

Awe and Wonder: Mathematics, science and the outdoors.

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Word count; 4374

Appendix; I haven't used AI to help support me, with this assignment.



Source: Evans, 2025, Personal photograph.

Part 2.

Recently, I had the opportunity to take my early years class, aged between four and five, on a visit to Park Howard in Llanelli. We took a bus journey to get to our trip, and the children loved observing the world outside the windows and singing lots of nursery songs along the way. The aim of the outing was to encourage the children to explore and develop scientific and mathematical concepts through hands on play and guided observation in a natural setting. As this supports the Curriculum for Wales, which emphasises learning through active exploration in both the Science and Technology and Mathematics and Numeracy Areas of Learning and Experience (Welsh Government 2019). Additionally, the park's natural features such as trees, leaves, insects, and open spaces provided great opportunities for inquiry-based learning.

For our trip to the park, I brought along whiteboards, pens, small buckets, magnifying glasses, and weighing scales, as these resources support the development of early maths and science skills through hands on exploration, observation, and problem solving. This aligns with Progression Step 1, where children are encouraged to "I can explore the properties of materials and choose different materials for a particular use" (Welsh government 2019).

I ensured that all the children were dressed appropriately for the outdoor environment, including waterproofs and wellington boots as the weather was a bit cloudy and had been raining before we arrived. I also made sure each child brought a water bottle and a packed lunch so they could enjoy a picnic in the outdoor area and make the most of the new surroundings.

When we arrived at the park around 10am, the children were allowed to explore a small area with their partners. They were encouraged to use the Think-Pair-Share method first observing and discussing what they could see and what interested them, before returning to us practitioners to share their thoughts and ideas for further exploration. This links to Progression Step 1, which states that children have the ability to explore, make observations, and communicate what they learn (Welsh Government 2019). Once we regrouped as a whole class, the children were divided into smaller groups of six. Each group was accompanied by two practitioners as they

set off to begin their activities around 11am. One of the activities during our visit to Park Howard focused on developing mathematical thinking through patternmaking. The children were encouraged to collect natural materials such as stones, sticks, and flowers, and use them to create repeating patterns. I can identify, follow and begin to create sequences and patterns in everyday activities. This activity supports children in learning how to identify, create, and extend patterns. It also encourages problem solving and reasoning skills and fosters a sense of curiosity as they begin to wonder what comes next in the sequence. This supports the Curriculum for Wales Mathematics and Numeracy AoLE, which emphasises developing learners who can think creatively and logically to solve problems, and who are curious and able to explore patterns and relationships in their everyday experiences (Welsh Government 2020). During this activity a practitioner supported the activity by prompting the children with open ended questions like, "Let's build a pattern using sticks and stones, what comes next?" This gentle guidance helped the children think critically and extend their patterns independently, fostering both mathematical understanding and confidence in their ideas. According to Progression Step 1 within the Mathematics and Numeracy Area of Learning, Welsh Government (2019). Where children begin to recognise, copy, and create simple patterns, and are encouraged to develop their problem solving and reasoning skills through playful exploration.

Another group of children took part in a sensory based science activity to encourage close observation and descriptive language. Using magnifying glasses provided for the trip, the children explored different textures and surfaces around the park, looking at the tree bark, leaves, soil, and even tiny insects. By using magnifying glasses to observe textures, patterns, and living things, children are engaging in first hand experiences that foster their natural curiosity. According to Hwb.Gov.Wales (2022) this is a key element of Progression Step 1 in the Science and Technology Area of Learning and Experience. Learners at this stage are expected to show curiosity and question how things work and explore the environment, make observations and communicate ideas. During the activity they were also encouraged to describe what they saw and felt, using words like "rough," "smooth," "bumpy," or "soft." Some children noticed patterns on leaves and the different colours on the flowers, and they begin to ask questions, describe what they notice, and make simple comparisons, which supports the development of early scientific skills such as

observation, and communication. Practitioners scaffolded the activity by asking guiding questions such as, “What does it feel like?” or “Why do you think the bark looks like that?” This not only helped develop scientific thinking and vocabulary but also nurtured curiosity. Welsh Government (2023) states that this approach reflects the Curriculum for Wales which emphasis on enabling adults to support learning through play, exploration, and conversation. As a result of this, children begin to make sense of the world around them, laying the foundations for confident, inquisitive learning.

