

**Developing Science in Broughton Primary School Early Years Foundation Stage**

Research has taught us that the most important period of human development is from 0-8 years old. During these years, the development of cognitive skills, emotional well-being, social competence and physical and mental health builds a strong foundation for success well into the adult years. Although learning takes place throughout life, in early childhood, learning is taking place at a speed that will never be equalled.

**0 to 2 years**

A child’s brain forms up to a million neural connections per second, triggered by rich, loving and protected environments, in the context of responsive and playful caregiving that foster bonding and secure attachment, contributing to positive socioemotional development.

**3 to 5 years**

Children’s language, social, emotional and cognitive skills are rapidly expanding. Stimulation and learning that comes from play, reading, singing and interacting with peers and adults are essential. Play enables children to explore and make sense of the world around them, as well as to use and develop their imagination and creativity.

**6 to 8 years**

Play-based learning continues to be critical. They can transform the educational experiences of children and strengthen learning motivation and outcomes.

**Play is therefore one of the most important ways in which young children gain essential knowledge and skills. Play is joyful, engaging and a hugely motivational way to learn.**

Our Early Years areas promote play, child-centred enquiry, exploration/discovery and hands-on learning. An important aspect of play is children’s agency and control over the experience. Agency refers to children’s initiative, decision-making and self-choice in play. This enables children to take an active role and ownership in their experiences. Our Early Years Science curriculum is well suited to the ages and the developmental, individual and cultural characteristics of children. Our school curriculum is designed to emphasise exploration and intentional teaching of key content through stimulating interactions and active, playful learning experiences, which promote progress across all areas of development and learning.

Children learn critical skills and develop as they play. When children choose to play, they are not thinking, “Now I am going to learn something from this activity”, yet their play creates powerful learning opportunities across all areas of development. Development and learning are complex and holistic, and all developmental domains (cognitive, affective, interpersonal & psychomotor) can be encouraged through play. Indeed, in playful experiences, children tap a breadth of skills at any one time. Young children learn in an integrated way and not in neat, tidy compartments such as subjects or topics.

Children are ‘hands-on’ learners. They acquire knowledge through playful interaction with objects and people. They need a lot of practice with solid objects to understand abstract concepts. For example, by playing with geometric blocks they understand the concept that two squares can form a rectangle and two triangles can form a square. This is why we use physical and visual models later to develop conceptual knowledge from year 3 onwards in science as these builds upon solid learning strategies from play. Play and learning are not static. Children play to practice skills, try out possibilities, revise hypotheses and discover new challenges, leading to deeper learning (iterative).

Dancing a pattern such as step forward, step back twirl, clap and repeat, they begin to understand the features of patterns that are the foundation for mathematics. Pretend or ‘symbolic’ play (such as playing house or market) is especially beneficial. In such play, children express their ideas, thoughts and feelings, learn how to control their emotions, interact with others, resolve conflicts and gain a sense of competence. Play, therefore, sets the foundation for the development of critical social and emotional knowledge and skills. Play also teaches children leadership as well as group skills. Furthermore, play is a natural tool that children can use to build their resilience and coping skills, as they learn to navigate relationships and deal with social challenges as well as conquer their fears. More generally, play satisfies a basic human need to express imagination, curiosity and creativity, which are key resources in a knowledge-driven world. They help us to cope, to find pleasure, and to use our imaginative and innovative powers. Indeed, the critical skills that children acquire through play form part of the fundamental building blocks of future complex “21st-century skills” (transferable skills necessary for STEM jobs).

Children at play learn how to plan and follow through, learn from trial and error (necessary for their experiential neural development), using imagination, reasoning/problem-solving skills and apply concepts of quantity, size and time. Play also allows them to ‘project’ themselves into an imaginary/unfamiliar world that brings understanding on a wider context than their current experience. This allows for an effective vehicle for targeted STEM-focussed activity that supports our science teaching through context. Play is meaningful as it makes sense of the world around them, through experience, by connecting it to something already known. It underpins formal learning later in childhood.

During play children may begin by exploring and experimenting with what interests them. They may touch objects, move around the spaces, manipulate things, ask questions, as if they are seeking answers to the question ‘What does this do?’. This period of play and exploration has been called the epistemic phase (the gathering knowledge phase) and it is typified by concentration and a serious facial expression. When children feel confident, they have some knowledge they will move into a ludic phase of play (the fun phase), as if they are asking the question ‘What can I do with this?’. Both phases are equally important and link to Piaget’s idea of assimilation and accommodation, where new knowledge is at first absorbed into and often understood in terms of previous knowledge. Then all relevant knowledge is adjusted as it becomes clear that the new knowledge has brought a different, challenging perspective that means the old knowledge needs expanding or correcting.

