

Awe and Wonder – Mathematics and Science in the Outdoors.

ECEY5005/C

Part 1



(Jones, 2023)

Part 2

The photo above in part 1 is from the forest area of my setting. It is an area used throughout the whole school to provide learning opportunities. Children at the setting from a young age are introduced to the area and a clear set of boundaries are in place to ensure safety, such as children are not permitted to leave the grassed area and go onto the concrete behind without an adult knowing. This outdoor classroom area provides children with the opportunity to develop holistically, with chances to develop language skills, social skills, problem solving and our focus for this portfolio mathematic skills and science skills. The area in the picture includes a mud kitchen in the right-side corner with a container that is free to be used stocked with loose parts, kitchen and measuring equipment, water storage and appropriate clothing. A bug hotel, picnic bench and large covered space are all available to be used in the picture. There is also a large amount of open green space for the children to utilise.

The space in the photo has provided children with an abundance of opportunity to develop maths and science skills in the outdoors over a range of topic based learning. This area also provides children with the chance to engage in wider STEM activities from a young age and continue to do so throughout their learning journey in our setting. Welsh Government (n.d) recognises the importance

of play in the development of maths not just numeracy skills but creating the ability to problem solve, explore concepts and to collaborate with others.

This area provides children with the opportunity to learn about capacity, volume and non-standard measures within the mud kitchen. Water play in this area has produced opportunity to explore floating and sinking, force, materials and waterproofs. Opportunities for mixing and creating are also available for children and they have participated in potion making and mixing, this not only supports maths but science learning too. Appropriate materials can aid this learning and are readily available to the children in the natural environment and in the locker. The area also provides opportunity for children to explore the concepts of shape, pattern and symmetry through the natural materials such as leaves, sticks and flowers. This learning all took place whilst we were taking part in the topic Hocus Pocus.

Opportunities for number and counting work are also available, children were recently engaged in planting activities to grow produce for our Big Bocs Bwyd project. The garden area to the left of the mud kitchen has been turned in to a vegetable plot. Children had to count seeds and space them correctly, this introduced measure into their learning whilst also crossing into planting and growing traditionally thought of as science learning. Through planting children were introduced to new tools which gave opportunity to build existing fine motor skills and enhance the chance to build new ones, correctly handling them and knowing their purpose. This cross area learning fits into the new categories of the non-maintained curriculum, this now would fall under exploration which combines the traditionally thought of maths and science subjects.

From the science and technology statements of what matter Welsh Gov (n.d) we are able to see the importance of the outdoors and world around us. Being curious, being creative and living things all feature heavily.

Children in this area have engaged in science learning through the bug hotel exploring living things and how they may differ from us, do they need the same things to survive? Other habitats and animals may also be learnt about notice the bird boxes. Bird boxes are man made how would the birds build their own homes? Can we spot any in the environment? Equipment such as binoculars, magnifying glasses, tweezers, jars have been provided to explore this avenue further alongside the use of natural materials gathered to create their own products and tools. Again, this has provided the children opportunity to problem solve, to find alternatives to glue, what might a bird use?

Through using this outdoor environment children have also been able to have first hand experiences of learning about the seasons and weather. Exploring the leaves and climates during different times of the year, comparing learning from one season to another. Being able to go out in all weathers throughout the year, noticing the clothing they use and how it differs depending on the time of year.

The outdoor picture has also provided children with the opportunity for risky play. Trees, uneven terrain, natural plants such as brambles all pose potential to display risks to the children. These pose challenges to children of how to overcome them to continue their learning in the way they want to. They also provided opportunity to explore height, friction, keeping themselves safe and healthy, the body and how it moves. Through the outdoors the children are able to explore themselves as well as traditional nature-based learning. This environment has produced learning linked to the human body, the changes that occur in it through different situations, how to keep it healthy, prepositions and movement.

The photo shows a clear path way that has been created. This was done through partnership with involve who helped us create the space. We were aware that we wanted the area to be accessible to all and we have had children and families unable to access the area due to the uneven ground and children not liking the unfamiliar. Through providing the track children have still been able to join us in learning and build their confidence to challenge themselves and be with their peers but on their own terms. Parents and families are also invited in to take part in learning sessions and occasions and the path has helped people with physical struggles to join their children in outdoor sessions. These sessions are of huge importance to the children and have enhanced the learning giving children that sense of belonging, unity and proudness to share their thoughts and lead their learning in their community.

