Knowledge Progression

Year 3/4 Science Cycle 1

	Living Things and their Habitats Y4 TERM: Aut 1	Plants Y3 TERM: Aut 2	Rocks Y3 TERM: Spr 1	Forces and Magnets Y3 TERM: Spr 2 & Sum 1	Sound Y4 TERM: Sum 2
Key Vocabulary	classification, key, habitat, environment, human impact, fish, amphibian, reptile, bird, mammal, vertebrate, invertebrate, shelter, food, protection, hibernate	leaf, leaves, flower, blossom, petal, fruit, berry, root, bulb, seed, trunk, branch, stem, bark, nutrients, soil, fertiliser, temperature, growth, transport, life cycle, pollination, seed formation, seed dispersal	rock, sedimentary, igneous, metamorphic, smooth, rough, light, soil, fossil, fossilise, organic, absorb, grain, crystal, hard, soft, texture, permeable, impermeable, marble, chalk, granite, sandstone, slate, sand, clay, peat	force, push, pull, contact – e.g. friction, air resistance, non-contact – e.g. magnetic, gravitational, magnet, non-magnetic, bar magnet, ring magnet, button magnet, horseshoe magnet, strength, poles, north pole, south pole, material, attract, repel, metal, iron, steel	sound, source, noise, vibrate, vibration, travel, transmit, sound, waves, particles, solid, liquid, gas, pitch, high, low, volume, loud, quiet, fainter, insulation, instrument
Previous knowledge/ Learning	In KS1, children will have: 1. Explored and compared the differences between: living, dead and never been alive. (Is a flame alive? Is a deciduous tree dead in winter?) 2. Identified that most things live in habitats to which they are suited and that plants and animals depend on each other. 3. Identified and named a variety of plants and animals in their habitats, including microhabitats. 4. Described how animals obtain their food from plants and other animals, using simple food chains. 5. Understood the term 'habitat' and 'microhabitat'. They will compare animals in familiar habitats to those in less familiar (seashores, woodlands, oceans and rainforests.)	1. In KS1 children have learned to identify and name a variety of common wild and garden plants and to identify and describe the basic structure of a variety of common flowering plants, including trees. 2. They also observed and describe how seeds and bulbs grow into mature plants and found out how plants need water, light and a suitable temperature to grow and stay healthy.	In KS1, children will have: 1. Learnt to distinguish between an object and the material it is made from. 2. Described the physical properties of everyday materials 3. Correlated materials (plastic, bricks, glass) with their suitability for use. 4. Learnt that certain materials have multiple uses (metal = coins, cars, cans) or that objects can be made of different things (spoon = wood, metal, plastic)	In KS1, children will have found out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	In KS1, children will have Identified, named, drawn and labelled the basic parts of the human body and said which part of the body is associated with each sense. In the States of Matter unit, children will have developed understanding of particles in solids, liquids and gases and how these particles move.
N.C. Objectives	1. Recognise that living things can be grouped in a variety of ways 2. Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment 3. Recognise that environments can change and that this can sometimes pose dangers to living things	1. Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers 2. 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 3. 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	1. Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties 2. Describe in simple terms how fossils are formed when things that have lived are trapped within rock 3. Recognise that soils are made from rocks and organic matter 4.	1. Compare how things move on different surfaces 2. Notice that some forces need contact between 2 objects, but magnetic forces can act at a distance 3. Observe how magnets attract or repel each other and attract some materials and not others 4. 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 5. Describe magnets as having 2 poles 6. Predict whether 2 magnets will attract or repel each other, depending on which poles are facing	1. Identify how sounds are made, associating some of them with something vibrating 2. Recognise that vibrations from sounds travel through a medium to the ear 3. Find patterns between the pitch of a sound and features of the object that produced it 4. Find patterns between the volume of a sound and the strength of the vibrations that produced it 5. Recognise that sounds get fainter as the distance from the sound source increases
Resources/ Assessment	***LOCATIONS OF PLANNING/RESOURCE*** Local Survey Investigation – TAPS focused assessments ID Guides: http://treetoolsforschools.org.uk/categorymenu/?cat=activities Greta and the Giants by Zoë Trucker - A story inspired by the real life activism of Greta Thunberg.	***LOCATIONS OF PLANNING/RESOURCE*** Measuring Plants Investigation – TAPS focused assessments	***LOCATIONS OF PLANNING/RESOURCE*** Rocks Report Investigation – TAPS focused assessments Resources for fossils: https://jurassiccoast.org/what-is-the-jurassic-coast/things-to-do/jurassic-coast-teachers-resources/ Book – Stone Girl, Bone Girl – the story of Mary Anning	***LOCATIONS OF PLANNING/RESOURCE*** Car Ramp, Shoe Grip and Magnet Tests Investigations – TAPS focused assessments	***LOCATIONS OF PLANNING/RESOURCE*** Pitch and String Phones Investigations – TAPS focused assessments Moses Goes to a Concert by Isaac Millman - A story about Moses and his school friends, who are all deaf, attending a concert and finding out how music can be felt through vibrations.

