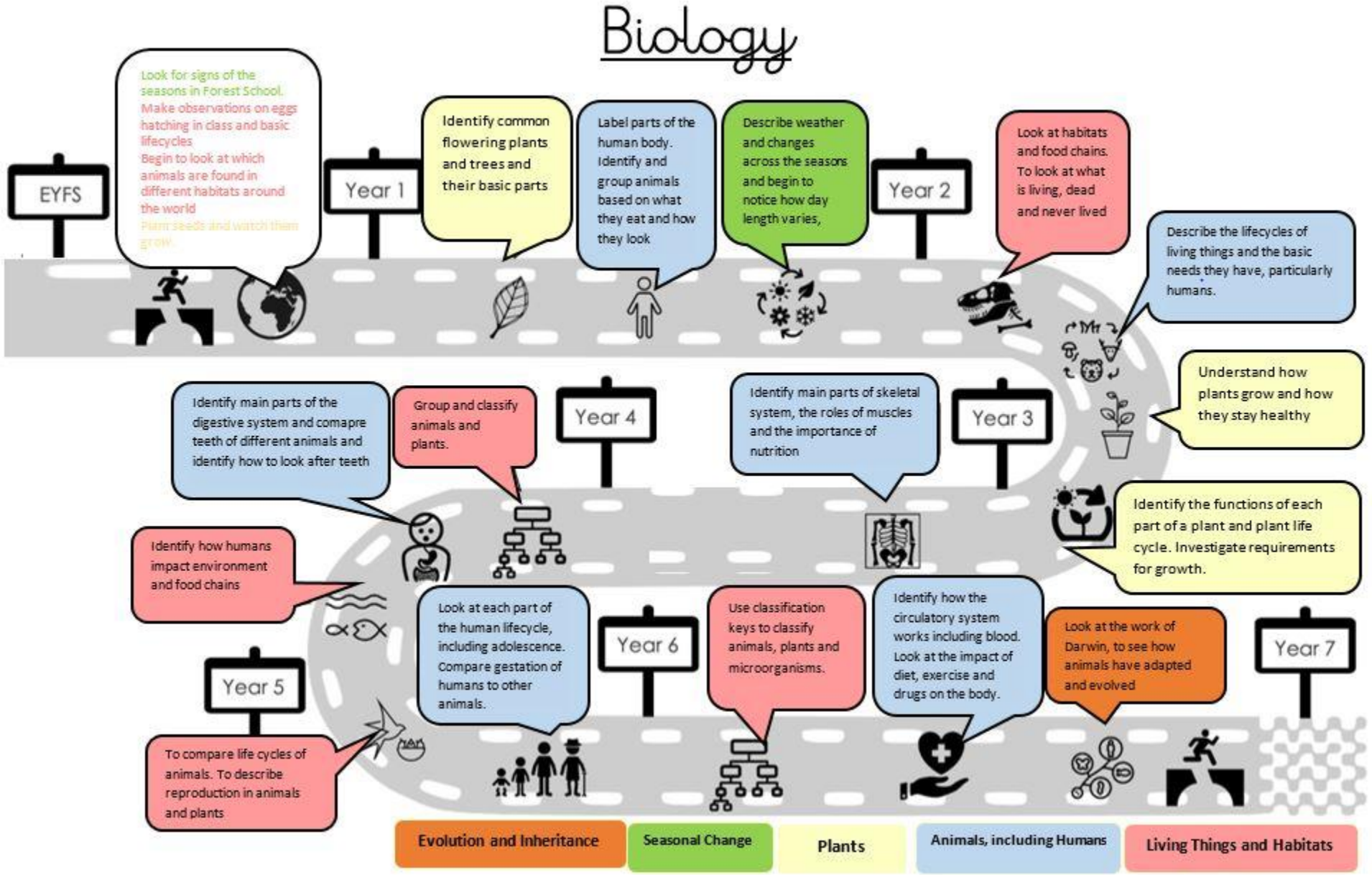
- Begin to raise their own relevant questions about the world around them
- Should be given a range of scientific experiences including different types of science enquiries to answer questions
- Can make and record a prediction before testing using scientific vocabulary and simple reasons.
- Start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions and which information needs to be collected
- Set up simple practical enquiries, comparative and fair tests
- Understands what a simple fair test is, recognise what a simple fair test is, when it is necessary and how it is fair.
- Talk about criteria for grouping, sorting and classifying; and use simple keys
- Use secondary sources and recognise when and how they might help them to answer questions that cannot be answered through practical investigations
- With support helps to make decisions about what systematic and careful observations to make and how long to make them for and the type of simple equipment that might be used.
- With support, begin to look for patterns and relationships (some naturally occurring) and decide what data to collect to identify them
- Take fair and accurate measurements using standard units and a range of equipment (including thermometers and data loggers) appropriately.
- Collect and record data from their own observations and measurements in a variety of ways: notes, bar charts and tables, standard units, drawings, labelled diagrams, keys
- With support, begin to make decisions about how to analyse this data
- With help, pupils should look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions from their findings
- Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences (including oral and written explanations, ICT, displays or presentations of results and conclusions)
- With support discusses the success of their working methods and suggests ways of improving what they have already done.

VOCABULARY

relevant questions
reasoned prediction A
ppropriate enquiry
Comparative tests
Keys
fair tests
systematic and careful observations
Accurate measurements
Standard units
Data collection
Dataloggers
Simple conclusion
findings
labelled diagrams keys
analyse
Improve
Working methods
Presentation/present
success
plan

Child friendly version to be put in the back of children's books/floor book	

Biology


EYFS
Look for signs of the seasons in Forest School.
Make observations on eggs hatching in class and basic lifecycles
Begin to look at which animals are found in different habitats around the world
Plant seeds and watch them grow.
Year 1
Identify common flowering plants and trees and their basic parts
Label parts of the human body. Identify and group animals based on what they eat and how they look
Describe weather and changes across the seasons and begin to notice how day length varies,
Year 2
Look at habitats and food chains. To look at what is living, dead and never lived
Describe the lifecycles of living things and the basic needs they have, particularly humans.
Year 3
Understand how plants grow and how they stay healthy
Identify the functions of each part of a plant and plant life cycle. Investigate requirements for growth.
Year 4
Identify main parts of the digestive system and comapre teeth of different animals and identify how to look after teeth
Group and classify animals and plants.
Identify main parts of skeletal system, the roles of muscles and the importance of nutrition
Year 5
Identify how humans impact environment and food chains
To compare life cycles of animals. To describe reproduction in animals and plants
Year 6
Look at each part of the human lifecycle, including adolescence. Compare gestation of humans to other animals.
Use classification keys to classify animals, plants and microorganisms.
Identify how the circulatory system works including blood. Look at the impact of diet, exercise and drugs on the body.
Year 7
Look at the work of Darwin, to see how animals have adapted and evolved
Evolution and Inheritance
Seasonal Change
Plants
Animals, including Humans
Living Things and Habitats