This area has been essential in providing children with additional learning needs the same experiences of learning as their peers. Most take to it with ease enjoying the freedom to explore while some have struggled with the openness and new experiences. Some have chosen to stay close to adults as they are weary of the unfamiliar. From being outdoors with children with additional learning needs the children who present with ALN if comfortable in the environment tend to lead their learning more than mainstream children, finding interests in things that others are aware might not be what they are supposed to be doing in that moment.

From my experience learning in the outdoors often takes a turn and follows a different path once the children become engaged. It tends to cover wide areas of development for children and has the ability to cross over into many areas of learning. Initially I found outdoor learning in this area easiest to plan in areas such as science and expressive arts. The non-maintained curriculum which is being developed within our setting has provided a clearer view of the freedom that can be had in the outdoors. It's showing to be a positive for children and that learning is still taking place through the notion of awe and wonder, non-maintained curriculum for Wales (n.d). Having discovered it does not work to keep children from engaging in free learning which might not be the intended outcome, this is where a greater knowledge of planning in the moment needs to be explained to practitioners. If we are not so

Imogen Jones
Student Number 2216692
Word Count 4011

confined by traditional tools used to measure progress I think as a practitioner I and others would feel more comfortable with largely allowing learning to be led by children not just during moments where it does to some extent still connect to the intended outcome.

Part 3

Risk Benefit Assessment

Location/Activity	Forest Area	Date	September 2023
Assessor	Imogen Jones	Review Date	September 2024

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
Entrance/Exit	Being able to access a holistic approach to all areas of learning	Children leaving the area without adult knowledge, becoming separated and possibly falling on concrete causing bumps and bruises	Children	- Adults to be aware of all children - Being stationed appropriately through the outdoor classroom	L
Tree stumps	Children will be able to climb and balance developing motor skills and also engaging in challenging and risky play	Children or adults falling over or into stumps or slipping off them. Could cause bumps, bruises or breaks when landing.	Children, adults	Children to be made aware of taking their time and being aware of what is in the surrounding environments prior to arriving in the forest area	M
Steps to shelter	Children will have the option to work	When wet steps become	Children, adults	Appropriate clothing and footwear to be	M

	and explore in a covered setting if they choose to. Children will have access to experiencing learning from all areas of the curriculum.	slippery causing people to slip and fall which may result in cuts, bruises or breaks.		provided for all engaging in activity in the area when it may be under these conditions • First kit available within the area	
Uneven ground	Develop motor skills and become accustomed to moving and traveling over different terrains	Children or adults may lose their footing causing injury such as breaks and bruises.	Children, adults	• Children reminded to take care in the forest as ground is uneven • Correct footwear to be worn by all	M
Water containers	Children will have the opportunity to explore mathematical and scientific concepts such as measure, sink and float, changing forms	Water containers may fill with rain water, drowning hazard	Children	• Adults to do a check of all large water vessels and to be present when water play is happening • Higher ratios to be deployed to keep children safe	H
Brambles and nettles	Explore nature and what it provides for us, provides children with concrete experiences about keeping safe in nature	Stings and sharp materials causing cuts, burns or irritations	Children, adults	• Children made aware of brambles and nettles on arrival and introduced as part of initial safety talk • adults to be vigilant for other unknown plants that may grow in the area • First aid kits to be taken with lead adult	L
Tools in container	Develops fine motor skills and an awareness of real-life skills. Builds hand eye coordination and helps children understand concepts	Could cause cuts or scrapes	Children	• Children to be shown correct handling of sharper tools with adults present to monitor • First aid kit to be taken by lead adult to learning area	H
Table corners/ structure corners/ structures	Table provides an area to gather and collect and explore their findings as do the wooden structures. Children are able to engage a range of skills such as social, creative, scientific.	Fall on uneven ground into corners causing cuts. Structures are wooden and may cause splinters	Children	• First aid kit to be taken by lead adult • Children also reminded about how they access the forest in prior safety talk	M
Gate	Keeps the children safe to explore and	Fingers may become	Children	• Gate to be closed	L

	learn in a holistic experiential based approach.	caught in the gate causing breakage, cuts or bruises		• Safety talk prior to arriving in the forest • Rules reiterated to the children around the agreed areas they can explore	
Animal droppings	Makes children aware that we are not alone in this world and that we share it with other living creatures.	Children may tread in or touch droppings, could lead to them ingesting and causing infections and illness	Children, adults	• Adults to do a walk around prior to children arriving to clear any mess • Appropriate cleaning and clearing equipment available in the area	M
ALN	Provides children with the experience of developing in new areas that may be unfamiliar or imposing	Children may find the experiences overwhelming causing distress which could lead to physical harm by tripping or falling	Children, adults	• Extra support for children who may need it • ALN children introduced separately to the area • All adults to be aware of children with ALN	M

