Awe and wonder- science, mathematics and the outdoors.

Part 1

(Cheshire, 2015)

Part 2

The image above shows an area within a woodland whereby children have the opportunity to explore and develop their knowledge whilst in the outdoors. There are many opportunities within this outdoor environment that allow children to learn and develop their understanding of mathematical and scientific concepts whilst exploring both independently and alongside enabling adults.

The stream within the picture provides several opportunities for children to develop their mathematical and scientific concepts within the outdoors. Through children exploring and finding sticks they are able to then use the stream to develop scientifically through placing the sticks on the water and testing whether they sink or

float, following this the children are able to work with the practitioners to understand the reasonings of why objects sink and float. There are many other loose parts within the environment that the children are able to test the sinking and floating theory for example, leaves, and stones. Through understanding why certain objects sink and others float the children are developing their scientific concept on density. Enabling practitioners are able to extend the children's knowledge through explaining the meaning of density, sticks are far less dense in comparison to the density of water therefore the sticks are able to float. Children are able to extend their play by watching which sticks flow down the stream the fastest or the slowest. The exploration of sticks within the woodland can also support children mathematical development through collecting sticks and sorting them into longest and shortest this supports the understanding of measurements.
Within the proximity of the stream practitioners can provide the children with an array of pots and utensils that the children can explore within the stream. Through using the resources provided the children may decide to explore the mathematical concept of measurements. Children are able to measure the amount of water in each pot and develop this further by seeing how much is needed to fill the next pot. The children may also decide to

Within the woodland area children may decide to develop their vestibular sense through balancing on the stones to cross the stream. The vestibular sense is responsibly for balance, movement and gravity which helps ensure that we move smoothly. Children are able to develop this sense through doing, therefore balancing while crossing the stream, climbing on the rocks, or jumping on and off natural materials found within the area is building a child's vestibular sense.
Whilst using the steppingstones to cross the stream the children may also decide to count the stones needed to cross or perhaps working alongside the practitioners, they may be able to time how long it takes for them to cross the stream each of these activities support children's mathematical concepts within the outdoors.

Another activity the children may carry out is collecting the fallen leaves and exploring the different patterns on each. The leaves will be of different shape, texture, colour, and pattern dependent on the tree they have fallen off. The children may discuss which leaves they think would belong to each tree and may wonder how

they have fallen off. This then is an opportunity for the enabling adult to explain the four seasons of the year to the children and the fact that the seasons change throughout the year in corelation with the earth's orbit around the sun. The woodland area will look different at different times of the year dependent on the seasons; therefore, the children may be able to visit at different times of the year to see what has changed and what is different within the area. Including pencils or crayons and paper within the environment will also extend this activity as the children will be able to trace the leaves and look further at the patterns created.

Another activity the children may decide to take part in is the exploration of life cycles. Within the area there will be opportunities to see all different wildlife and a chance to see different animals' habitats. There may be rabbit holes at the bottom of the trees or under the leaves, hedgehogs, and several kinds of insects and birds to be seen in the area. The children are able to look under leaves and stones to see what creatures they are able to find and discuss the type of habitat it is. For example, they may find woodlice, worms, earwigs and spiders when looking under a stone. They then may be interested in understanding the life cycle of these insects such as which insects begin as an egg, become larva, then become adults as the insects we have found. We are then able to develop this activity further by offering the children magnifying glasses or bug pots in order to gain a closer look and see how many legs the creatures may have, their colours or patterns. Whilst in the woodland the children may also see and hear different birds. They may be able to hear the different bird songs from an array of species and also see the nests that have been made within the trees and branches above and whether the nests hold eggs. By giving the children binoculars they will be able to gain a clearer view and try and identify what birds they are able to see. This activity supports children's scientific development as they are learning about life cycles and nature through biology.

Within the area shown in part 1 there is lots of moss to be seen. This may draw the children in and open up many questions of what it is? Why is it there? This opens up opportunities for an enabling adult to explore the moss with the children and understand what exactly moss is. Exploration of moss supports children's understanding of scientific concepts as moss is a living thing- plant. The children are able to look through magnifying glasses in order to understand the structure of the

plant. What colour it is, how does it feel, what is it growing on and why aren't there any flowers may be questions asked during the discussion. Moss grows in damp, shady areas so that gives an understanding of the climate within the area.

This woodland area supports the guidance from the curriculum for funded non-maintained nursery settings by providing children with an enabling environment where they are able to explore and develop within the outdoors. The Welsh Government (2021) states that through providing children with an enabling outdoor environment they are able to gain an understanding and develop their mathematical concepts through doing and exploring. Children are able to carry out practical activities within a natural environment whereby they can learn patterns, life cycles, numeracy and much more within an authentic environment.

Part 4

One of the main roles for an adult when supporting and encouraging young children to engage with mathematical and scientific concepts within the outdoors is providing a stimulating outdoor environment. Through doing so practitioners are promoting children's curiosity, discovery and experimentation which are the skills that support mathematical and scientific thinking. Dancer (no date) states that a practitioner's role is to identify an effective area that children are able to use resources around them in order to naturally develop their knowledge and understanding of mathematical and scientific concepts. For example, she states that the area practitioners have sourced may provide children with the opportunity to collect and sort natural materials, carryout measuring activities or hunt mini beasts in order for them to develop their mathematical and scientific concepts naturally away from the classroom environment. Welsh Government (2009) states that an effective outdoor area that children are exploring will be ever changing. Therefore, children's experiences within the area will differ dependent of seasons, weather, and accessibility. Allowing children to visit outdoor environments during different times of the year will enable them to build upon their knowledge. Tebbs (2022) discusses that children being in the outdoor is beneficial regardless of the type of area that children have access too. She explains that practitioners are able to create effective enabling areas within the

school yard area and are able to add natural items within that enable children to explore and develop their knowledge within the fresh air.

