

Cover Sheet

Student Number: 2408631

Assignment Title and Number: A portfolio of evidence outlining how outdoor environments promote and support children's scientific and mathematical thinking – ECEY5005

Total word count (excluding Risk / Benefit Assessment): 3372

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Part 1 – Photograph (Source: McDonough, 2023)



Part 2: Exploring Science and Mathematical Concepts in the Outdoor Environment

Ten nursery children (aged 3) from a non-maintained childcare setting participated in a two hour beach session, inclusive of travel time. Prior to the visit practitioners introduced and reinforced safety protocols with the children including walking to the transport, travelling safely, transitioning to the beach, and understanding the “Golden Rules” for off site visits and beach play.

On arrival, practitioners established clear boundaries using perimeter flags and introduced a small selection of open ended resources - buckets, baskets, clear Perspex tubes, a few trays, and water nets. Shallow rock pools were identified for safe exploration. Children were then encouraged to engage freely with the environment, collecting loose parts and to freely explore the environment.

Several children dash eagerly to the water pools, splashing and jumping with excitement. Others approach the rocks, boulders, and shallow rock pools, beginning to climb and explore. A few children start digging in the sand with their hands, soon discovering driftwood and sticks to extend their play.



Tremorfa Nursery School, 2025a



Tremorfa Nursery School, 2025b



Tremorfa Nursery School, 2023c

Through climbing, balancing on boulders, jumping, digging in the sand and investigating sticks of varying size and texture the children are engaging with a range of gross motor, fine motor and physical skills. These movements all stimulate their vestibular system, sense of balance, and proprioception, sense of force and effort. The natural slopes and gradients of the beach environment challenge their coordination and spatial awareness encouraging opportunities to judge inclines and explore elevation. They also support early mathematical development as they begin to compare heights and angles for jumping

and climbing, size and texture of sticks and problem solving and estimation in terms of how far to jump or how deep to dig. Such play affords opportunities to revisit and consolidate skills previously practised in setting, to assess risk, aid decision making,

build emotional resilience and core strength, self confidence and co-ordination (WG, 2024).

ECCC, 2024a



ECCC, 2024b

While splashing in the water pools, Emma suddenly exclaims, “Eww, what’s that green stuff, it’s slimy!” Asha responds, “It’s seaweed, my Grandad told me,” she then proceeds to explain that her Grandad uses seaweed at his allotment to feed his tomatoes and once cooked he also eats it. This spontaneous exchange illustrates peer-to-peer learning, where children actively share personal knowledge and experiences. Such interactions validate individual understanding, reinforce collaborative learning, and deepen conceptual connections. They also support the development of communication skills, confidence, and respect for diverse perspectives, as outlined in the Curriculum for Funded Non-Maintained Nursery Settings in Wales (WG, 2024).

Adam shouts “No way! Can we eat it Miss? Will it make me big and strong?” The practitioner discusses the benefits of seaweed and lets the children know that if they collect fresh seaweed they can take it back to setting and cook it over the forest school fire. Using the buckets provided the children eagerly proceed to collect fresh seaweed discussing what they think it might taste and smell like when cooking. While climbing and looking for seaweed another child shouts “Be careful, the seaweed is slippery to stand on!” This unprompted moment of peer support reflects the development of positive relationships, empathy and compassion as children learn to care for one another’s safety and wellbeing. This reinforces collaborative learning and emotional literacy (WG, 2024).

In a shallow rock pool, while climbing and looking for seaweed, Adam spots a starfish “look, look! Look what I’ve found!” Ellis asks “What is it? Wow are those it’s legs”. Another child picks up a stick in an attempt to poke the starfish, Adam intervenes “No stop, you’ll hurt it”. The children gather around and further discuss whether the starfish would feel pain, how many legs it has and how it