Year 3	Area of NC: Animals, including humans (Biology)		
Learning Objectives *(in suggested order of teaching sequence)*	***Prior Learning relevant to this topic*: In Year 2, children have learnt the importance of eating healthily and the need for food to survive. However, they have not been introduced to food groups. In Year 1, children learnt the basic parts of the human body but have not looked at the names of bones, they have also learnt about the bodies of other animals that aren't human.** • Identify main parts of the skeletal system • Identify the role of muscles in our body • Explain why humans and other animals have skeletons and muscles • Identify the different food groups and explain that animals, including humans, get nutrients from food. • Explain the importance of a nutritionally balanced diet ***Pupils do not need to be taught the following content, which they will learn in later year groups*: In Year 4 children will learn about the digestive system and in Year 6 children will learn about the circulatory system as well as learn more complex nutritional information and the effect diet can have on the body/heart. In Y3 organs do not need to be looked at.**		
Working Scientifically Objectives that link to this topic:	• Should be given a range of scientific experiences including different types of science enquiries to answer questions • Talk about criteria for grouping, sorting and classifying; and use simple keys • Use secondary sources and recognise when and how they might help them to answer questions that cannot be answered through practical investigations • Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences (including oral and written explanations, ICT, displays or presentations of results and conclusions) ***Others could be relevant dependant on which practical enquiries you choose to plan***		
Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Identify main parts of the skeletal system	Pupil, with support, can identify, name, and label the basic bones in the human skeleton	Pupil can independently name the main bones in the human skeleton	Pupil can name a large number of bones in the human body and knows how many bones there are in the human body
Identify the role of muscles in our body	Pupil understands that muscles help the movement of bones	Pupil recognises how bones are joined to and move in the skeleton of animals and humans, explaining the effect of and how muscles work	Pupil can describe the 3 types of muscle and identify their different functions e.g. role in lifting, running, sitting.

Explain why humans and other animals have skeletons and muscles	Pupil can recognise some function of the skeleton and muscles	Pupil can accurately describe the functions of the skeleton and muscles giving examples of which parts support, help them move or provide protection.	Pupil can explain the functions of the skeleton, muscle and joints in animals and humans and can begin to provide disadvantages that not having a skeleton would bring for the animal
Identify the different food groups and explain that animals, including humans, get nutrients from food.	Pupil understands that animals cannot make their own food and get nutrition from the food they eat Pupil can name some foods and the food groups they belong to	Pupil can explain that animals get nutrition from the food they eat and different foods give different nutrients and amounts of energy Pupil can name the nutrients found in food and the function of each food group	Can classify food into those that are high or low in particular nutrients. Can answer their questions about nutrients in food based on their gathered evidence.
Explain the importance of a nutritionally balanced diet	Pupil can describe some consequences of a poor or limited diet	Pupil can describe the dangers of poor and limited diets on the body, health and fitness of humans and can explain that to be healthy we need to eat the right types of food to give us the correct amount of these nutrients.	Pupil understands the effect of nutrition on the development of bones and muscles Pupil can discuss that a balanced diet for a human is different to other animals or for women, men and children and compare the differences/similarities

Scientific Enquiry/Activity Ideas:

Ensure experiments/enquires related to healthy food and diet is significantly different to Year 2

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
• Look at the skeletons of various animals including humans, what similarities and differences do they notice? (use x-ray photographs and x-ray apps) • Review a food survey to look for patterns and trends.		• Why do we need a skeleton? • What are our joints for? Can you make a model of some of them using elastic bands? • Use nutritional labels to sort a range of food dependent on how nutritious they are for us, how much energy, how much fat et I*MPORTANT - nutritional info rather than simple food groups should be looked at and not just healthy melas as this is more y2 objective.* • How much fat? **See *the book 'A Creative Approach to Teaching Science')*** • How much fat do different types of pizza contain? • How much sugar is in soft drinks • Create a song to remember the bones in the skeleton. • Create a skeleton puppet with moving joints.	• **What is the longest bone in the body?** Children accurately measure different bones or can use strips of paper for non standard measurements. This will show the femur as the longest bone in the human body. Who in the class has the longest femur? • Investigations linked to how our skeleton and body parts can make us super athletes https://www.stem.org.uk/resources/elibrary/resource/34278/super-athletes-ages-7-9 • Could we live without bones? Use rubber glove to show how we need bones for support otherwise the hand is floppy- add straws for bones and for support move onto to looking at joints and muscles for movement - ***See the book 'A Creative Approach to Teaching Science')***	• Can something survive without a skeleton? • Are bones that are bigger, stronger? • Why do different types of vitamins keep us healthy and which foods can we find them in? • What are the different food groups and how do they keep us healthy? • What is a calorie? • What is the nutritional information in your favourite snack? Use an online nutrient calculator. • Create a five a day fruit/veg smoothie • Research parts and function of the skeleton. • Plan a daily diet to contain a good balance of nutrients.

		• Use McDonalds nutritional calculator to work out the nutrition in their favourite meal, can they make the healthiest meal etc.		• How did James Lind explain the cause of scurvy and what was his evidence? • Pupils could consider replacement materials for bones being used today and developed for the future.

Non statutory NC ideas

- They might compare and contrast the diets of different animals (including their pets) and decide ways of grouping them according to what they eat.
- Could work scientifically by: identifying and grouping animals with and without skeletons and observing and comparing their movement.
- Could work scientifically by: Design healthy meals based on their own research

Scientists to Consider

Marie Curie- Radiation , Wilhelm Rontgen - X rays, Adelle Davis -Nutritionist

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
• I see, I think, I wonder – healthy plate of food • PMI – What if we had no bones/skeleton? • PMI – What id our bones were made from jelly? • Odd one out – Pasta, pizza, fruit • Odd one out – Giraffe, octopus and human (skeleton/no skeleton) • Odd one out – Pasta, banana, breakfast bar	skeleton, bones, joints, vertebrates, invertebrates, muscles, pull, contract, relax, support; protection; movement; organs; structure; Skeletal system, attached , sockets tendons , ligaments , Cartilage skull , Lower jaw , Collar bone / clavicle Breast Bone , ribs , spine , knee cap/patella femur; tibia; fibula, radius; ulna; humerus; Food groups; balanced diet; protein (food for growth); fats & carbohydrates (foods for activity); vitamins, minerals and fibre (foods for health); whole grain; energy; carnivore; omnivore; herbivore; vegetarian; Nutrients, nutrition, water, fibre, sugars	• Hands on Science - https://www.hands-on-science.co.uk/workshop/skeletons/ - Skeletons • Life Centre - https://education.life.org.uk/workshop/circulation-and-movement-ks2 • Life Centre - https://education.life.org.uk/workshop/keeping-healthy-lks2 • Sunderland Winter Gardens - Bones and Skeletons - https://www.seeitdoitsunderland.co.uk/learning-sessions/295/natural-world	**English:** A guide to good nutrition/healthy eating **Maths:** Bar charts with nutritional information of food Putting data into tables/completing tables with nutritional information **ICT/iPads:** • *Padlet can be used to generate the questions the children want to investigate in each topic.* • *Kahoot can be used as an assessment tool in lessons or at the end of each unit.* • *Visual anatomy 3D– skeleton* • *Post it app or pic collage for identifying and groupings.* • *Curiscope virtual T-shirt App to show how the Skelton protects the vital organs.* • *Google expeditions – human anatomy skeletal system*	• Bones by Steve Jenkins - *To be able to identify main parts of the skeletal system* • Book of Bones: 10 Record-Breaking Animals - *To be able to explain why humans and other animals have skeletons and muscles*