Enquiry and Working Scientifically	**GROUPING, IDENTIFYING AND CLASSIFYING** **Working Scientifically Skills:** **Identifying and classifying** **Making systematic and careful observations and, where appropriate, taking accurate measurements using** **standard units, using a range of equipment, including thermometers and data loggers** **Gathering and recording data to help in answering questions**	**GROUPING, IDENTIFYING AND CLASSIFYING/ RESEARCH USING SECONDARY SOURCES** **Working Scientifically Skills:** **Identifying and classifying** **Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers**	**GROUPING, IDENTIFYING AND CLASSIFYING/ RESEARCH USING SECONDARY SOURCES/ COMPARATIVE TESTING** **Working Scientifically Skills:** **Identifying and classifying** **Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions** **Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables**	**COMPARATIVE TESTING/ GROUPING, IDENTIFYING AND CLASSIFYING** **Identifying and classifying** **Setting up simple practical enquiries, comparative and fair tests.** **Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions** **Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables**	**COMPARATIVE TESTING/ GROUPING, IDENTIFYING AND CLASSIFYING** **Asking relevant questions and using different types of scientific enquiries to answer them** **Identifying differences, similarities or changes related to simple scientific ideas and processes**

Knowledge Progression

Year 3/4 Science Cycle 1

Key Knowledge – what do we want our children to know before they leave our year group? How will we get them there? How is that personalised to Tranmere?

Living Things and their Habitats Y4
TERM: Aut 1

POWERFUL KNOWLEDGE:
OUR CHILDREN WILL KNOW THAT:

S1 - Living things can be grouped (classified) in different ways according to their features. These will include insects and other minibeasts, plants and trees in the school grounds (sycamore, horse chestnut, birch, conifer etc), and animals including trout, frog, lizard, robin, rabbit. Classification keys can be used to identify and name living things.

S2 - Living things live in a habitat which provides an environment to which they are suited (year 2 learning). These environments may change naturally e.g. through flooding, fire, earthquakes etc. Humans also cause the environment to change. This can be in a good way i.e. positive human impact, such as setting up nature reserves or in a bad way i.e. negative human impact, such as littering. These environments also change with the seasons; different living things can be found in a habitat at different times of the year.

COMMON MISCONCEPTIONS
Some children may think:
- the death of one of the parts of a food chain or web has no (or limited) consequences on the rest of the chain.
- there is always plenty of food for wild animals.
- animals are only land-living creatures.
- animals and plants can adapt to their habitats however they change.
- all changes to habitats are negative.