ECCC, 2023c

survives in such shallow water. One child expresses fear “No, I don’t like it. Its scary”. With reassurance from a practitioner that the starfish would not hurt anyone the practitioner asks “Who’s bigger, you or the starfish?”, “We are” replied the children. The practitioner then compares the starfish’s size to a shell, a rock and the children themselves encouraging empathy by asking “Do you think the starfish might be frightened of us as we are bigger and louder?” Thoughtfully the frightened child responds “yes, shh everyone not so loud, we’ll scare it”. Noticing patterns in the sand



of the rock pool another child wonders if they were made by the starfish. This sparks a discussion about habitats, where different creatures might live and what they would need in their habitat to survive. With support from a practitioner the children look through the Perspex tubes provided to investigate and identify what is in the starfish habitat. When asked what the starfish might need the children have an animated discussion

and suggest food, water, and a rock for protection. When asked why it might need protecting Asha, a frequent beach visitor, answered “When the tide comes in a bigger fish might eat it”. Asha was praised for her vocabulary and encouraged to explain what this meant to the other children. Asha explained that the tide comes in and out throughout the day and that sometimes there was no beach to play on at all. When this happened the rock pools would be covered with sea water. In this instance the peer to peer learning fosters care and empathy for the natural world, embedding respect for living things and environmental awareness (WG, 2024). It also aligns with the four purposes encouraging children to share ideas and lead learning ensuring creative contributors and by encouraging capable learners to reinforce and extend understanding (WG, 2024).

With encouragement from the practitioner and the use of a shallow tray the children collaboratively collect loose natural materials to create a habitat that they think the starfish would need to feel safe. As they discuss what is needed and where best to place each item they use mathematical language such as “big/small, thick/thin, rough/smooth and wet/dry” to describe the size and textures of the materials they

find. Once completed the children sit back and Ellis proudly declares “We did it, I think he’ll like it in there now” however Adam asks “Will we hurt him if we move him?” prompting a thoughtful discussion about whether the starfish should be moved from it’s natural habitat. The children reflected on how they might feel if they were taken from their own homes. Ellis suggested leaving the starfish where it was and the group agreed. To reduce environmental impact and show care for the natural world the children were encouraged and supported to return all of the collected items to where they had got them from. This helped to reinforce the importance of respecting living things and helped to embed sustainable behaviours through meaningful actions. This activity supported children’s understanding of natural habitats, living things and ethical decision making all while fostering inquiry and experimentation. It also encouraged problem solving, spatial reasoning, measurement and classification, aligning with multiple Areas of Learning and Experience (WG, 2025).



The children in this scenario have been afforded the opportunity to explore the outdoors within a meaningful, real world context and have been encouraged to follow their interests using open ended resources and responsive questions. They demonstrate agency and curiosity all while developing skills and aligning with the four purposes (WG, 2024).

The outdoor environment plays a vital role in fostering a sense of belonging, an appreciation of the natural world and environmental empathy. With practitioners scaffolding learning and modelling respectful engagement with nature, children are guided toward becoming ethically informed citizens. Outdoor learning provides extensive rich opportunities to explore awe and wonder through mathematical and scientific concepts including observation, classification, measurement and inquiry. These experiences support holistic learning and teaching, cultivating a deep sense of self and connectedness to the world around them reinforcing the curriculum emphasis on authentic child led experiences (WG, 2024).

Part 3: Risk / Benefit Assessment

Location:	BEACH	Date:	10.09.25
Job Title / Role of Adult:	Setting Leader	Review Date:	09.10.25 – unless needing earlier review

Low	Something which may result in minor damage or slight harm (i.e. scratch or bruise)
Medium	Something which may result in a significant loss/damage or major injury (broken bone or other injury, which results in person being taken to hospital for treatment)
High	Something which may result in extensive damage, multiple major injuries, or death

Experience exploring the outdoor space in the attached photograph.	How will children BENEFIT from this activity?	Possible hazards	Who is at risk?	Control	Residual risk
Exiting the setting	Emotional wellbeing and holistic development – being outside and learning in nature. Experience, observe and make links to prior learning. Developing attention and listening skills. Experience as part of a group enhancing social and communication skills with their adults and peers.	Children running Doors Vehicles and unknown adults in the car park	Learners/ Staff	Pre Departure and Safety Preparation • All permission slips must be collected and fully completed, including emergency contact details for parents, the setting, and the venue. • Permission slips and emergency information to be carried in an 'Outings' bag on the day. • Mobile phones to be fully charged and use varying network providers to maximise signal coverage. • All staff to be briefed on and follow the setting's emergency procedures. • Correct adult-to-child ratios to be maintained at all times, including contingency planning for emergencies. • A trained paediatric first aider must be present for the entire duration of the trip. • First aid kit to be accessible, including documentation of pre-existing conditions, allergies, and individual care plans for all attendees.	L