Year 3	Area of NC: Plants (Biology)		
Learning Objectives *(in suggested order of teaching sequence)*	***Prior Learning relevant to this topic*. In Y1 they will have identified basic parts of plants and tress but not functions, they should be able to name so wild and common plants and understand the difference between evergreen and deciduous trees. In Y2 children have learnt the difference between seeds and bulbs, observed plants grow and learnt the basic needs that they require to grow and that some lants grow in different ways and different rates.** • Identify and describes the functions of different parts of flowering plants (roots, stem/trunk, leaves and flowers) • Identify 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 • Explain the way in which water is transported within plants. • Explain the life cycle of a flowering plant, (including seed formation/germination, pollination and seed dispersal). ***Pupils do not need to be taught the following content, which they will learn in later year groups*: They do not need to classify plants into different groups or use classification keys to identify them as this will be done in Y4 and Y6. In year 5 they will learn about the reproduction of plants.**		
Working Scientifically Objectives that link to this topic:	• With support discusses the success of their working methods and suggests ways of improving what they have already done. • With help, pupils should look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions from their findings • With support helps to make decisions about what systematic and careful observations to make and how long to make them for and the type of simple equipment that might be used. • Understands what a simple fair test is, recognise what a simple fair test is, when it is necessary and how it is fair. • Set up simple practical enquiries, comparative and fair tests • Can make and record a prediction before testing using scientific vocabulary and simple reasons. ***Others could be relevant dependant on which practical enquiries you choose to plan***		
Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Identify and describes the functions of different parts of flowering plants (roots, stem/trunk, leaves and flowers) **Forest school**	Pupil can identify each part of the flowering plant and recognise some functions	Pupil can identify and describe each function of a flowering plant	Pupils can describe the impact upon a plant if a part fails to function
Identify 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	Pupil can name and describe some of the requirements of a plant for life and growth	Pupil can name and describe all the requirements of a plant for life and growth, understanding that it can vary from plant to plant	Pupils can describe, for a range of plants, that they need different requirements for life and growth and the impact if some requirements are missing.

Explain the way in which water is transported within plants.	Pupil recognises that plants need water to grow and be healthy as well as naming the root as the part of the plant through which water enters the plant	Pupil can explain how water is transported around the plant	Pupil uses correct vocabulary and reference a practical enquiry to explain the transportation of water around a plant to keep it healthy
Explain the life cycle of a flowering plant, (including seed formation/germination, pollination and seed dispersal).	Pupil knows that flowers are important in pollination and seed dispersal	Pupil can describe the life cycle of flowering plants, including pollination, seed formation, seed dispersal and germination. Pupil can give different methods of pollination and seed dispersal, including examples.	Pupil can suggest external factors which can limit the processes of pollination, fertilisation and seed dispersal, and how this could affect plants

Scientific Enquiry/Activity Ideas:
Ensure experiments/enquires are significantly different to Year 2

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
• How does the structure of a fruit relate to how the seeds are dispersed? • Observe different seeds, can you find any patterns that indicate whichever type of seed dispersal they use. • What colour flowers do pollinating insects prefer? Take a survey predicting which colours they think are the most attractive colour petals? ***(See the book 'A Creative Approach to Teaching Science')*** • Does the shape and size of a seed determine the shape and size of the plant? • Do broccoli, lettuce, pea, mustard and cress seeds grow differently? What is the same?	• What happens to celery when it is left in a glass of coloured water? How does water travel? Cut the celery open and see where the water has transported. ***(See the book 'A Creative Approach to Teaching Science')*** • What are the stages in a plant life cycle? • Observe the growth of a variety of bulbs. Display bulbs in glass jars so children can see the roots grow. How long do they take to grow? Could measure the length of the stem each week. Variables can discussed to see what children would change e.g amount of water, light conditions (use books and drama to go alongside of this to tell the journey of the seed) • Remove leaves and plant in soil, remove roots and plant in soil, plant a complete plant in soil and watch over a number of weeks ***(See the book 'A Creative Approach to Teaching Science')***	• What's in a flower bud? • Can you explain the function of each part of a plant and label it? Identify and observe carefully using a microscope • Dissect a lily or daffodil to identify and inner parts of a plant and pollination ***(See the book 'A Creative Approach to Teaching Science')***	• Which soil absorbs the most water? Are some soils more nutritious? • Does temperature and light level affect growth rate? https://www.bbc.com/teach/terrific-scientific/KS2/z6q47nb • Turf Troubles http://www.ciec.org.uk/resources/turf-troubles.html • How does the length of the carnation stem affect how long it takes for the food colouring to dye the petals? • Can you plant a seed anywhere? Do plants need soil to grow?Can they grow in other materials? • Does the amount of water affect the growth of the plant? • Will seeds grow if I plant them far apart, close together or on top of each other? (Looking at room to grow) • Do leaves contain water? Put a sealed plastic bag over some leaves on a tree branch and see the water in the bag after the week. ***(See the book 'A Creative Approach to Teaching Science')*** • Design a case or system for transporting plant material back from expeditions, ensuring the plants get everything they require in order to survive- https://endeavour.kew.org/app/os • Designing a seed to fly far from the tree.	• What are all the different ways that seeds disperse? • What would happen to humans if the bees die? • How does grass grow?