After completing part of our activities, we took a short break at 12pm for a picnic. The children were given the choice of where to sit, offering them varied learning experiences. Some chose the wooden bench, which was new to many of them, and they enjoyed exploring its texture. Others decided to sit on the picnic blankets I had laid out on the grass. This also links to Progression Step 1 in the Health and Well-being Area of Learning, where children are encouraged to make choices, develop independence, and engage with their environment through sensory exploration. It also touches on the Science and Technology Area, as children begin to explore and describe materials using their senses (Welsh government 2019). During our break we discussed our favourite parts of the park were. One girl shared, “I liked the flowers the best, there were so many colours!” This led to a small conversation where I asked, “Did you notice how many different colours there were?” The little girl began listing them: “Red, yellow, purple, pink.” We then talked about how we might group them later by colour or size. I asked her, “Think back, how many red flowers do you think we saw?” She replied, “Five,” and we discussed how we could record this on the whiteboards later. This natural conversation supported early mathematical concepts such as counting, sorting, and estimating, while also encouraging scientific thinking through observation. Even during a casual picnic, meaningful learning was taking place, guided by curiosity and supported by responsive adult interaction (Welsh Government 2022).

After our picnic, we returned to our groups to complete the final activity. The children collected small buckets from the resources I had provided and were asked to go find items around the park to create the heaviest bucket. They gathered a variety of natural materials such as acorns, stones, and sticks. Some children even used their imagination to fill their buckets with water from a puddle, demonstrating creative

thinking and problem solving. I could hear children, giggling and saying to other peers, “let’s have a race, who can fill it the quickest” and other conversations where the children were saying “I need more”, “get more” and this “bucket is heavier than than buckler “. These conversations were demonstrating that they were starting to understand how to get the buckets heavier and during this the children were fully engaged. The second part of this activity they had to then fill another bucket with lighter items. Children used items such as grass and leaves so that they could feel the difference between a heavier bucket and a lighter bucket, encouraging them to compare, they also compared with others around the group. This activity supports Progression Step 1 and begins to touch on Progression Step 2 within the Mathematics and Numeracy Area of Learning and Experience for example it links to Progression Step 1: “I can compare the size of objects using everyday language”, as children used terms like 'heavier' and 'lighter' while filling and comparing their buckets. It also supports Progression Step 2: “I can use appropriate vocabulary to describe quantities, measurements and comparisons “(Welsh government 2019). Once they filled the buckets, they placed them on the weighing scales and recorded their answers on a mini white board. Linking this with progression step 1, in the curriculum where it states, “I can investigate, collect and record data found in my environment” (Welsh government 2019). During this activity, the practitioner supported and scaffold children's learning in a variety of ways. One approach was by introducing the use of mathematical vocabulary such as “heavier,” “lighter,” “balance,” and “estimate,” helping to develop children's understanding of weight and comparison. This introduced those early mathematical concepts such as comparing weight, estimating, and experimenting with volume, while also promoting teamwork, communication, and exploration. The practitioner also encouraged children to predict which bucket might be heavier before using the scales, fostering scientific thinking and problem solving skills. This links to the Science and Technology Area of Learning and Experience, Progression Step 1: “I can explore the world around me and ask questions” (Welsh Government 2019). In addition, by modelling how to use the scales correctly and how to record findings on the mini whiteboards. Alongside this playful challenge, the learners were also encouraged to think critically, express their ideas, and reflect on their outcomes, core elements of Progression Step 1 that help children become ambitious, capable learners who explore the world through

meaningful, active experiences. Overall, the practitioner played a key role in guiding and extending the children's learning while keeping the activity engaging and playful.

At the end of our trip, we gathered all our belongings and came back together. As a special treat, the children were able to enjoy a lolly or ice cream from the little shop on site. While eating their treats, we took time to reflect on the day and listen to the children's voices, discussing what activities they would like to do next time we visit. One practitioner wrote down all the children's thoughts on a piece of paper to bring back to the classroom, helping us plan future trips. This experience, along with the activities, offered the children a fresh approach to learning and further supported their development in maths and science through outdoor exploration.

RISK BENEFIT ASSESSMENT

Location / Activity:	Park Howard, Llanelli	Date:	15.09.25
Assessor:	Joelle Evans	Review date:	23.09.25

The boxes in the table below will expand as you type into them; pre-entered text is simply for illustration. You should delete irrelevant items and replace with text relevant to your circumstances.

Your overall risk rating – Low, medium or high – is based on your judgement about whether the BENEFITS of the activity or opportunity outweigh the RISKS.