	Learning to wait, follow rules and instructions aimed at their developmental ability.			• Agree a safety call/ word/ action for all the children and adults ensuring they all know what to do when called. Child Supervision and Movement • Children must be supervised at all times. • Regular headcounts to be conducted throughout the outing. • Children to be reminded of GOLDEN RULES** while walking. • Younger children to be safely secured in buggies or with reins. • Doors to be opened only when all children are ready to leave; an adult must exit first and supervise the group's movement. • High-visibility jackets to be worn by both staff and children to ensure visibility in public spaces.	
Outside setting boundaries Travelling on the minibus	Emotional wellbeing and holistic development – being outside and learning in nature. Experience, observe and make links to prior learning. Developing attention and listening skills. Experience as part of a group enhancing social and communication skills with their adults and peers.	Lost child Injured child/ adult Road accident Travel sickness	Learners and Staff	Staffing and Supervision • Correct adult-to-child ratios maintained throughout • Supervision at all times with regular headcounts • Outing led by a Level 3 or competent staff member. Pre-Departure Prep • Safety discussion held with children before leaving. • Children will follow GOLDEN RULES ** • Older children walk on the outside of the pavement when paired with younger ones. • Supervision ratios upheld during transitions and walking. • Fully stocked first aid kit. • Emergency procedures and lost child protocol • Any relevant care plans or allergy information Minibus Travel • Children seated safely with appropriate restraints and car seats. • Staff monitor for travel sickness and respond as needed.	L

	Learning to wait, sit safely, follow rules and instructions aimed at their developmental ability. Learning about and discussing what they can see through the window re going, road safety.			Sick bags and wipes available; care plans followed if applicable	
walking to and from the minibus to the beach	Emotional wellbeing and holistic development – being outside and learning in nature. Experience, observe and make links to prior learning. Developing attention and listening skills. Experience as part of a group enhancing social and communication skills with their adults and peers. Learning to wait, walk safely, follow rules and instructions aimed at their developmental ability.	Separation from group Injury	Learners and Staff	- Safety briefing held before departure, REMINDING OF GOLDEN RULES**, including expected behaviour (e.g. no running) - All children and staff to wear high visibility jackets. - Walk / led by a competent staff member; appropriate supervision ratios maintained. - Route planned to avoid fast roads and ensure safe pavement use. - Older children paired with younger ones, older child walks on the outside of the pavement. - Single file walking used where necessary. - Adults positioned at the front, middle, and rear of the group. - Pavement-to-beach access checked for slip hazards; safe reroute if needed. - Gathering point agreed by staff before entering the beach.	L

Members of the public	Developing self awareness, awareness of others, surrounding space and monitoring own risk. Learning about stranger danger and how to respond.	Stranger danger Fatality Abduction Violence and aggression Verbal or physical attack	Learners and Staff	• GOLDEN RULES** • Older children briefed on stranger danger before arrival. • Correct ratios maintained, supervision by competent staff at all times. • Regular headcounts conducted throughout the outing. • Lead staff member to assess beach conditions before proceeding. • Adults remain vigilant to inappropriate behaviour or attention from non-group individuals. • If an unknown adult shows undue interest, remove child, note description, and report to beach warden or police if needed. • Group positioned away from other beach users to avoid confusion or mixing. • Ensure children and adults are aware of the safety call/ word/ action and know what to do when it is called by a child or an adult.	M
Animals / insects/ pets on the beach	Awareness of other living things and about the hazards of stranger dogs/ animals. Learn the appropriate way to respond to unknown animals – do not approach/ do not touch. Developing self awareness, awareness of others, surrounding space and monitoring own risk.	Animal attacks – bites/ stings/ cuts/ bird attacks Animal/ bird faeces	Learners and Staff	• GOLDEN RULES** • Maintain correct adult-to-child ratios with supervision by a competent staff member. • Children briefed that bees and wasps only sting when provoked. • Area checked for jellyfish; children wear appropriate footwear when paddling. • Children advised not to pet strange animals or feed sea birds. • Children must not approach or interact with dogs. • Staff to be aware of any dog-related phobias or children likely to approach animal. • The dog warden number will be saved in setting mobile phone.	M