HOW DOES THIS LOOK AT TRANMERE?
1. Children will recap the naming of living things by going on a nature scavenger hunt in the school grounds using ID guides.
2. Children will classify living things found in different habitats based on their features (see below).
Today we are environmental scientists. Using the school grounds/local area as a habitat, go on a search for living things (incl. plants) in the grounds. Take a camera/draw/make lists of larger things and collect smaller things.
Classify the living things into groups e.g. vertebrates (fish, amphibians, reptiles, birds, mammals)/ invertebrates (snails, slugs, spiders, worms, spiders, insects)/ plants. These groupings could also be herbivore/carnivore/omnivore. Create subsets within groups e.g. flowering / non-flowering plants, birds / mammals/ invertebrates and then further subsets.
3. Children will use classification keys (also called branching diagrams and dichotomous keys) to name unknown living things and will create simple identification keys based on observable features. This will be introduced and developed by using Liquorice Allsorts.
4. Children will undertake fieldwork to explore human impact on the local environment e.g. litter, tree planting, house building on green spaces.
5. They will write a report on why building houses on Thorpe Lane would be bad for the environment.
6. They will use secondary sources to find out about how environments may naturally change, and to find out about human impact, both positive and negative, on environments. They will make links to what they are seeing locally to the deforestation of the Amazon Rainforest **(Topic link)** focusing on extinction of animals and effect on climate.

Plants Y4
TERM: Aut 1

POWERFUL KNOWLEDGE:
OUR CHILDREN WILL KNOW THAT:

S3 - Many plants, but not all, have roots, stems/trunks, leaves and flowers/blossom. The roots absorb water and nutrients from the soil and anchor the plant in place.

S4 - The stem transports water and nutrients/minerals around the plant and holds the leaves and flowers up in the air to enhance photosynthesis, pollination and seed dispersal. The leaves use sunlight and water to produce the plant's food. Some plants produce flowers which enable the plant to reproduce.

S5 - Pollen, which is produced by the male part of the flower, is transferred to the female part of other flowers (pollination). This forms seeds, sometimes contained in berries or fruits which are then dispersed in different ways (including wind, animals (inside and outside), self-propelled (explosion).

S6 - Different plants (beans, sunflowers, cress) require different conditions (amount of water, light, soil, temperature, space to grow) for germination and growth).

COMMON MISCONCEPTIONS
Some children may think:
- plants eat food
- food comes from the soil via the roots
- flowers are merely decorative rather than a vital part of the life cycle in reproduction
- plants only need sunlight to keep them warm
- roots suck in water which is then sucked up the stem.

HOW DOES THIS LOOK AT TRANMERE?
1. Children will observe what happens to plants over time, when the leaves or roots are removed, and will also investigate what happens to plants when they are put in different conditions.
Today we are botanists. - Ask, how much water do these plants need to grow? Discuss how to set up an investigation as a whole class. Either draw on previous maths work or teach the children how to measure volume of water and the height of the plant. As they carry out the investigation, the children will need to make their own measurements of the water and the plant and record the height of the plant.
Provide beakers/measuring cylinders, but amount of water should be easy to measure, e.g. 200ml, expect measurement of length to the nearest half cm.
Over the course of the investigation, plan to check groups measuring the water and plant to observe their accuracy (TA support would be helpful here). Children could also peer check measures. Ask the children to explain why accurate measurements are important.
This investigation could be extended once the first variable (amount of water) has been examined, to investigate the effects of light, temperature, soil/fertiliser.
2. They will observe the effect of putting cut celery in coloured water to see how water is transported in plants.
3. At the start and end of the unit, children will spot flowers, seeds, berries and fruits outside, observe flowers carefully to identify the pollen and to see them being visited by pollinators e.g. bees and butterflies in the summer. They will observe seeds being blown from the trees e.g. sycamore seeds.
4. Children will research different types of seed dispersal (including wind, animals (inside and outside), self-propelled (explosion))., classifying seeds in a range of ways, including by how they are dispersed, and investigate models of seed dispersal – including creating paper spinners and explosive seeds and testing out which are most effective at dispersing the seed (how far they travel).

Rocks Y3
TERM: Spr 1

POWERFUL KNOWLEDGE:
OUR CHILDREN WILL KNOW THAT:

S6 - Rock is a naturally occurring material.

S7 - There are different types of rock e.g. sandstone, limestone, slate etc. which have different properties. Rocks can be hard or soft. They have different sizes of grain or crystal. They may absorb water. Rocks can be different shapes and sizes (stones, pebbles, boulders).