Part 4

According to (Kennard 2022) the benefits of outdoor learning are significant for children's development, providing improvements in areas such as neuro and physical development as well as cognitive enhancement specific to the child's pace. Redford 2013 agrees with the statement as a forest school provider using Piaget's theories around schemas. Suggesting that the brain and neuro development are being built through their curiosity by making connections, as they work through processes they are cementing the connections being made in the brain. Other papers including one written by Adams, et al (n.d) continue to discuss the importance of outdoor learning and its connection to brain development, stating that outdoor play increases the flow of blood to the brain which can increase mental focus, this in turn then leads to developing pathways to learning and brain development.

The outdoors provides children with the opportunity to engage in risky play. Risky play according to (Boston University 2020) enables children to become engaged in their own science experiment discovering their limits and developing skills to enable them to assess situations. Froebel supported

the idea of children engaging in risky play. He suggested that the emphasis should not be on the risks posed but instead focus on the challenge and the benefits it may lead to, such as children being more equipped to deal with risk through their own experiences (Tovey, n.d). Risky play is something that practitioners find difficult to engage with. In their article for Nursery World 2017 Bruce and Dyke acknowledged the challenges this form of learning can pose and how it is a journey many are still on to find a balance. Marchant, E. et al. (2019) found in their study that teachers initial worry regarding outdoor risky play was reduced with the embedding of clear boundaries and rules which they felt would lessen the chance of injury. This study was conducted with older primary children which might imply that if these boundaries are set from a young age, children would be more aware of risks and how to identify and navigate them.

Other studies have found barriers to outdoor learning may include the pressures put on staff with regards to how success and achievement is measured. The way we measure success and facts as oppose to the understanding and skills gained may deter practitioners from fully engaging with outdoor learning preventing the child from gaining a holistic experience Waite (n.d). Whilst still stating the negative impact of measuring children as a barrier to the outdoor environment Waite (2010) also acknowledges that there may still be other areas to navigate in the promotion of outdoor learning. The attitudes of practitioners and their confidences whilst delivering sessions in the outdoors still may prove to be negative experiences for children. This is something the paper stated could be over come through professional development that provides the practitioner with experiential training. Oberle, E. et al. (2021) support Waite's statement that teacher's attitudes and characteristics influenced how they engaged with outdoor learning but also noted that teachers who felt they had a good support system from their head teachers, appropriate training to improve their abilities and a supportive school community that were open to new learning initiatives implemented outdoor learning on a more regular basis.

Montessori also supported the idea of the outdoor environments being extensions of the classroom seeing them as environments where children could build on their learning through nature and using their senses. These experiences she believed would help to support and build the whole child as well as nurture scientific discovery Montessori Community School 2021. Montessori believed that children should take part in real life activities with the correct tools to complete activities such as cooking or gardening through encouraging them to explore concepts they become active learners within their environment WJEC (2019). Through the outdoors children can have hands on practical experiences of learning about nature and science through natural exploration. Being able to learn about the seasons, weather and other aspects of the natural world whilst actually in it as oppose to looking at pictures in books or online. Learning can be brought to life for children when taken outdoors to experience situations first hand Cole (2021). Through the implementation of the new Non-Maintained

Curriculum for Wales practitioners are being encouraged to implement this way of thinking by giving children real life authentic experiences when learning. It is hoped through these authentic experience's children can develop knowledge of the world around them and discover their environment Welsh Gov (n.d). Outdoor environments also provide children with the opportunity to engage in sensory activities that may not be available in the indoor classrooms. Prince (2018) talks of cognitive development, values and behaviour all being enhanced through sensory activities outdoors. Through using local areas or grounds it was hoped areas such as maths, science and literacy could be addressed using sensory activities. Hanscom (2016) believes that the lack of development of these sensory skills is leaving children underprepared to deal with social situations, academics and daily life, by encouraging children to be in the outdoors they are using all of their senses, taking risks, regulating emotions and over coming fears. It is also noted by Hanscom that we need to give children the trust and space to explore these opportunities. Sensory play helps to build new connections within the brain, these new connections communicate with each other and relay information such as feelings or smell. The network is built upon by all of these sensory experiences with repeated encounters strengthening the connections Gascoyne, (2016).