				• Ensure children and adults are aware of the safety call/ word/ action and know what to do when it's called by a child or an adult.	
Special medical/ pre-existing medical conditions/ learning needs/ dietary needs Illness or injury – slip/ trip/ fall	Discuss and learn about the lifeguard role and how they keep us safe when at the beach. Learn about the RNLI and how they keep us safe. Learn what we do in we do in an emergency -999 Children with specific needs will learn to achieve despite medical conditions / learning needs while building resilience.	Asthma/ diabetes/ allergies/ sickness Trip, slip or fall or any other illness or injury		• Activities, trip duration, location, and rest breaks to be considered during planning. • Avoid any activity likely to worsen an existing injury or medical condition. • Nursery Manager and individual to complete a pre-trip risk assessment for any health concerns. • If needed, arrange 1:1 support for children with specific medical needs/ learning needs. • Outings bag to include: • Fully stocked first aid kit. • Emergency contact list and procedures • Fully charged mobile phone • Allergy sheets and any required medication • Children to drink only their own provided drinks — no consumption of beach or natural water sources. • If a child ingests sea water, parents must be informed. Parents advised to monitor for symptoms. If child becomes unwell, parents should inform their GP of the location and activity. • Discuss roles of lifeguards and RNLI and what they do to keep us safe. • Ensure children and adults are aware of the safety call/ word/ action and know what to do when its called by a child or an adult	M
Weather and environmental changes	Emotional wellbeing and holistic development – being outside and learning in nature. Experience, observe and make links to prior learning including natural	Sunburn Dehydration Slipping Dust and debris blowing around Extreme cold/ wind Lack of shelter	Learners and Staff	• Check weather forecast on departure day; prepare for sudden changes. • Wind may mask sun exposure — model to face away from wind. • Apply sunscreen frequently due to increased beach UV risk.	M

	experiences and nature connections. Be aware of and experience different seasons, temperatures and weather. Learning about beach safety, discussions around tides – how much beach do we need to stay safe? Staying away from cliff face. Developing self awareness, awareness of others, surrounding space and monitoring own risk. Weather language – hot/ cold/ wet/dry/ clouds. Discussing and identifying harmful weather conditions – too hot/ windy/ cold, and prevention of harm – wear sunscreen/ wellies.	strong waves sudden changes in tidal conditions rock falls from cliff facing unpredictable weather changes		• Carry space blankets/warm layers for cold or wet children. • Discuss weather conditions and safe practices with group at session start. • Golden rules – always wear appropriate clothing i.e. long sleeves/ hat/ coat /wellies. • Conduct regular site appraisals to confirm suitability for young children. • Check public safety equipment is present and fit for purpose at each visit. • Confirm mobile phone signal for emergency contact. Complete daily site check: • Weather conditions. • Tide times (choose slow-flowing area; visit well before high tide). • Rip currents and sea conditions. • Wind levels (gentle only; avoid strong winds). • Sufficient beach space above high tide line • Type and quantity of litter. • Water quality and any prevailing environmental factors. • Check for freshly fallen debris from cliff facings; avoid unstable areas. • Identify public safety equipment locations and confirm they are accessible and functional. • Note lifeguard station locations, including attendance times and coverage during visit. • Check for freshly fallen debris from cliff facings; avoid unstable areas. • Identify public safety equipment locations and confirm they are accessible and functional. • Note lifeguard station locations, including attendance times and coverage during visit	
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Litter Hazardous litter	Developing self awareness, awareness of others, surrounding space. Developing own risk and health awareness. Awareness of hygiene and litter safety. Awareness of ecological impact of rubbish and litter.	Rubbish / litter/ broken glass/ BBQ's / toxic hazardous waste.	Learners and Staff	• Staff to complete a visual check of the beach area before children enter. • Gloves and rubbish bags provided for adult use only. • Dangerous litter moved only if safe to do so. • Litter awareness discussed with children before and during the trip. • Children must not touch unnatural items — alert staff immediately. • Remove children from vicinity of any suspicious object. • Contact coastguard if unidentifiable or hazardous items are found.	L
Getting lost	Developing self awareness, awareness of others, surrounding space and monitoring own risk. Learning to follow rules and instructions – staying within boundary flags, keeping high vis vests on. Learning about stranger danger and how to respond.	Separation from the group Getting lost Panic attacks Possible abduction	Learners and Staff	• Adults select a quiet beach area; clear boundaries set and shared with all. • GOLDEN RULES** • Maintain 1:2 adult-to-child ratio; higher support needs retain their usual supervision level. • When moving, adults positioned at front, back, and throughout the group for coverage. • Children hold hands with an adult or peer when moving between spaces. • Safety straps used if needed for younger children. • Regular headcounts conducted throughout the outing. • Staff carry fully charged mobile phones with emergency contact numbers available for seafront offices (if applicable), emergency services, and home contacts.	L/M
Sand play and beach walks	Emotional wellbeing and holistic development – being outside and learning in nature.	Uneven terrain – soft/ hard sand, water pools, rock pools, pebbles and low-level rocks.	Learners and Staff	• GOLDEN RULES** • Children and adults must stay clear of all cliff faces. • Rock fall risks and safe behaviour (e.g. no throwing stones) discussed with children before visit.	M