Bates (2019) discusses both Forest schools and Reggio Emilia, similarly both approaches place an emphasis on providing children with stimulating environments in which children are able to learn and develop within a natural outdoor area. Bates states that a practitioner's role within both approaches is providing children with an effective outdoor area that gives them the opportunity to explore and gain understanding through doing activities freely that they would not have the opportunity to do within a classroom environment. Through exploring the outdoors children are naturally developing their mathematical and scientific knowledge without feeling pressured. The curriculum for funded non maintained nursery settings states that it is important that practitioners allow children the opportunity to carry out activities in different contexts in order to develop their thinking. They therefore state that a practitioner's role is providing children with the opportunity to explore mathematical concepts within the outside world using natural resources that offer children endless possibilities for their mathematical development.

Watts (2020) discusses the importance of children being able to carry out child led play and exploration within the outdoors without activities being adult led. Through practitioners providing safe natural environments children are able to build confidence in order to explore the world around them. Through open ended and self-directed play children begin to use their own ideas on understanding the world around them which benefits their development. Waters and Rekers (2019) state the importance of adults providing an effective outdoor environment that supports and benefits children's learning outcomes through being responsive to children's interests without taking control and allowing the exploration to remain child led. When working with children observation is part of a practitioner's role. Through practitioners observing children's interests they are able to add additional loose parts into the outdoor area in order to further develop children's exploration and understanding of maths and science White (no date). Practitioners observing within the outdoor environment will give them the understanding of children's developmental needs and therefore they are able to support the children to develop further. Practitioners are able to encourage and support children's mathematical and scientific development within the outdoors through implementing Bruner's scaffolding theory. Aubrey and Riley (2019) discuss Bruner's theory and state that practitioners

are able to support children by breaking down learning and providing tools in which children are able to build on their knowledge gradually. This is an effective way in which practitioners can support children within the outdoors as through including additional loose parts children are able to build confidence in their own learning. Bruner's theory states that along with children exploring and playing independently they also need support from adults in order to develop their knowledge further and become independent learners.

Ranheim (2020) states that Nicholson's term loose parts refer to objects that are open ended, and therefore inspire creativity and curiosity. She states that within a natural outdoor area such as a woodland, leaves, sticks, flowers, and stones can be found, and these materials are effective in supporting children learning and development. Through collecting natural loose parts children are often drawn to sorting, counting, and identifying shapes with the materials which supports children's mathematical development. Early impact learning (no date) agrees with Ranheim (2020) stating that loose parts are items that have no fixed purpose, the items offer the children countless opportunities for extending their learning. They state that the loose parts practitioners are able to add into an outdoor area in order to expand their mathematical and scientific concepts may include tubes, boxes, wheels and planks. Each of these offer children open ended play and encourage curiosity in which the items can be used in several ways in order to enhance their activity.

Ernst and Tornabene (2012) states that there are limitations and barriers to practitioners being able to provide children with stimulating outdoor environments that allow them to explore and develop within nature. Their research suggested that practitioners stated that access to a safe natural environment for young children to explore is difficult to source and there are often transport barriers. They state that practitioners should find ways in which they are able to overcome possible barriers as there is a wide range of benefits that exploration within the outdoors can have on young children. Sargent (2015) states that all settings outdoor areas will have limitations, it is important that practitioners overcome the limitations in order for children to benefit from gaining experience within the outdoors. Sargent (2015) explains that it is beneficial for young children to spend time learning outdoors and that practitioners should take advantage of the unique outdoor space that they have access to in order to enhance children's learning.

Bilton (2010) and Watkins (2021) both state that through research within settings practitioner's report weather conditions to be a barrier in outdoor play. They state that wet weather is a factor that stops practitioners wanting to enter the outdoor area which is then reflected on the children. In order to overcome this barrier practitioners and children should have waterproof clothing and footwear within the setting in order for them to be able to access the outdoor environment during wet days. Upon return to the classroom both practitioners should ensure that warm dry clothing is available in order for them to remain comfortable.

Bruce and Dyke (2017) discuss that often a limitation of outdoor exploration for young children is practitioner's perceptions on risks. They state that Froebel's theory encourages children to have opportunities for positive risk taking within the outdoor environment. Practitioners within settings are often reluctant in allowing children the opportunity to take risks while exploring an area although through doing so practitioners are affecting children's outdoor development. Froebel states that children exploring and taking risks within the outdoors has a positive effect on them in later life. Bilton and crook (2016) state that a practitioner's role within the outdoor environment is ensuring that children are not exposed to danger and hazard but are able to experience risk and challenge within the environment. Through providing children with an outdoor environment that offers opportunities to experience risk taking they are supporting children to become independent and self-sufficient. They state that practitioners are able to carry out risk assessments within an outdoor area and identify what they deem as appropriate risk-taking opportunities and what could be a hazard and harmful to young children. Along with Bilton and Crook (2016) Gill (2010) also states that young children need the opportunity to learn about risks for themselves therefore practitioners within settings need to be encouraging children to explore and allow their natural curiosity to flow whilst risk taking in the outdoors as they will then be benefiting holistically.

In conclusion practitioners providing children with an outdoor area in which they are able to explore, be curious and take risks can benefit children learning in all areas. Through allowing children to use their own initiative to explore they are producing open ended questions that in result practitioners are able to expand on children knowledge.

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