Non statutory NC ideas

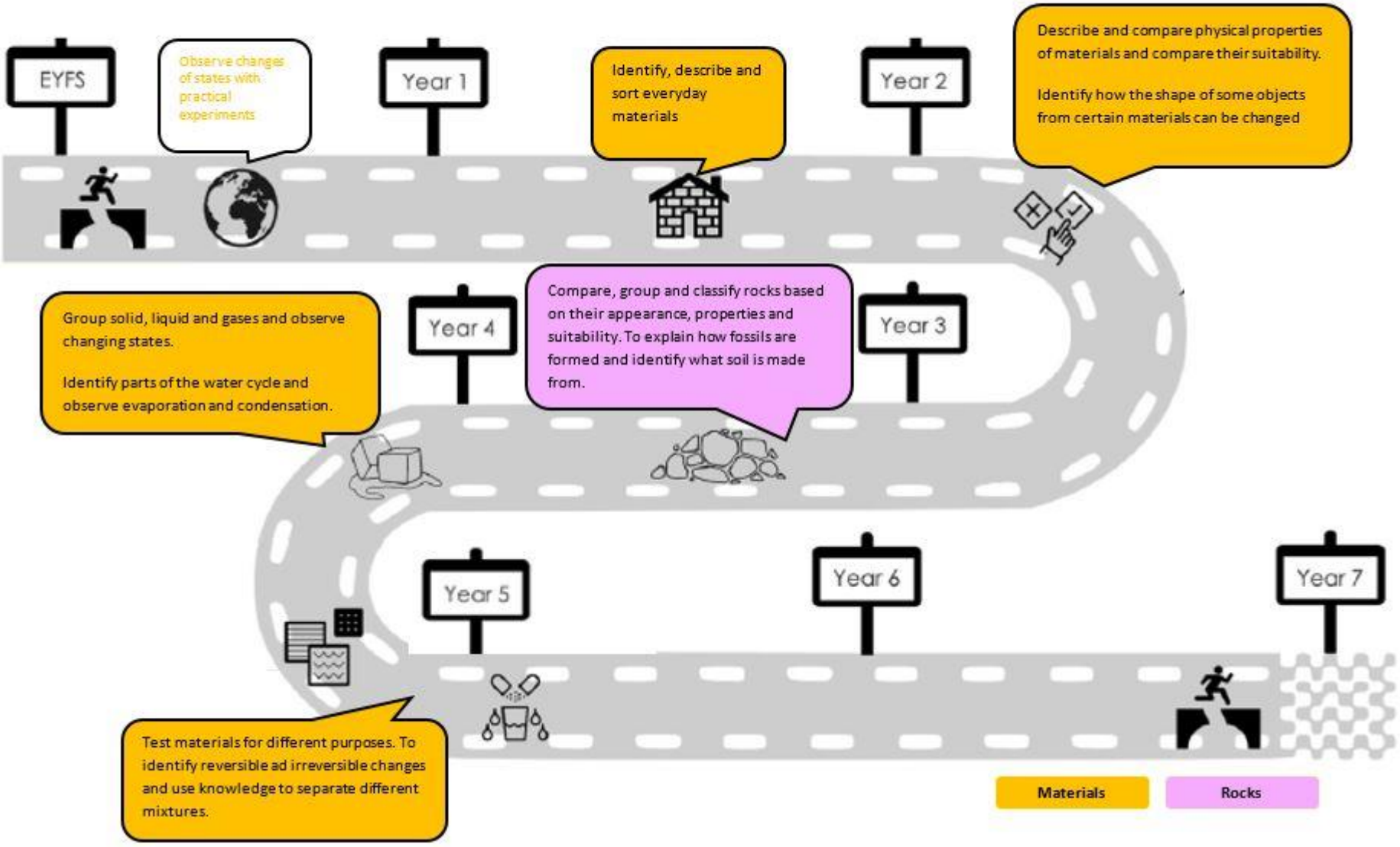
- Could work scientifically by: comparing the effect of different factors on plant growth, for example, the amount of light, the amount of fertiliser etc and how these vary from plant to plant
- Could work scientifically by: putting cut white carnations in coloured water or a similar experiment
- Could work scientifically by: observing plant life cycles at different stages over time to see how seeds are formed

Scientists to Consider

Joseph Banks - Botanist

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
• Big Question - If a tree starts life as a tiny shoot, where does the enormous trunk come from? • PMI – What if plants can walk? • PMI – What If plants could survive without water? • Odd one out – Root, Stem, Flower • Picture of a dying plant – What do you think, know and wonder? • Odd one out - butterfly, a ladybird and a spider (pollinating animals) • https://explorify.wellcome.ac.uk/en/activities/odd-one-out/sightseeing-seeds	hotter/warmer/cooler/colder/ /brighter, damper/ wetter/drier , healthy, structure of plant , Functions of parts of the plant, air , nutrients , fertiliser , Transported , Botanist, pollination Life cycle, Germination , Seed formation , Seed dispersal, Photosynthesis	• Hands on Science - https://www.hands-on-science.co.uk/workshop/transport-systems-in-plants/ - How water and nutrients travel in plants workshop • Gibside - Growing at Gibside - https://nt.global.ssl.fastly.net/gibside/documents/gibside-information-packs-for-primary-schools.pdf • Life Centre - https://education.life.org.uk/workshop/growing-plants • Sunderland Winter Gardens - Growing Plants - *https://www.seeitdoitsunderland.co.uk/learning-sessions/295/natural-world*	**English:** • Write a diary entry from the perspective of a bee, including their scientific understanding about the life cycle of a flowering plant. • Write a report based on their investigative findings. • Write a set of instructions for taking care of a plant properly. **Maths:** • Bar charts and Putting data into tables/completing tables from plant investigations • Measuring and comparing plant height **ICT/iPads:** • *Consolidate time lapse – Stop motion, I can Animate videos of lifecycles* • *Pic Collage to identify parts and functions AR Sheets of creating labels for plants* • *Explain everything explanations to upload to seesaw* • *Shadow Puppet app to record over an image an explanation* • *Padlet can be used to generate the questions the children want to investigate in each topic.* • *Kahoot can be used as an assessment tool in lessons or at the end of each unit.*	• Seed Safari: The Story of How Plants Scatter their Seeds By Judith Heneghan - *To be able to explain the life cycle of a flowering plant, (including seed formation/ germination, pollination and seed dispersal).* • From Tiny seeds: The • amazing story of how plants travel - *To be able to explain the life cycle of a flowering plant, (including seed formation/ germination, pollination and seed dispersal).* • A seed is sleepy by Dianna Aston - *To be able to explain the life cycle of a flowering plant, (including seed formation/germination, pollination and seed dispersal*

Chemistry


EYFS
Observe changes of states with practical experiments
Year 1
Identify, describe and sort everyday materials
Year 2
Describe and compare physical properties of materials and compare their suitability.
Identify how the shape of some objects from certain materials can be changed
Year 3
Compare, group and classify rocks based on their appearance, properties and suitability. To explain how fossils are formed and identify what soil is made from.
Year 4
Group solid, liquid and gases and observe changing states.
Identify parts of the water cycle and observe evaporation and condensation.
Year 5
Test materials for different purposes. To identify reversible ad irreversible changes and use knowledge to separate different mixtures.
Year 6
Year 7
Materials
Rocks

Year 3	Area of NC: Rocks and Soils (Chemistry)		
Learning Objectives *(in suggested order of teaching sequence)*	***Prior Learning relevant to this topic:*** **Children in Y1 and Y2 have learnt the basic properties to describe materials, such as rock and may have thought about objects that can be made out of them.** • Compare and group together different types of rocks based on their appearance and simple physical properties • Identify and classify rocks into sedimentary, igneous and metamorphic • Describe how different rocks are useful and suitable for different purposes • Explain how fossils are formed • Identify that soils are made from rocks and other organic matter ***Pupils do not need to be taught the following content, which they will learn in later year groups:*** **In Y6 children will look in more detail at what fossils tell us about the Earth and the living things that inhabited it millions of years ago.**		
Working Scientifically Objectives that link to this topic:	• Should be given a range of scientific experiences including different types of science enquiries to answer questions • Can make and record a prediction before testing using scientific vocabulary and simple reasons. • Talk about criteria for grouping, sorting and classifying; and use simple keys • Use secondary sources and recognise when and how they might help them to answer questions that cannot be answered through practical investigations • Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences (including oral and written explanations, ICT, displays or presentations of results and conclusions) ***Others could be relevant dependant on which practical enquiries you choose to plan***		
Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Compare and group together different types of rocks based on their appearance and simple physical properties	Pupil can name some types of rock and give physical features of them	Pupil can group rocks in a variety of different ways based on their appearance and physical properties. They can use appropriate vocabulary with accurate reasoning relating to colour, hardness, grain or crystal composition	Can devise tests to explore the properties of rocks and use data to rank the rocks
Identify and classify rocks into sedimentary, igneous and metamorphic	Pupil can name some common types of rocks e.g. limestone, granite and may use the terms igneous, metamorphic or sedimentary when discussing properties	Can describe and identify sedimentary, igneous and metamorphic rocks. Pupil can explain how igneous, metamorphic and sedimentary rocks are formed	Pupil can accurately explain the differences between the three types of rocks using scientific vocabulary Pupil can describe the structure of the Earth and where the different types of rocks may be found