	Developing self awareness, surrounding space and monitoring own risk. Self confidence, critical thinking, building resilience and self challenge. Experience, observe and make links to prior learning. Hand eye coordination and physical development – gross and fine motor when walking on uneven ground (vestibular), digging (proprioception) and collecting small objects. Opportunity to explore living things, habitats, environments and life cycles Exploring different properties – loose shells, driftwood – why is this piece of wood heavier than the next?	Trip, slip or fall or any other illness or injury. Rock falls from cliff face Sand in the eyes/ mouth Hidden sharp objects		Adults to model safe movement across uneven terrain	
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	Supports schemas and STEAM Learning. Multisensory and messy play, creativity and imagination. Teamwork and social skills.				
Paddling and rock pooling	Emotional wellbeing and holistic development – being outside and learning in nature. Experiencing free play in an unstructured environment. Experience, observe and make links to prior learning. Hand eye coordination and physical development – gross and fine motor when walking on uneven ground, over unsecured rocks and pebbles, balance (vestibular) weight when lifting (proprioception) and collecting small objects, awareness of slopes and gradients.	Slips/ trips Impact injuries – bruises/ cuts/ broken bones/ concussion Trip, slip or fall or any other illness or injury infection drowning Children are not yet swimmers Underwater hazards – slimy rocks/ sharp shells	Learners and Staff	• GOLEN RULES** • Discuss water safety with children before and during the visit; reinforce regularly. • Clearly define paddling boundaries; understood by all adults and children. • Adults check water depth, ground conditions, and trip hazards in sand and rock pools. • Avoid slippery surfaces and areas with sinking sand. • Children must not be lifted or carried over rocks. • Check for hidden litter in water or pools. • Children may paddle only ankle deep (wave motion may raise water level). • Limit number of children paddling at one time; ensure sufficient adult supervision. • Adults stay close enough to speak calmly to children. • Model slow, safe movement in water and respectful wildlife observation. • If wearing wellies, trousers must be worn outside to prevent water ingress.	M

	Exploring different landscapes and looking for fossils in rocks – learning about evolution, why are some rocks smooth and others sharp and craggy? Observing biodiversity of environment and geographical concepts – place, space and change Exploring different properties – does the rock sink or float, how big a splash does it make when dropped from height Multi sensory experiences of mixing textures and exploring changes – sand and water Collecting, exploring and discussing different textures – seaweed, rocks, shells, driftwood Developing awareness of self and surrounding space, resilience and monitoring own risk.				
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	Self confidence, critical thinking and self challenge when climbing on rocks or pools. Team work and social skills.				
Disruption and possible destruction of ecosystems	Benefits of learning about the coast, eco systems and the weather. Emotional wellbeing and holistic development – being outside and learning in nature. Experiencing free play in an unstructured environment. Sense of achievement and wellbeing while developing ethical practices. Inventive and problem solving activities. Team work and social skills.	Threat to rock pool life Destruction of habitats Affect of food supply to other animals/ sea life Removal or rocks/pebbles from the beach affecting flood defences	Learners and Staff	• Use only a few designated rockpools with clear boundaries. • Promote litter-free snacks and leave-no-trace expectations. • Encourage ethical observation using clear cylinders (no handling of sea life). • Return rocks gently to original positions after exploration – for habitats, eco systems and flood preventions. • Remind children to watch their step around sensitive habitats. • Only adults to use nets for transferring marine animals. • Use shallow trays of seawater for short investigations; adults return animals to habitat. • Handwashing after activities; use alcohol gel if facilities are unavailable	L