S8 – Rocks are formed in three different ways, forming sedimentary rocks (limestone), metamorphic rocks (marble) and igneous rocks (granite).

S9 - Soils are made up of pieces of ground down rock which may be mixed with plant and animal material (organic matter). The type of rock, size of rock piece and the amount of organic matter affect the property of the soil.

S10 - Some rocks contain fossils. Fossils were formed millions of years ago. When plants and animals died, they fell to the seabed. They became covered and squashed by other material. Over time the dissolving animal and plant matter is replaced by minerals from the water.

COMMON MISCONCEPTIONS
Some children may think:
- rocks are all hard in nature
- rock-like, man-made substances such as concrete or brick are rocks
- materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural'
- certain found artefacts, like old bits of pottery or coins, are fossils
- a fossil is an actual piece of the extinct animal or plant
- soil and compost are the same thing.

HOW DOES THIS LOOK AT TRANMERE?
1. Children will observe rocks closely (using microscopes for finer detail), classifying them based on: their appearance e.g. colour, texture, crystals, 'stripes'.
2. Children will devise a test to investigate the hardness of a range of rocks and/or to investigate how much water different rocks absorb. There will be a purpose for the investigation e.g. to find the best material for a new paved area in school.
Suggest that you would like to find out which rock would last the longest/be the least wearing/the strongest. Decide whether to do a rub test and/or a scratch test etc.
Rub: Children to rub rocks on sandpaper and collect scrapings onto white paper.
Scratch: Try scratching the rocks with e.g. a fingernail, a matchstick, a metal nail etc.
Ask children to order the rocks and justify their selection of strongest rock.
How will you report your findings (to persuade), e.g. draw, write, present?
3. Children will observe how rocks change over time e.g. gravestones or old buildings.
4. Children will research using secondary sources how fossils are formed using books and the internet. (If possible arrange a visit/or who is involved in researching/finding fossils)
5. They will fossilise a jelly baby to model the fossilisation process.
6. Children will observe soils closely and will undertake the 'soil in a jar' investigation to separate it (sedimentation method) by adding ¼ soil and filling to ¾ with water, shaking the jar and letting it settle. They will then classify soils in a range of ways based on their appearance.
6. Children will research the work of Mary Anning.

Forces and Magnets Y3
TERM: Spr 2 & Sum 1

POWERFUL KNOWLEDGE:
OUR CHILDREN WILL KNOW THAT:

S11 - A force is a push or a pull.

S12 - When an object moves on a surface, the texture of the surface and the object affect how it moves. It may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes. This is friction.

S13 - A magnet attracts magnetic material. Iron and nickel and other materials containing these, e.g. stainless steel is magnetic.

S14 - The strongest parts of a magnet are the poles. Magnets have two poles – a north pole and a south pole. If two like poles, e.g. two north poles, are brought together they will push away from each other – repel. If two unlike poles, e.g. a north and south, are brought together they will pull together – attract.

S15 - For some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees. Some forces can act at a distance e.g. magnetism. The magnet does not need to touch the object that it attracts.

COMMON MISCONCEPTIONS
Some children may think:
- the bigger the magnet the stronger it is
- all metals are magnetic
- direct contact is needed to move an object