Describe how different rocks are useful and suitable for different purposes **Forest school**	Pupil, with support, can explain why they think one rock may be more suitable than another for a given purpose	Pupil can give sensible reasons, based on their physical properties and appearance, as to whether a rock will be suitable for a given purpose. Children should use accurate vocabulary.	Can link rocks changing over time with their properties and provides accurate reasoning as to whether a certain rock would be suitable for a given purpose. Pupil should be able to devise their own tests to see if the rock would be suitable.
Explain how fossils are formed	Pupils, with support, can order the steps in which fossils are formed. Pupil understands fossils are impressions of animals or plants that lived in the past	Can explain how a fossil is formed step by step	Can present in different ways their understanding of how fossils are formed e.g. in role play, comic strip, chronological report, stop-go animation etc.
Identify that soils are made from rocks and other organic matter **Forest school**	Can identify plant/animal matter and rocks in samples of soil	Can explain that soils are made from rocks and also contain living/dead matter (organic/non-organic), can use a diagram to show their understanding.	Can devise tests to explore different soils

Scientific Enquiry/Activity Ideas:

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
• Is there a pattern in where we find volcanos on planet Earth?	•	• Can you group these unlabelled rocks based on given vocabulary, microscopes and magnifying glasses? ***See the book 'A Creative Approach to Teaching Science' pg 99*** • *You are a geologist can you decide which rocks you would need for certain scenarios?* ***See the book 'A Creative Approach to Teaching Science' pg 100*** • *Can you go for a walk around the local villag, local churchyard and school grounds and identify any of the rocks we have discussed. How are they used?* • What rock is best for a kitchen chopping board? What might be the issues with various materials and what they have to withstand? • What types of rocks are there? • How do rocks change? • Which type of rock soaks up the most water? • Which type of soil does water flow through the quickest? • Which type of rock is the heaviest? (Introduce the idea of density). • Classify a range of soil samples using your own criteria.	• Edible model rocks https://www.stem.org.uk/resources/elibrary/resource/440610/edible-model-rocks • Which rock would be the best to build a bridge over a river (hardness and permeability test) • How does adding different amounts of sand to soil affect how quickly water drains through it? • Which soil absorbs the most water?	• What were James Hutton's ideas about how rocks were made and what was his evidence? • How did Mary Anning's work help us to understand prehistoric life? • Who was Mary Anning and what did she discover? • What types of animals can be found in fossils? • How are fossils formed?- https://pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom?fbclid=IwAR2bAM9lj7tZvcpH2UIvl-rmKHAIfK4XHFbZ8uye9rKZZhqU8O7eFDDT_Lc (How can rocks tell a story) • Children make a factfile on different rocks • How do we know that fossils were once living organisms and not a peculiar type of rock? • Find out how soils are formed by rubbing rocks together.

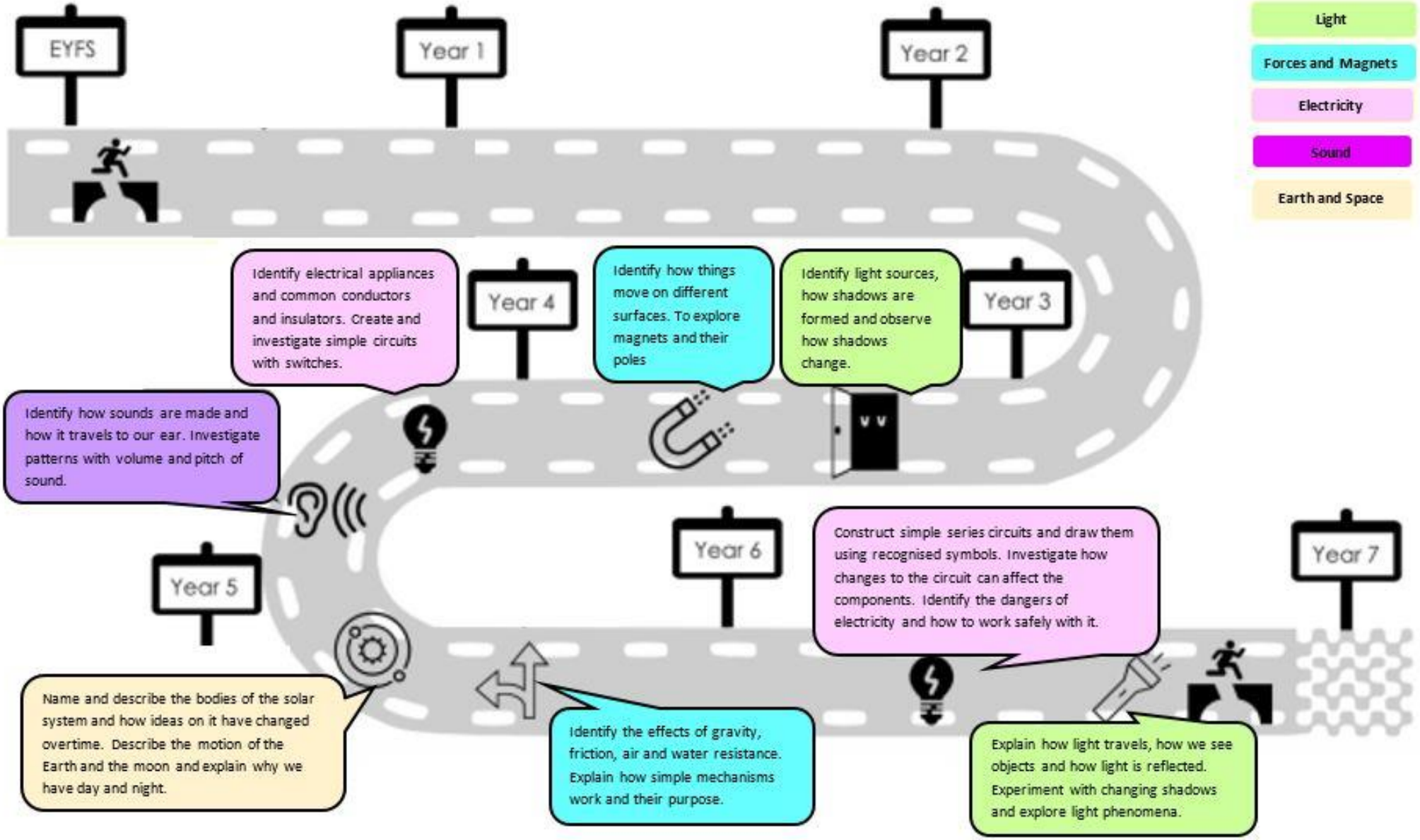
Non statutory NC ideas

- Pupils might work scientifically by: observing rocks, including those used in buildings and gravestones, and exploring how and why they might have changed over time; using a hand lens or microscope to help them to identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them.
- Pupils might research and discuss the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed.
- Pupils could explore different soils and identify similarities and differences between them
- Pupils can raise and answer questions about the way soils are formed.
- Could work scientifically by: investigating what happens to rocks in water and when they are rubbed together