	Experience, observe and make links to prior learning. Explore habitats and sea life responsibly and ethically. Begin to learn to risk assess – why should rocks be put back in the same place as we found them? Why do we need to be careful when walking? Explore and discuss reasons why not to remove rocks / pebbles from the beach – habitats and flood defences.				
Toilet facilities	Develop selfcare and emotional and social skills. Learn about self hygiene and hand washing. Learn about boundaries and follow rules of attending the toilet with supervision.	Trapped in the toilet Nappy/ changing facilities Public toilets may pose infection risks Strangers/ unknown adults	Learners and Staff	• Children to be toileted/changed before leaving the setting. • Children will always attend toilets with 2 staff members for supervision cover. • Staff members will monitor entry and exit of all children with regular head counts. • Children must not lock toilet doors; staff to ensure privacy while maintaining safeguarding. • Use nappy changing facilities correctly, including safety straps and hygiene procedures. • Staff will supply hand sanitiser and tissues in case of lacking hand washing facilities or toilet paper. • All staff and all children will wash hands following a toilet visit.	M

				• Toilet visits will be logged for the session. • Report any concerns about welfare facility cleanliness to the appropriate Council contact	
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**Early Years Beach Visit: GOLDEN RULES for Children

Staying Safe Together

- Always stay with your grown-up—no running off
- Hold hands with your allocated adult or buddy when walking
- Never go near water without your adult
- Stay within the flagged or designated play area
- Keep away from cliff edges and steep drops

People and Animals

- Do not approach strangers or unknown animals
- Respect other beach users—no shouting or rough play
- Stranger danger: stay close to your group and trusted adults

Easy to Spot

- Wear your beach gear: hats, hi-vis, matching clothing or waterproofs
- Stay visible and together at all times

Hygiene and Health

- Nothing goes in your mouth—no sand, shells, or water
- Wash hands after water play and at the end of the session
- Wear appropriate footwear and clothing for the weather

Beach Play Rules

- No throwing sand, stones, or objects
- Use kind hands and feet—play safely with others
- Listen to adults and follow instructions straight away

Part 4 – Evaluating a Practitioners Role in Supporting Mathematical and Scientific Learning in Early Years Outdoor Environments

The remainder of this portfolio will consist of an evaluation of the adult practitioner's role in relation to inspiring and supporting awe and wonder through the exploration of scientific and mathematical concepts in early years practice. This approach is often referred to as the STEAM model – Science, Technology, Engineering, Arts and Mathematics, which promotes inquiry-based learning and nurtures curiosity, creativity and critical thinking (MacDonald *et al.*, 2020 and Welsh Government (WG), 2024). STEAM opportunities offer an abundance of long lasting rich cross curricular experiences and are particularly powerful when in the outdoors where natural elements and real-world contexts enhance sensory engagement and conceptual understanding (MacDonald, 2020 and Nazia *et al.*, 2025).

Piaget (1951) viewed children as little scientists who actively construct their own knowledge through exploration, experimentation and interaction with their environment. Piaget particularly emphasised children learn best through hands on experiences during the sensorimotor, from birth to two years, and preoperational, from age two to seven, stages of development. McLeod (2025) reaffirms Piaget's view and states that this constructive approach remains foundational in early pedagogy especially within the Science and Technology Area of Learning and Experience (AoLE).

Froebel strongly believed the natural outdoor world was vital to children's learning, offering rich context for exploration, creativity and self-directed play (Bruce, 2021). These spaces provide affordances, features within the environment that invite and enable specific actions or interactions (Gibson, 1979), such as climbing logs, collecting loose natural parts and den building. Practitioners are able to then recognise and enhance these affordances which support children's autonomy, agency and holistic development in line with the Froebelian principles. In agreement Sisson and Lash (2017) highlight that extended, uninterrupted outdoor play in the natural world fosters harmony and respect for all forms of life. These experiences enable children to build meaningful relationships with not only peers and practitioners, but also with the land and nature itself.

Time spent in nature often evokes feelings of awe and wonder, offering opportunities for children to integrate mind and body through sensory and emotional engagement.