Experience exploring outdoor space in photograph	How will young people BENEFIT from this activity?	Hazards and associated risks	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk after precautions RATING: L/M/H
Exploring the area.	- Developing balance. - Thinking about self awareness. - Encourages physical activity. - Fosters sensory development. - Sparks curiosity, problem solving, and critical thinking. - Often encourages collaboration, teamwork, and communication.	- Uneven ground or slippery surfaces - increasing the risk of slips and falls. - Allergens or irritating plants - risk of skin irritation or allergic response. - Getting lost or straying from the group – can cause distress.	Children and staff	- Chat to the children before they go off into the area. - Set clear, age appropriate rules. - Maintain appropriate adult to child ratios. which ensures effective supervision and quick response if an incident occurs. - Have a first aid kit readily available and a qualified first aider present. - Observe and support children as they explore. - Make families aware of the nature of the activity in advance. - Ensure children wear suitable clothing and footwear. - set clear boundaries (cones out to mark where children can and cannot go). - Encourage children to assess risk themselves For example, "Does that look safe to pick up?" This builds awareness and decision making skills.	M & H

Bring awareness to safety concerns surrounding the area.	- Learn about road safety. - They also develop important life skills. - Independent decision making. - Gain confidence in managing their own safety when near roads or vehicles. - Understand the importance of rules and boundaries for their protection.	- Entering roads or car parks. - risk of being hit by a vehicle; serious injury or fatality. - Miss important safety warnings. - Distracted or unaware of surroundings – risk of running into the road or causing accidents. - Walk on unsafe or uneven surfaces near roads.	Children	- Pre visit safety talk with children, about the dangers of roads and the importance of following rules (e.g “we walk together,” “we don’t go past the cones/fence”). - Maintain appropriate adult to child ratios and close supervision. - Position adults strategically (e.g entrances/exits, corners, near cars). - Set clear physical boundaries. - Hold hands. - Teach and model road safety rules. - High visibility clothing or vests. - Regular headcounts. - Emergency procedures in place, ensure all adults know what to do in case of an emergency. - Inform parents/carers in advance.	H
When exploring freely.	- Supports their holistic development across all areas of learning. - Develops their independence and confidence. - Creativity and imagination. - Promoting social interaction and communication. - Supporting emotional wellbeing and mental health. - Gaining physical development through active movement.	- Sharp objects and rubbish around the area. – Infection or injury from sharp objects. - Strangers in public spaces. - Slippery surface – fall.	Children	- Carry out a visual sweep, look for broken glass, sharp objects, and remove. - Establish and enforce clear boundaries. - Talk to children about potential dangers.	M & H

Duck pond	• Children observe ducks and other animals. • Helps them understand life cycle. • Promotes critical thinking and observation. • Watching water movement and reflections.	• Deep water-drowning or slipping into the water. • Duck droppings – Infections, hygiene issues. • Avoid going too close to the ducks – bites or scratches. • Slippery or muddy banks – falls, injuries.	Children and adults.	• Always supervise children closely. • Teach children pond safety rules: no running, no chasing animals and stay back from the edge. • Avoid direct contact, enforce handwashing after visit. • Wear suitable footwear and supervise closely near edges.	H
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Picnic – food	• Social and Emotional Development • Strengthening relationships with peers and adults • Building confidence and independence by managing their own food, belongings, and space. • Feeling a sense of belonging and inclusion in a group setting. • Engaging in conversations during mealtime and play. • Learning about respect for the environment (e.g., not littering). • Enjoying fresh air and open space, which supports mental and emotional wellbeing.	• Children with food allergies- Severe allergic reactions. • Choking - (e.g grapes, tomatoes) • Unwashed hands before eating- stops spread of germs, illness. • Children wondering off during picnic - getting lost or injured. • Insects around food. • Rubbish and food waste- littering.	Children	• Provide hand sanitiser or wipes, encourage handwashing before and after eating. • Check allergies in advance, label all food, have emergency medication (e.g EpiPen) on hand. • Cut food into safe sizes, supervise while eating, ensure children are seated while eating. • Cover food and clean up spills quickly. • Set clear boundaries, frequent headcounts and assign children to adults. • Bring rubbish bags, dispose of waste properly, and teach children to cleanup responsibility.	M & H
Filling buckets	Activity that supports learning through play. Supports curiosity and creativity.	• Heavy buckets – could strain or drop the buckets which lead to injuries. • Sharp or natural items - Cuts,	Children	• Use small, lightweight buckets which limit weight and supervise lifting and carrying. • Teach the children how to carry the safely. • Encourage good posture, remind children to bend knees when lifting. • Encourage children to wash hands regularly.	M

		splinters or scratches from sticks or rocks. • Hygiene issues.			
Weather	- Seasons and changing weather patterns. - Improve mood and focus.	- Hot/Sunny Weather- Sunburn, heat exhaustion, dehydration. - Cold weather – could cause discomfort for the children. - Rain weather – slipping, becoming cold or wet.	Children	- Apply sunscreen, wear hats and loose clothing, encourage water drinking, provide shaded areas and limit time in direct sun. - Dress in layers, bring extra clothing and keep children active. - Wear waterproof clothing and boots and avoid muddy/slippery areas. - Check forecast before leaving the school and a few days before the trip.	M & H