Sensory outdoor experiences can be particularly important for children with additional learning needs. Children with sensitivities to exploring their senses are encouraged through the outdoors providing development without it feeling like a chore. This learning in an informal way could be essential for their development early years alliance (2018). Hussein, (2012) in a study found that for children with additional learning needs the physical layout of the outdoor environment was an important factor to accessing it but the aesthetic appearance was not, the crucial design factor was sensory value. Article 31 of the united nations right of the child act (1989) tells us that all children have the right to leisure, play and culture. Play is recognised as internationally through this document as being fundamental to the development of all children whether they present with additional learning needs or not.

Adults play a vital role in the facilitating of outdoor play. It is the practitioner's role to ensure that all children are able to be included and treated equally whilst exploring the outdoor space. For some groups of children this could present as a barrier to their learning. Scottish government (n.d) tells us planning maybe required to ensure that access to the outdoors is possible for all, working with families or outside agencies depending on the barrier whether it be financial, physical or cultural. Adults should be aware according to Rymanowicz, (2015) of the concept of supporting versus leading when children are at play, by adults leading or directing that play they are actively breaking one of the play principals as stated by the play work foundation (2016) that play should be freely chosen, personally directed and intrinsically motivated. Tonge, Jones and Okely, (2018) found in their study that children who directed their own learning more so in the outdoors experienced a higher-quality of interaction with adults at the setting, educators in this study believed that children feeling safe, secure

and supported promoted the learning. This could be supported by forest schools and their belief that Maslow's hierarchy of needs plays a role in children's outdoor experiences. Are they warm enough or cool enough as they will be out in all weather types, have they had food, do they feel safe and secure? If these basics have been met then forest school (n.d) believes learning can now take place. These basic needs are elements of how practitioners can support outdoor learning. As practitioners facilitating outdoor experiences a part of our role to provide quality learning is the need to enhance our areas. Bilton (2010) believed that we are always trying to improve what we do and reflecting to develop our outdoor areas. To be able to develop our areas to best suit our children's needs it is vital that we observe them when in the environment. Pacey (2016) tells us that observation is essential for understanding the needs of children we care for. These observations should be used to support the progress of the children and what they need from their learning environments.

What we provide children in the natural outdoor environment can influence what and how they learn. As oppose to playing with plastic toys loose parts provide children with the opportunity to be more creative and develop new skill sets according to the treasure box (2021). By providing children with loose parts they are being presented with open ended learning situations that they can explore and develop their curiosity, loose parts in the outdoors can increase the depth and quality of an experience that may not always be able to be achieved in the indoor environment Flannigan and Dietze (n.d). Loebach and Cox, (2020) supported this loose parts theory by stating that natural materials could offer more learning experiences in the outdoors. Nicholson who introduced the theory of loose parts believed it gave children the chance to be creative through play guided by themselves, whilst doing this cognition, social skills, creativity and emotional skills could all benefit. Gull et al., (2019) believed that a clearer definition and understanding of loose parts for practitioners and parents will enhance the use of them to develop a loose parts mindset within learning in the outdoors.

The outdoor environment consistently provides children with the opportunity to explore learning through maths and science. Within the non-maintained curriculum for wales these learning experiences now come under the title exploration. These maths and science learning opportunities fall under the STEM approach encompassing science, technology, engineering and maths that focuses on teaching them as one as opposed to four separate subjects hoping to better equip children for life and work situations in the real word Myhill, (2020). Campbell et al (2018) found in a study that STEM in the indoor classroom was limited to focused activities based on what was provided in the classroom and mainly of a maths and science focus but in the outdoors with resources such as loose parts children were developing a wider range of whole stem understanding. Hassan et al., (2019) research showed that STEM activities being introduced to early years children sooner could develop their interest and stop a lack of engagement when older, they found it has made a good start but needs

improvement as it can help younger learners explore, investigate and develop their own knowledge through curiosity.

In Wales we want our children to become ambitious capable learners, healthy confident individuals, ethically informed citizens and enterprising creative contributors. To do this we need to provide and support children to gain the necessary tools and skills to succeed however that may look for them as an individual learner. Whilst exploring the outdoor learning environments we have explored theorists and each of their beliefs, PACEY (2016) reminds us that it is important to acknowledge each and their contribution. They place high value on the holistic development of the child recognising that all areas of learning are interconnected. The new curriculum for Wales is providing children with hopefully more freedom to explore and learn on their own terms through safe spaces where learning is nurtured and supported.

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Imogen Jones
Student Number 2216692
Word Count 4011

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