These moments can also connect to a child's sense of spirituality and belonging (Larimore & Warden, 2019). This closely aligns with Bronfenbrenner's ecological systems theory which emphasises the importance of a child's interactions with their environments in shaping development (Hayes *et al.*, 2022) and also reflects Reggio Emilios approach which views the environment, particularly the outdoors, as the third teacher supporting the belief that every child is capable and competent and deeply connected with their surroundings (Edwards *et al.*, 2022). When practitioners embrace the Froebelian ethos of hands on, experiential learning, offering freedom with guidance and sensitively observing and extending play they nurture children's care for the natural world. This approach fosters a sense of holistic interconnectedness with nature (Bruce, 2021). This directly associates with the Four Purposes of the Curriculum for Wales, particularly the development of ethically informed citizens and healthy, confident individuals (WG, 2024)

Practitioners who intentionally create and design outdoor learning environments that integrate seamlessly with indoor spaces enable children to engage in authentic scientific inquiry, develop ecological awareness, and foster a sense of identity, autonomy, and belonging (Sisson & Lash, 2017 and Nazia *et al.*, 2025). When these outdoor areas are thoughtfully constructed, they include natural elements such as logs, stones, water and plants invite open ended play and enquiry and can significantly enhance STEAM learning. Prince and Diggory (2023) suggest that when outdoor spaces are designed with intentional affordances, features that suggest possible action, they support a wide range of experiences. A slope may invite rolling, a hollow may encourage hiding or imaginative play, and a quiet zone can foster story telling or time for reflection. Active zones for climbing, building and movement promote mathematical concepts and motor development such as gravity, weight and force, while investigation zones such as weather stations and mud kitchens support scientific enquiry and mathematical concepts like measurement, comparison and pattern recognition. In agreement Nazia *et al.* (2025) highlights that these environments actively promote engagement with STEAM activities, reinforcing the additional value of well-designed outdoor spaces in supporting holistic learning. In addition, Sisson and Lash (2017) state that wild open spaces allow for children to have autonomy over their own play and at times distance between themselves and

practitioners, demonstrating the practitioner's confidence in the children and that they are competent and capable learners.

Sisson and Lash (2017) also emphasis the vital role of practitioners in sustaining natural environments that support developmental skills and growth. This includes actively maintaining such spaces in terms of plants, habitats, and the natural environment to ensure they remain rich in learning potential. Practitioners also play a key role in engaging children and their families fostering a sustained shared thinking and collaborative approach to caring for these environments. This practice directly supports science and technology learning within the Curriculum for Wales. For example, when children help maintain a bug hotel or observe seasonal changes they are engaging in authentic scientific enquiry by asking questions, making predictions, recording changes and developing ecological understanding. Parent led nature groups further enhance this by enabling adults and children to explore together, building on scientific skills such as classification, observation and environmental stewardship (Prince and Diggory, 2023).

Howard *et al.* (2018) state that sustained shared thinking is central to practice as it underpins high quality interactions between practitioners and children. It involves open ended dialogue where both parties collaborate to solve problems, clarify concepts and extend ideas and thinking. The approach promotes language development, supports critical thinking and child led learning while recognising the importance of both the child and the practitioner's voice and the shared opportunity to contribute through meaningful dialogue.

This is particularly relevant in mathematics and science where sustained shared thinking supports conceptual understanding and inquiry-based learning (WG, 2022a). Mercer *et al.* (2019) found that approaches including questioning, reasoning and joint exploration enhance children's abilities to engage with mathematical and scientific thinking, including pattern recognition, prediction and explanation. These interactions help build a child's confidence in expressing their ideas, hypothesis and reflection.

WG (2022a) reinforces this view, highlighting the importance of dialogue, co-construction and purposeful interactions between practitioners and children as core elements of sustained shared thinking. WG (2022a) further emphasis that learning is

deepened when children are supported to reflect, ask questions and are encouraged to extend their thinking. Furthermore, sustained shared thinking is identified as a core pedagogical strategy within the AoLE's particularly in Mathematics and Numeracy (WG, 2022B) and Science and Technology (WG, 2020) where it plays a vital role in supporting progression and conceptual understanding.

Keller and Keller (2022) delve further into sustained shared thinking and extend the concept beyond pedagogy, framing it as a philosophical approach to rationality. They argue that when practitioners and children engage in discussions, they are not only exchanging ideas but are also developing the ability to think about knowledge itself. This includes the co-construction, justification and reasoning of their ideas through open conversations. Keller and Keller (2022) further state that this is essential in the early years as it nurtures metacognition, thinking about how they think, autonomy and agency while reinforcing Reggio Emiliass principles of capable and competent individuals.

Brodie (2020) supports this perspective, proposing sustained shared thinking and dialogic teaching are not isolated strategies but are a part of a broader continuum of embedded pedagogical practice that supports cognitive emotional and social development. The continuum places meaningful dialogue at the heart of learning, ranging from simple responses and scaffolding questioning to joint exploration to deep dialogic engagement. This inclusive approach values every child's voice and aligns with the Curriculum for Wales, particularly in promoting agency, progression and meaningful experiences across AoLE's (WG, 2024).