Scientists to Consider
Mary Anning- Fossil hunter, William Smith - Geologist , James Hutton

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
• Odd one out – gravestone, wooden bridge, stone bridge • Odd one out – introduction to fossils - https://explorify.wellcome.ac.uk/en/activities/odd-one-out/making-records • Zoom in/zoom out - https://explorify.wellcome.ac.uk/en/activities/zoom-in-zoom-out/mysterious-material • Zoom in/Zoom out - https://explorify.wellcome.ac.uk/en/activities/zoom-in-zoom-out/kaleidoscope-of-colour • Zoom in/zoom out - https://explorify.wellcome.ac.uk/en/activities/zoom-in-zoom-out/obscure-orange • Which rock would be the best for a skate ramp? • Why don't all rocks look the same?	Rocks, stone, pebble, boulder, grain, crystals, layers, marble, chalk, granite, sandstone, clay, limestone, slate, igneous, metamorphic, sedimentary, hard, soft, texture, absorb water, permeable, impermeable, porous, weathering, erosion , rough, smooth , Purpose/uses of rock: buildings, gravestones fossil, Mary Anning, extinct, organic matter, non-organic matter, soil, top soil, sub soil, base rock, peat, sandy/chalk/clay soil	• *BOX OF DELIGHT TO HIRE FROM DISCOVERY MUSEUM* - https://twamschools.org.uk/boxes-of-delight/rocks-and-fossils • *Life Centre* - https://education.life.org.uk/workshop/fantastic-fossils-ks2 • *Life Centre* - https://education.life.org.uk/workshop/volcanoes • *Life Centre* - https://education.life.org.uk/workshop/rocks-and-soil	**English:** • Using technical language in writing and labelling diagrams. • Explanation text – how are rocks formed? **Maths:** **ICT/iPads:** • Padlet can be used to generate the questions the children want to investigate in each topic. • Kahoot can be used as an assessment tool in lessons or at the end of each unit. • Post it app/pic collage sorting and grouping rocks • Flip book/stop animation on how fossils are formed.	• The Rock Factory: A story about Rocks and Stones by Jacqui Bailey - *To be able to explain how fossils are formed* • A Rock Is Lively - Dianna Hutts Aston & Sylvia Long - *To be able to compare and group together different types of rocks based on their appearance and simple physical properties* • This Little Pebble -Anna Claybourne & Sally Garland- *Identify and classify rocks into sedimentary, igneous and metamorphic* • Stone Girl Bone Girl -Laurence Anholt and Sheila Moxley – *About Mary Anning* • The Street Beneath My Feet - Charlotte Guillian & Yuval Zommer - *Identify that soils are made from rocks and other organic matter* • The Pebble in my Pocket: A History of Our Earth - Meredith Hooper & Chris Coady - *Explain how fossils are formed* •

Physics


Light
Forces and Magnets
Electricity
Sound
Earth and Space
EYFS
Year 1
Year 2
Year 3
Year 4
Year 5
Year 6
Year 7
Identify electrical appliances and common conductors and insulators. Create and investigate simple circuits with switches.
Identify how things move on different surfaces. To explore magnets and their poles
Identify light sources, how shadows are formed and observe how shadows change.
Identify how sounds are made and how it travels to our ear. Investigate patterns with volume and pitch of sound.
Construct simple series circuits and draw them using recognised symbols. Investigate how changes to the circuit can affect the components. Identify the dangers of electricity and how to work safely with it.
Name and describe the bodies of the solar system and how ideas on it have changed overtime. Describe the motion of the Earth and the moon and explain why we have day and night.
Identify the effects of gravity, friction, air and water resistance. Explain how simple mechanisms work and their purpose.
Explain how light travels, how we see objects and how light is reflected. Experiment with changing shadows and explore light phenomena.

Year 3	Area of NC: Forces and Magnets (Physics)		
Learning Objectives *((in suggested order of teaching sequence)*	***Prior Learning relevant to this topic:*** **This is the first time children are learning about forces. During their materials units in Y1 and Y2 magnetic materials may have been mentioned as a property.** • Identify how force makes different things move • Compare how things move on different surfaces • Observe how magnets behave • Identify magnetic materials • Describe and explore magnetic poles • Make reasoned predictions about the behaviour of magnetic poles • Identify and investigate ways magnets can be used and are useful in everyday life ***Pupils do not need to be taught the following content, which they will learn in later year groups****: in Y5 children will learn about gravity, air resistance and water resistance as well as the effects of gears, levers and pulleys.*		
Working Scientifically Objectives that link to this topic:	• Can make and record a prediction before testing using scientific vocabulary and simple reasons. • Set up simple practical enquiries, comparative and fair tests • Understands what a simple fair test is, recognise what a simple fair test is, when it is necessary and how it is fair. • Talk about criteria for grouping, sorting and classifying; and use simple keys • With support, begin to look for patterns and relationships (some naturally occurring) and decide what data to collect to identify them • Take fair and accurate measurements using standard units and a range of equipment (including thermometers and data loggers) appropriately. • Collect and record data from their own observations and measurements in a variety of ways: notes, bar charts and tables, standard units, drawings, labelled diagrams, keys • With help, pupils should look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions from their findings • Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences (including oral and written explanations, ICT, displays or presentations of results and conclusions ***Others could be relevant dependant on which practical enquiries you choose to plan***		
Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Identify how force makes different things move	Pupil recognises that objects need a force applying to move them (push or pull)	Pupil knows that for an object to move a larger force is applied to overcome the stationary force holding it in place	`Pupil can independently link that when a force is applied it will not always act the same if the object is on a different surface
Compare how things move on different surfaces	Pupil recognises that objects need greater/less force to move over different types of surface	Pupil can use scientific vocabulary to describe how objects move on different surfaces and give reasons as to why objects may require more or less force to move over different surfaces	Pupil can use their results to make predictions for further tests e.g. it will spin for longer on this surface than that, but not as long as it spun on that surface.