Bus journey.	- Encourages social interaction with peers and adults during the journey. - Builds awareness of safety rules (e.g. seatbelt use, staying seated, road awareness). - Promotes independence and confidence — especially if it's a child's first group trip. - Builds patience and self regulation. - Children may sing songs, play quiet games, or look out the window together.	- Getting on and off the bus - trips, falls, road traffic accidents. - Disruptive behaviour - distraction to driver. - Emergency (breakdown, crash) - delay, injury, distress. - Travel sickness – vomiting. - Delays or route changes - distress, missed activities.	Children	- Supervise closely. - Discuss behaviour expectations, seat children calmly and staff seated throughout bus for monitoring. - Bring first aid kit, mobile phones, emergency contact list and brief staff on emergency procedure. - Seat travel prone children near front, bring bags/tissues/wipes and notify parents in advance. - Communicate with transport provider. - Keep parents informed if any changes.	M
Trees - touch and feels.	- Engaging multiple senses touch, smell, sight, and hearing. - Outdoor learning has been linked to improved attention span, creativity, and academic performance. - Tree exploration activities encourage teamwork. - Encourages movement and exercise (walking, running, climbing).	- Tree branches (low) - Head injuries, scratches, falling branches. - Uneven ground - trips, slips, and falls. - Allergies - Allergic reactions (skin or respiratory).	Children and adults.	- Pre walk site check; supervise walking areas and ensure appropriate footwear. - Identify and avoid areas with low hanging or dead branches. - Encourage the children to be careful what they touch. - Check for known allergies in advance (carry medication).	M

Part 4;

In early childhood education, the outdoor environment is an important place for children to learn. It offers many opportunities for them to explore, discover, and use their senses while playing. Engaging with nature supports not only children's physical and emotional development but also plays a key role in introducing foundational mathematical and scientific concepts in meaningful, practical ways. According to the University of Hertfordshire, outdoor learning provides unique experiences that support children's development across multiple areas, helping them build knowledge through play, sensory engagement, and interaction with nature (University of Hertfordshire, n.d.). Adults working with young children, such as early years practitioners, and caregivers play a vital role in guiding and supporting this learning. By joining in with play, asking questions, scaffolding children's experiences, setting up activities, that help children make connections between their play and key mathematical and scientific ideas. In doing so, they support children in making sense of the world around them. According to the Department for Children, Schools and Families (2009), states that when adults get involved in children's play in thoughtful ways like asking questions or offering support it can really help children learn and make good progress. This approach aligns with Vygotsky's theory of the Zone of Proximal Development supports this approach, he argued that children learn best when supported by a more knowledgeable other, someone who helps them move from what they can do independently to what they can achieve with guidance. By being present, engaged, and responsive, adults transform outdoor spaces into rich learning environments where children can build scientific understanding and mathematical reasoning through play, exploration, and discovery (McLeod, S. 2025). Additionally, according to the Early Years Foundation Stage (Department for Education, 2021), outdoor play supports all areas of learning, including problem solving, measuring, exploring nature, and understanding the world. Furthermore, Froebel, the founder of Kindergarten, believed outdoor play was very important and played a vital part of early childhood education. The word "Kindergarten" means "garden for children," showing how he valued nature and learning outside (Luds Kadimba 2011). Additionally, Froebel also believed the outdoor environment allowed young children to grow and learn in their own time, supporting their curiosity and creativity, which are essential for problem solving and discovery in both mathematics