HOW DOES THIS LOOK AT TRANMERE?
1. Children will carry out investigations to explore how objects move on different surfaces. They do this through the car ramp and soles of shoes investigations.
A) Car Ramp - ***Today we are going to be mechanical engineers.*** Discuss the purpose of an escape lane and the kind of surfaces which could be used to slow down vehicles. Explore how far cars go after a hill (down a ramp) which is sitting on the carpet. In small groups discuss how they will measure how far the car goes on different surfaces and how they can record this.
Emphasise that we are testing the surface, so everything else must stay the same to be fair – as a class, list the control variables (angle of ramp, same car, where car starts on the ramp).
Generate success criteria with the children for drawing tables. Groups investigate with each drawing their own results table. Children could self-assess their results tables against the success criteria.
Ask children to explain how the surface makes a difference.
B) Shoe Grip - Invite children to examine a collection of shoes and to look at the shoe's grip. Ask children to plan (in small groups) their own way of testing the shoe's grip but give teacher support where needed. Have useful equipment visible, e.g. ramps (for lifting until the shoe slips), Newton meters (for pulling). A further option could be for runs across the hall to be timed wearing shoes, trainers, socks and bare feet. Record the plans in words and/or diagrams.
2. Children will explore what materials are attracted to a magnet and classify materials according to whether they are magnetic. (use materials from science cupboard).
3. They will explore the way that magnets behave in relation to each other and use a marked magnet to find the unmarked poles on other types of magnets.
4 Children may explore how magnets work at a distance. They do this through the table, in water, jumping paper clips up off the table.
5. Children will devise an investigation to test the strength of magnets. -
Today we are going to be physicists. Provide the children with a collection of magnets and other materials (e.g. card, fabric, tissue, thin wood, aluminium foil, paperclips) to explore. Ask them to find out ways to test whether the magnets are all equally strong e.g. through paper/card or layers of each, how close magnet needs to be before it attracts a paper clip etc.
Ask the children to report their findings verbally, e.g. explaining how they carried out their investigation to their peers.
As a class, discuss the different ways of testing magnet strength and talk about the advantages and disadvantages of each approach. Discuss why it is a good idea to try different ways of answering a question (to get a more reliable answer).

Sound Y4
TERM: Sum 2

POWERFUL KNOWLEDGE:
OUR CHILDREN WILL:

S16 - A sound source produces vibrations which travel through a medium from the source to our ears. Different mediums such as solids, liquids and gases can carry sound, but sound cannot travel through a vacuum (an area empty of matter). The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound.

S17 - The volume of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. Therefore, sounds decrease in volume as you move away from the source. A sound insulator is a material which blocks sound effectively.

S18 - Pitch is the highness or lowness of a sound and is affected by features of objects producing the sounds. For example, smaller objects usually produce higher pitched sounds.

COMMON MISCONCEPTIONS
Pitch and volume are frequently confused, as both can be described as high or low.
Some children may think:
- sound is only heard by the listener
- sound only travels in one direction from the source
- sound can't travel through solids and liquids
- high sounds are loud and low sounds are quiet.

HOW DOES THIS LOOK AT TRANMERE?
1. Classify sound sources by going on a sound walk around school. Noting where sounds are coming from and what is making those sounds.
2. Children will explore making sounds with a range of objects, such as musical instruments - ***Today we are acoustic scientists***.
Show children some homemade 'musical instruments': elastic bands over shoe box, 'straw flute/pan pipes', 'sound sandwich' (lolly stick and straw harmonica), stretched balloon 'drum skin' over tube, glass bottle containing water to blow or tap. Explore how to play them to make a sound and ask the children to suggest which parts are vibrating. Ask children to record a range of questions that they could investigate, focusing on changing pitch (e.g. How does the width/length of the elastic band affect pitch? What happens if you change the tension of the band? What happens if you shorten the straw?) Children then work in small groups investigating their questions, considering different ways to alter pitch.
3. Children will explore how string telephones work - ***Today we are acoustic engineers.*** Explore how to use a string telephone. Discuss how this works; vibrations in air, vibrations in string, the cup amplifies the vibrations, vibrations travel to ear.
Provide a range of pots (yoghurt pots, paper/plastic beakers, polystyrene cups etc) and different types of string/wool.
In groups, ask children to investigate what makes the best string telephone, supporting with questioning as necessary. Give time for the children to reflect and test their designs so that they can be modified and improved.
After the investigation, children demonstrate their telephones to the class and explain why their telephone is/is not good. Discuss how their research has informed their design – detailing improvements they have made and reasons for making those improvements.
4. Children will measure sounds over different distances by testing how long it takes for the sound to reach another member of the class stood further away e.g. 2 metres, on the playground, at the top of the banks. The first person bangs a drum, and each team member claps when they hear the sound. Compare this to seeing lightning and hearing thunder.
5. Children will measure sounds through different insulation materials, testing out materials to find the most successful sound insulator for a pair of ear defenders. (link to careers that might need this).