Observe how magnets behave	Pupil knows that magnets can make some objects move without touching the object	Pupil can identify the difference between non-contact and contact forces and explain why a magnetic force is non-contact	Pupil can develop investigations which will show the distance upon which a magnet will still attract materials and link result to strength of the magnet
Identify magnetic materials	Pupil is beginning to recognise that some materials are magnetic and others non-magnetic	Pupil can independently compare and groups a wide variety of everyday materials on the basis of whether they are magnetic or not`	Pupil can use classification evidence to identify that some metals but not all are magnetic.
Describe and explore magnetic poles	Pupil describes magnets as having two poles (N & S).	Pupil can explain that a magnet has different poles which can repel or attract each other depending on which poles are facing.	Pupils consistently, independently and accurately use scientific vocabulary to explain how magnets repel and attract in relation to the north and south poles. Their explanations will include arrowed diagrams. Pupil can identify the poles as the strongest part of the magnet.
Make reasoned predictions about the behaviour of magnetic poles	With support, a pupil can predict whether two magnets will repel or attract	Pupil can look at a marked diagram of magnets and predict whether the magnets will repel or attract	Pupil can use their knowledge of poles and how they act to name unmarked poles on a magnet.
Identify and investigate ways magnets can be used and are useful in everyday life	With support, pupil can give examples of magnets in their local environment	Pupil can explain some possible everyday uses for magnets	Pupil can devise investigations which will have an everyday use to show the properties of a magnet

Scientific Enquiry/Activity Ideas:

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
• Are all metal objects magnetic? • How do different objects move on different surfaces? Toyologist Challenge - ***See the book 'A Creative Approach to Teaching Science' pg 123*** • Is there something similar about the materials that are magnetic? • How is a magnetic force different to many other forces? (Can work at a distant rather than needing contact- sometimes children have the misconception that other things move without contact but is generally wind, in which air is making contact with another object to make it move)		• Which materials are magnetic and non-magnetic? -- Children could choose a material to try and use a magnet under the table and the material on top to see if they can guide their chosen predicted magnetic object around a maze. If it doesn't move then it must not be magnetic. • I have a fridge magnet why won't it stick to my wall? • The N and S have worn off the magnet, how can we find out which pole is which? Use a marked magnet to find the unmarked poles on other types of magnets. • Are all coins magnetic? • Sort contact and non-contact forces	• Which type of magnet is strongest? • Which surface is best to stop you slipping? What does friction do? • How does changing the height of a ramp or the material on a ramp affect how far a toy car travels? • Does the size and shape of a magnet affect how strong it is? • How far does a magnet have to be away from an object before it attracts? Would this change if we changed the surface? • Do magnets work at a distance, can we block the magnetism? See the floating paperclip - ***See the book 'A Creative Approach to Teaching Science' pg 126***	• How does a compass work? • Why are zip-wires so fast? • Why do magnets attract and repel? • How do you know which is the north and which is the south pole? • After research, invent a device that uses magnets

Non statutory NC ideas

- Could work scientifically by: Investigating the strengths of different magnets and find fair ways to compare them.
- Could work scientifically by: predicting and investigating how far different things move different surfaces

Scientists to Consider

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
• Odd one out - iron filings, sawdust, pile of coins • PMI – What if there was a world without friction? • Odd one out - https://explorify.wellcome.ac.uk/en/activities/odd-one-out/pull-together • PMI – What if used bricks made from magnets to build things?	force/ forces Friction Push/pushing / pull/pulling Surfaces- texture Magnetic force distance magnet/magnets Strength bar magnet ring magnet Button Magnet Horseshoe agent Strength Attract repel Magnetic Non-magnetic Magnetic poles: north and south Like Unlike Resistance Contact force Non-contact force Magnetism	• Greenshift Education - http://greenshifteducation.co.uk/workshops/ • Discovery Museum - Rocket Car Racers - https://discoverymuseum.org.uk/whats-on/rocket-car-racers-forces-in-motion • Dr Research Workshops into School - http://drresearch.co.uk/?page_id=20 - Racing Ramps , Slip, Slide and Away and Magnetic Attraction • Hands on Science Workshops - https://www.hands-on-science.co.uk/workshop/massive-magnets/ - Massive Magnets • Life Centre - https://education.life.org.uk/workshop/friction and https://education.life.org.uk/workshop/magnets	**English:** • Persuasive writing – advert for a magnetic game. **Maths:** • Carroll diagrams to group materials based on their properties. • Draw bar charts to compare magnets • Measuring distance accurately in magnet investigation **ICT/iPads:** • Padlet can be used to generate the questions the children want to investigate in each topic. • Kahoot can be used as an assessment tool in lessons or at the end of each unit. • Split screen forces experiment. • Use a data logger to measure the speed of objects. • Post it app/pic collage sorting and grouping materials that are magnetic v non-magnetic	

Year 3	Area of NC: Light (Physics)
Learning Objectives *(in suggested order of teaching sequence)*	***Prior Learning relevant to this topic:*** **This is the first time children will be learning about light although daylight and darkness at night time will have been discussed in Y1 when looking at the length of day during seasonal change. In Y2 children will have learnt about materials which are transparent, translucent and opaque.** • Recognise what light and dark is and how it impacts what we see • Identify light sources • Identify and observe reflective surfaces • Explain how the Sun can be dangerous and ways we can protect our eyes.

	• Explain how shadows are formed • Carry out an investigation to find patterns in the way the size of shadows change ***<u>Pupils do not need to be taught the following content, which they will learn in later year groups:</u>*** **In Y6 children will learn more about light travelling in straight lines and how we can see things. More complex areas of light like refraction and the visible spectrum will also be looked at in Y6 as well as more investigation on shadows and how they can be altered.**		
Working Scientifically Objectives that link to this topic:	• Should be given a range of scientific experiences including different types of science enquiries to answer questions • Can make and record a prediction before testing using scientific vocabulary and simple reasons. • Start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions and which information needs to be collected • Set up simple practical enquiries, comparative and fair tests • Understands what a simple fair test is, recognise what a simple fair test is, when it is necessary and how it is fair. • With support, begin to look for patterns and relationships (some naturally occurring) and decide what data to collect to identify them • Take fair and accurate measurements using standard units and a range of equipment (including thermometers and data loggers) appropriately. • Collect and record data from their own observations and measurements in a variety of ways: notes, bar charts and tables, standard units, drawings, labelled diagrams, keys • With support, begin to make decisions about how to analyse this data • With help, pupils should look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions from their findings • Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences (including oral and written explanations, ICT, displays or presentations of results and conclusions) • With support discusses the success of their working methods and suggests ways of improving what they have already ***Others could be relevant dependant on which practical enquiries you choose to plan***		
Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Recognise what light and dark is and how it impacts what we see	Can define darkness and knows we cannot see without light.	Can describe how we see objects in light and can describe dark as the absence of light. Therefore, can clearly explain that objects are not visible in complete darkness.	Can describe patterns in visibility of different objects in different lighting conditions and predict which will b more or less visible as conditions change.
Identify light sources	Can identify a range of light sources.	Can identify whether a light source is natural or man-made	Can understand that difference between luminous an non-luminous light sources
Identify and observe reflective surfaces	With support, can explain what reflection is	Can identify reflective surfaces	Can explain the properties of materials that reflect light well Can select the most reflective material for a purpose.
Explain how the Sun can be dangerous and ways we can protect our eyes.	Can state that it is dangerous to view the sun directly	Can state that it is dangerous to view the sun directly and state precautions we can take day to day.	Can explain about UV light and its dangers and describe broader ways to protect our eyes from the sun for example in eclipses.