and science. He emphasised the important role of adults, guiding children's development in the same way that good gardeners nurture young plants. Froebel saw children as engaged, curious, and imaginative learners. He believed they learn best through child led activity, first hand experiences, problem solving, play, and meaningful conversation (Tovey, H. & Froebel Trust n.d.). However, not every child has a lot of access to the outdoors, which can limit their opportunities for physical activity, exploration, and hands on learning experiences that support their holistic development. According to Piaget (1965 cited in Hargraves 2021), where he outlines that children learn best through active exploration, which the outdoors naturally supports, he considered children "as little scientists" constantly experimenting and constructing knowledge through interaction with their environment, yet limited access to outdoor spaces can restrict these important learning experiences. Furthermore, limited access to outdoor spaces can hold back these important learning opportunities. It's also difficult when adults don't feel confident or simply don't have the time to support outdoor learning, such as tight schedules, safety concerns, or lack of training can all get in the way. This becomes a real challenge when we consider how outdoor learning supports key areas of the curriculum. For example, according to the Department for Education (2024), the Early Years Foundation Stage (EYFS) promotes learning through play and exploration, with a strong focus on understanding the world and developing mathematical thinking. Outdoor environments naturally support these goals by offering hands on experiences that help children count, measure, observe changes, and ask questions. Similarly, the Curriculum for Wales encourages children to develop enquiry skills, recognise patterns, and use practical methods to solve problems through the Science and Technology and Mathematics and Numeracy Areas of Learning and Experience (Welsh Government 2020). These aims are supported through outdoor activities, especially within Progression Steps 1 and 2. When children are given the chance to explore outside, they're not just playing, they're building the foundations for scientific thinking and mathematical reasoning in line with curriculum expectations. The environment itself plays a crucial role in how children engage with learning outdoors. Simon Nicholson's Theory of Loose Parts (1971) suggests that the more different kinds of materials there are in a learning environment, the more interesting and creative it becomes for children. He argued that "the degree of inventiveness and creativity, and the possibility of discovery, are directly proportional to the number and

kind of variables in it" (Nicholson, 1971, as cited Department for Education 2025). Loose parts are materials that can be moved, combined, taken apart, and used in multiple ways. These might include natural elements like sticks, stones, and leaves, or everyday items such as boxes, pipes, and fabric. The key idea is that these materials do not have a fixed purpose, allowing children to use their imagination and creativity to explore. To support this kind of learning, it's important for adults to create environments where children have easy access to a wide variety of loose parts. This includes offering natural materials, as well as ensuring outdoor and indoor spaces are safe. Adults play a key role in setting up spaces that encourage curiosity, while also stepping back to allow children the freedom to direct their own play (Gano, D. 2021). According to Main (2024) A well prepared environment not only includes the right materials but also provides the time, space, and freedom children need to engage fully in meaningful exploration and discovery. Through this kind of open ended play, children naturally explore early maths and science concepts like measurement, problem solving and balance. On the other hand, According to Hwb.Gov.Wales (n.d.) the James Gibson's Theory of Affordances, introduced in 1979, looks at how people interact with their surroundings. He believed that objects and spaces offer different possibilities for action called affordances, which depend on how someone sees and uses them. For children playing outside, this means they might see a log not just as wood, but as something to climb on, balance across, or turn into part of a game. These possibilities are shaped by the child's own ideas and abilities, encouraging creativity and problem solving which are key aspects of both science and mathematics learning (Gibson, 1979). These two theories are closely connected when applied to children's play. Nicholson's loose parts offer a wide range of affordances that children can perceive and act upon and Gibson's theory helps us understand how children recognize and respond to these affordances, based on their experiences, interests, and imagination (NurseryNook 2016). According to Pasquier (2016) In early years settings, environments rich in loose parts encourage children to experiment, collaborate, and engage in meaningful play. Practitioners who understand these theories can better design spaces that promote exploration and learning. Rather than fixed, structured toys with one intended use, offering varied materials allows children to make choices and direct their own learning (Department for Education 2025). In conclusion, Nicholson's and Gibson's theories together highlight the importance of creating flexible, engaging environments for children. By

understanding and applying theories such as those of Nicholson, Gibson, Vygotsky, Froebel, and Piaget, practitioners can better support young children's natural curiosity and development. When children are given the time, space, and materials to explore freely, especially in outdoor environments, they build strong foundations for scientific thinking, mathematical reasoning, and a lifelong love of learning. Research shows that outdoor play fosters curiosity, problem solving, and critical thinking, which support key aspects of early scientific and mathematical thinking (Children & Nature Network, 2021). Ultimately, outdoor environments, combined with thoughtful adult support, play a key role in helping children become confident, creative, and capable learners. By valuing play, open ended materials, and child led exploration, practitioners can ensure all children have meaningful opportunities to engage with the world around them, and to develop the skills they need for the future. As Froebel believed, children thrive when allowed to explore and learn through first hand experience and interaction with nature (Froebel Trust, n.d.).

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