**A typical resource for the teaching of Science, Technology, Engineering and Maths in the Early Years is the water tray:**

**Water Play**

**Early Experiences in Science & Technology:**

* explore the properties of water e.g. pour, run, drips
* ask questions about how things work and why they happen e.g. stones in water, water wheels, flow of water, floating, sinking
* use their senses to investigate water e.g. colour-sight, baby bath – smell, hot/cold – touch, bottled water – taste
* recognise the importance of water in personal hygiene
* observe how objects behave in water
* make predictions
* use cutting, joining, folding and building skills to make boats for water play
* explore ice in water

**Early Mathematical Experiences:**

* compare the amount of water in different containers by pouring from one to another
* understand and use mathematical language e.g. full/empty, need more/less, heavy/light
* compare the size of the containers e.g. which is the biggest? which container contains the most?
* talk about the shape of the containers e.g. straight sides, curved sides, circle at the bottom etc
* understand and use positional words e.g. pouring through, floating on top of etc

**Language Development:**

* describe the properties of water e.g. wet/cold
* describe their actions and the actions of others e.g. pouring, emptying, splashing
* extend vocabulary associated with water play
* describe similarities, differences and changes e.g. which objects flaot/sink?
* explain what I shappening when the water wheel is turning
* engage in role-play as a fireman, plumber, adult washing clothes, dolls
* children have access to books and rhymes connected to water e.g. Going to the Seaside, Mr Plug the Plumber, Rain
* children talk about their experiences in relations to displays/books about water play

**Developing progression into KS1:**

**Everyday Materials**: experience properties of water, investigate surface tension make ‘bubbles’ in water tray by swishing water (what happens when they burst?); fill containers with water in the tray by submerging them (watch air escaping); experience and explore the nature and properties of water by observation (sight; touch, smell, sound, taste (bottled water)); pour through hands; compare and describe the feeling of warm and cold water; observe how water finds its own level; make jelly use vocabulary (dissolve, dilute, how much?); begin to discover that water can exist in different states; investigate ice and discover some of its features; develop appropriate vocabulary (e.g. freeze, melt, frozen, change, colder, icy, slippery, frosty, hard add ice cubes, freeze); go outside on an icy day – look at frozen puddles, frost on grass; allow children to freeze water and then observe what happens when the ice is left to sit; investigate condensation on windows; talk about clothes we wear (materials they are made from); describe what happens sprinkle salt on ice (what happens?); explore the movement of water; move water using kitchen utensils & water wheels.

**Light & Shadows**: discuss shapes and colours (can you see through a bubble?); lift bubbles in hands, describe what you see; look for reflections in water when water is still; see the “colour” in clear water (add colour – watch how it changes); have fun with water (refraction effects in a glass, hide a penny, wonky pencils).

**Sound:** Listen to water (tray, seaside, river, rain, through pipes), describe sounds; listen to the sea using a shell.

**Pushes & Pulls:** observe how different objects behave in water; find out that objects float/sink; discover that not all heavy things sink/all light things float; predict which objects will float/sink; make simple boats using a variety of materials; compare bottles with tops on/off in relation to floating and sinking discover that changing shape affects buoyancy (e.g. float sheets of tin foil float, screwed up foil sinks); make miniature life jackets for model people; talk about using sprayers and water pistols; recognise that the flow of water is greatest at the bottom of the bottle/bag.

**Seasonal Changes:** explore water in relation to weather (e.g. rain, ice & snow); develop vocabulary associated with weather; describe the weather; recognise the need for appropriate clothing and equipment; look at some puddles outdoors; splash in the puddles; make a rain gauge.

**Living Things & Habitats:** talk about their experiences at a pond or river; be aware of the dangers of water; recognise and care for living things; make the water tray into a pond; keep a goldfish in the classroom; cut out plastic fish, attach paper clips and use magnets on string to ‘fish’; recognise that water is essential for growth/life; plant bulbs and seeds outside (discuss how they will be watered).

**Classification:** sort containers by colour, shape and capacity; sort, match and make comparisons; investigate a fish from the supermarket (feel, see gills & fins (use dramatic play).

**Working Scientifically:** name toys and equipment; respond to instructions (can you fill the cup, teapot? Can you pour the water from the jug to the cup?); blow bubbles through different shaped blowers (can you make a bigger bubble?); develop manipulative skills – filling cups, yogurt cartons and pouring out; develop vocabulary e.g. full, empty, nearly full, holds more; pour from container to container; use different funnels to control flow; count (e.g. counters, stones); count how many buckets of water are needed to fill the tray; observe how some objects that look alike behave differently (e.g. golf ball/table tennis ball floating); predict and test which objects float/sink; investigate absorbency (what happens to the water? Where has it gone? How can you get the water back?); develop relevant language (drip on/through, fall to bits, go through, roll off/run off, soak in/up, stay dry); make ice lollies in different colours, shapes and flavours; control the speed of the water wheel by varying the amount of water.