Explain how shadows are formed **Carry out an investigation to find patterns in the way the size of shadows change** **Forest school**	Can explain the difference in translucent, opaque and transparent. Can describe how shadows are formed by opaque objects blocking light. With support, can carry out an investigation into the size of shadows	Can describe and demonstrate how shadows are formed by blocking light. Can plan and set up an investigation about the way shadows change size.	Can describe patterns in how shadows vary in size, explaining with accurate scientific vocabulary.

Scientific Enquiry/Activity Ideas:

Pattern Seeking

- Create shadow sculptures, children to notice how different objects depending on , material colour, pattern may create different shadows. Notice patterns then who can create the most interesting shadow sculpture. ***See the book 'A Creative Approach to Teaching Science' pg 110***
- They chose from a selection of closed boxes that each contained a different object and tried to identify the object by looking through a small eye hole. Which objects could you see?

Observations Over Time

- When is our classroom darkest?
- Is the Sun the same brightness all day?
- During the day, observe how shadows change. Morning, afternoon and late afternoon.
- Do shadows change over the year?

Identifying, classifying and grouping

- Children to have a range of photos to sort into the headings light/ dark. Can children write a definition for light/dark?
- As a group children to 'map' light sources in and around school/ the classroom. Children to then create a scale from the brightest to least bright.
- What is a shadow?
- How would you organise these light sources into natural and artificial sources?
- Are these objects light sources? ***See the book 'A Creative Approach to Teaching Science' pg 107/108***
- Which surfaces are the most reflective ? Use data logger to measure and make predictions***See the book 'A Creative Approach to Teaching Science' pg 108***
- To enable the children to experience true darkness, the teacher set up a black out tent in the classroom. The children went inside two at a time to see what they could see.
- Children given some different materials and a torch and allowed time to explore their reflectiveness.
- Explore the difference in the shadow when using a transparent, translucent and opaque object
- Where is the light brightest in school? Data logging investigation to investigate our local community.
-

Practical Tests

- Which pair of sunglasses will be best at protecting our eyes? Which sunscreen is the best? ***See the book 'A Creative Approach to Teaching Science' pg 109/110***
- **Curtains***(in practical work in primary science)*This activity encourages children to investigate and find a solution to an everyday problem. They are presented with a letter from an individual, who works nights and is having trouble sleeping through the day, as his curtains do not block the sunlight entering the room. Using the knowledge that an opaque material would be the best for replacement curtains, the children test a collection of different samples, analysing the shadows formed and then recording the light levels with a data logger.
- How does the number of layers of transparent plastic affect how much light can pass through?
- Can you create the most reflective shield for Perseus' to defeat Medusa? Use what children know about reflective materials.

Research

- What are sunglasses for?
- Why do cat's eyes glow at night?

Non statutory NC ideas

- Pupils might work scientifically by: looking for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes.
- Pupils should explore what happens when light reflects off a mirror or other reflective surfaces,

Scientists to Consider

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
• PMI – What if we didn't have mirrors? • Odd one out – sources of light (sun, lantern, candle) • Odd one out – diamond, coin, disco ball (reflecting light) • PMI – What if all animals could see in the fark? • What can you see when there is absolutely no light? • Would you prefer a world in darkness or a world always in light? Explain your answer.	dark, absence of light, natural light source, artificial light source, luminous, non-luminous Reflect/reflective/reflection, shiny, matt, mirror, bounce, visible, beam, sun, glare, travel, surface opaque, shadow, block, transparent, translucent, solid, distance, size sunlight, dangerous, UV light, sunglasses, protect/protection	• Dr Research Workshops into School - http://drresearch.co.uk/?page_id=20 - Light and Dark • Hands on Science - https://www.hands-on-science.co.uk/workshop/lovely-light/ - Light workshop • Life Centre - https://education.life.org.uk/workshop/light-and-shadows	**English:** • Write a persuasive letter to but the curtains or the sunglasses they have designed. **Maths:** • Measuring light intensity with data loggers – comparing data and sorting into order (rounding numbers). • Measuring size of shadows (nearest mm). • Bar charts on size of shadows **ICT/iPads:** Using data loggers to investigate accurately. Using excel to create bar charts.	• The Dark—Lemony Snickett - *Recognise what light and dark is and how it impacts what we see* • The King who banned the dark.- Emily Haworth-Booth - *Recognise what light and dark is and how it impacts what we see* • Hortense and the Shadow – Natalia O'Hara - *Explain how shadows are formed*

Other Useful Websites / Resources

For Bright Ideas Time

- https://explorify.wellcome.ac.uk
- Curriculum Coverage Document with Bright Ideas examples on
- Concept Cartoons on the School Server

For Class Resources and Planning

- https://www.ogdentrust.com/resources-cpd/resources
- https://explorify.wellcome.ac.uk
- https://pstt.org.uk/resources
- https://www.primarysciencebee.com – **example medium term plans**
- https://ypte.org.uk/audiences/teachers
- https://www.stem.org.uk (excellent resources for all topics and areas of science curriculum)
- http://www.ciec.org.uk/interactive-planning-tool.html **(good interactive planning tool)**
- https://www.bbc.com/teach/terrific-scientific
- https://www.bbc.com/teach/ks1-science/zhsr2sg (KS1)
- https://www.bbc.com/teach/ks2-science/zf3kt39 (KS2)
- http://www.ciec.org.uk/primary.html#resources
- https://wowscience.co.uk
- https://pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom?fbclid=IwAR2bAM9lj7tZvcpH2UIvl-rmKHAIfK4XHFbZ8uye9rKZZhqU8O7eFDDT_Lc – **Great resources for Rocks**

- https://sites.google.com/view/primary-science-bee/home - **Examples of medium term planning that could support planning**
- http://www.rsc.org/learn-chemistry/resource/listing?searchtext=&filter=all&fLevel=LEV00000001&eMediaType=MED00000009&reference=primaryresource - Good cross-curricular links to science and topic
- https://endeavour.kew.org/app/os - good real life contexts and challenges surrounding plants
- https://nustem.uk/primarycareers/#tab-id-10 - **gives children a context for learning science by showing jobs related to the topic being taught.**
- https://www.linnean.org/learning/teaching/primary/discovery-kits - email for free resources to use of plants, life cycles, habitats, classification and evolution.
- https://www.bbc.com/teach/terrific-scientific/amazing-people/zhy4hbk - information on some influential scientists
- https://www.youtube.com/watch?v=gEGYU-0AtaM&list=PLg7f-TkW11iU11yatk_TcbA2tGH_WLe8d - Brian Cox School Experiments videos - a range of ideas for experiments in schools.
- https://nustem.uk/loans-boxes/ - free loan boxes of resources to have for 6 weeks
- A creative Approach to Teaching Science book - copy given to all teachers
- Concept Cartoons on the School Server
- Curriculum coverage document on the server
- Science cupboard resource list on the server
- Resources in subject > science > then individual year group folders - these have ideas for experiments or other useful resources when planning.

Science in the News
- https://www.reachoutreporter.com
- https://www.bbc.co.uk/newsround
- https://www.bbc.co.uk/news/science_and_environment

For CPD
- https://www.reachoutcpd.com
- https://www.pstt.org.uk/resources/cpd-units
- http://primaryscienceonline.org.uk/glossary-of-terms/
- Science Glossary on the server