During sustained shared thinking practitioners have valuable opportunities to embed metacognitive talk, language that supports children in reflecting, planning and thinking about their own learning processes. This type of dialogue helps children develop metacognition, an awareness of what they think, which is essential for self regulation, independent learning and problem solving (Mercer, 2019 and Jackson, 2023). In practice practitioner prompts may include "I wonder why you decided to do it that way?" or "what could you try next?" encouraging children to consider their reasoning and consideration for alternative strategies.

Jackson (2023) notes that metacognitive talk often emerges naturally during sustained shared thinking and supports children's ability to problem solve, adjust

strategies, make informed choices and reflect on outcomes. Reinforcing this Hitt's (2023) research review confirms that metacognitive talk and self regulated learning can significantly improve mathematic outcomes for learners aged 3-18, highlighting its relevance across developmental stages and curriculum areas.

In contrast Larimore and Warden (2019) recognise that intentional silence can sometimes be just as powerful during outdoor play. Allowing children to fully experience the moment without any interruptions. Rather than immediately engaging in discussion practitioners may choose to pause, offering space for children to absorb the environment and their emotions. A simple, heartfelt response such as "Wow" can honour the moment without over taking it. This quiet presence offers the children time to reflect, process the experience and initiate dialogue when they feel ready. This type of response supports curiosity, autonomy, emotional awareness and a deeper connection with the natural world.

This approach aligns with Alison Clarke's concept of slow pedagogy which advocates for the unhurried, child led experiences that value stillness, reflection and emotional connection (Clarke, 2020). By slowing down and resisting the urge to fill every moment or silence practitioners support a child's curiosity and deep connection to the outdoors. It also creates space for scientific and mathematical thinking to emerge organically such as recognising seasonal changes, patterns and shape in nature, comparing sizes and qualities, exploring, using tools or spatial awareness through movement and positioning. Furthermore, by slowing down, practitioners create space to allow children to make meaningful observations and connections prioritising depth of learning over speed and allowing ideas to unfold at the child's own pace (Marks, 2023).

Within Curriculum for Wales this practice supports both the Mathematics and Numeracy and Science and Technology AoLE's through real world exploration of measurement, shape and pattern and observation, question and making sense of the natural world through enquiry and reflection (WG, 2022a).

Bilton and Waters (2016) discovered that Welsh practitioners were more likely to plan outdoor learning with clear links to the curriculum whereas their English counterparts tended to focus more on children's personal, social and emotional development

when outdoors. This suggests a difference in how education policies and curriculum guidance can vary.

Prince and Diggory (2023) found that some practitioners felt unprepared to lead outdoor learning due to lack of training in risk assessment, curriculum integration and outdoor pedagogy with some undervaluing its role within mathematics and literacy.

Louv (2006, cited Wilson, 2018, np) introduces the concept of the “de-naturing of childhood”, highlighting how reduced access to outdoor experiences can negatively impact children’s physical health, emotional development, and sense of connection with the natural world. Tinney (2023) adds to this by referencing Louv’s notion of “nature deficit disorder”, attributing this disconnect to a range of cultural, institutional, familial, and personal factors. Wilson (2018) further identifies growing litigation, urban design, and safety concerns as significant barriers to outdoor pedagogy, alongside excessive screen time and risk-averse parents and practice.

These limitations not only restrict children’s opportunities for well-being and autonomy but also hinder the development of scientific and mathematical thinking. Outdoor environments offer rich, real-world contexts for exploring cause and effect, pattern, measurement, and spatial reasoning all of which are key components of the Science and Technology and Mathematics and Numeracy AoLE’s. When access is limited, children may miss inquiry-based experiences that foster curiosity, problem-solving, and conceptual understanding.

In conclusion an intentional, reflective practitioner is required for outdoor learning. By slowing down, observing sensitively and responding with curiosity they prioritise depth over speed. Thus, encouraging connectedness to the natural world. Acting as co-learners and facilitators practitioners design and create bespoke environments related to the children’s needs and interests. They model respectful engagement of the environment and living things to embed sustainability for future growth and development and scaffold learning. This approach aligns with the Curriculum for Wales supporting cross curricular AoLE’s in particular Mathematics and Numeracy and Science and Technology.

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