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Awe and wonder – science, mathematics, and the outdoors.

Section one.



Section two.

The play environment I have chosen is an outdoor construction and exploration area. This area is designed to promote development in areas such as, problem solving, teamwork, imagination, and physical development. Developments such as problem-solving link to mathematics as it allows a child to experience a process, they are not immediately faced with a solution and are able to explore and experiment to reach their desired outcome. Whereas physical development could link to scientific developments as children learn to control their body, learning about areas of the body and how they work and support movements in different ways. When looking at the environment it is clear that children are provided with holistic opportunities in play, children have an area that allows them to connect to the world around them and learn basic skills.

9.30 am - Child A ran towards the construction area 'Come on, come on' he shouted to his friends who were following closely behind. Child A and B headed straight towards the tyres. Child A picked up the small tyre, put it down and picked it up

again. 'Help me!' child A bellowed excitedly to Child B. Child B tried to pick up a larger tyre 'it's too heavy, help me!' Child A ran over and together they lifted the large tyre and rolled it across the construction area. The children implemented teamwork after realising that the weight of the tyres were different, and the larger tyre was in fact much heavier. The children were able to figure out what they needed to do in order to move the tyre without any adult intervention, in line with the curriculum (Welsh Government, 2022) children used the play environment to work collaboratively and solve problems. The children continued to collect the smaller tyres, laying them on their sides in a line. Child A sat on the tyres 'bouncy bouncy bouncy' he chanted as he bounced up and down, Child B sat behind and imitated. 'NEENAW NEENAW, here comes the fire truck' called out child A. Meanwhile child B jumped off the tyres and started counting them 'One, two, three, four, five, FIVE, there's five' 'Well done Child B, that's really great counting, there is five, what else could you count?' 'One, two, three, four, five, six, SIX trees' child B shouted as he counted the logs picking up the sixth log 'AHHH SPIDERS!!' he shouted, drawing attention to all the other children.

9. 45 am - A group of four children ran over to look at the spiders underneath the log. The children all crouched down low to get a closer look at the spiders and other minibeasts that were hiding under the log. 'Why do you think the bugs are under the log?' I questioned the group of children. 'To go to sleep' child C answered quickly. 'I think they do sleep under there, that's such good thinking Child C, they also like to hide there from birds and other things that may want to eat them. Birds love to eat bugs, but they are safe hiding under these logs.' As the children investigated the bugs underneath the logs, I was able to open up conversations to expand the children knowledge based on their interests. I took this opportunity to plan in the moment. 'Would anyone like a magnifying glass to get a closer look at the bugs?' I asked. Of course, all children were eager to participate with the new resources being offered. The children used the magnifying glasses as expected, getting closer to the mini beasts. 'I can see worms!' Child C shouted excitedly. I took the opportunity to join the children in play at this moment, to allow them the opportunity to ask questions. Child B spotted some eggs, 'look, white balls' he called out. 'Do you know what they are?' I asked the children. 'Spider eggs?' questioned Child A. I explained to the children that they were worm eggs and spider eggs looked a bit different to that, and offered to show them different type of eggs on the iPad when we go back inside. By joining the children in this moment, it allowed me to purposely expand and plan an indoor scientific about life cycles and the types of eggs mini beasts hatch from, this was all implemented by following the children's curiosity (Welsh Government, 2022).

10 am – Child A picked up a giant orange tube 'AAAAHHHHH' he shouted into it. Child A and B roared with laughter and child B held the other end and shouted back 'AAHHHH' Both children repeated this and continued to laugh at each other. Child B picked up a ball by his foot and put it through the tube, it stayed inside the tube as Child A was still holding the tub upwards. I resisted intervention at this moment and gave the children the opportunity to problem solve. 'It's gone' called out child B, 'I can see it' said child A with his eye up close to the end of the tube, he then dropped

the tube and watched the ball roll to the floor, Child A did not pick the tube back up, this time he ran around to the same side as child B and put the ball inside and watched it roll out the other end. The children were able to figure out that the tube needed to be at an angle for the ball to fall out the other end. Child A ran to pick up a piece of bark and tried to put it through the tube, 'it doesn't fit' the child said as he attempted to push the bark into the tube. 'It is too big' child B replied picking up the ball again to roll it into the tube. The children worked together to problem solve and create a game that was enjoyable to them but also meets criteria linking to science in the outdoors. Children in this environment have been able to experience size, and shape, numbers and counting by leading their own play and through their own experiences. I was able to guide and facilitate the play, leaving the children in full control. In my experience of play in this area children have shown great interest in forces and gravity, such as, things that roll. There are many items provided that roll when pushed, furthermore resources can be added by adults to encourage rolling in different ways, these resources can include ping pong balls and tennis balls. By adding these resources this area can be linked to mathematical development, introducing size and weight. Children can explore what rolls the fastest and why that could be. The activities that the children create and explore by themselves can be enhanced to further develop their knowledge and understanding to link with mathematics and science. In an outdoor environment like this adults are able to follow a child's lead in play to implement mathematical and scientific activities and developments, as there are enough resources in the free play area that link to these subjects. When children use the resources provided in the picture, they naturally learn about things such as, length, weight, height, gravity, and forces. When adults stand back and watch play unfold, they are able to observe, support and guide the children's play to further their learning.

RISK BENEFIT ASSESSMENT

Location / Activity:	Outdoor Construction area	Date:	27/09/23
Assessor:	Keire McAlinden	Review date:	

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
Stacking and building with Milk crates.	Children are able to use their imaginations to build something with the materials provided, this can be anything they imagine. While participating in this activity children are able to figure out balance, and what ways the crates stack and fit together best. Children can benefit from incorporating imagination and creativity into this activity.	Some children may stand on the milk crates, and climb them, creating a falling hazards. Some children may stack the crates too high causing them to topple over. Crates could split or become damaged.	Children could be at risk.	• This activity would be observed by a practitioner at all times, ensuring the crates that are stacked high are secure, as they may be slightly out of children's reach. • Practitioners will monitor any climbing that may occur, and risk assess the safety in the moment. • All crates will be checked over for any damage, cracks, and splits before and after use.	Medium

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
Rolling items down the tubes/ testing gravity	Children are able to learn about what rolls and what doesn't roll. How and why, it rolls downwards and not upwards. Implementing gravity, forces into their outdoor environment. Children experience problem solving and teamwork.	The tubes are heavy and all different sizes, children may struggle to lift and balance with the tubes. Children may struggle with spatial awareness and bump into other children while manoeuvring the tubes.	Children could be at risk.	- Children would need a helping hand with any tubes they would like to move, staff can help. - Children could be encouraged to work as a team when adjusting their environment.	Low

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
Log jumping.	Children are able to jump from one log end to another, engaging in physical play, in the process learning about balance, gravity, distance and height. Children will also benefit in their self-confidence and wellbeing.	Children could fall while jumping from log to log. Children may carry the logs and drop them, risking dropping them on their own feet or the people around them.	Children could be at risk.	- The risk is very low as the log ends are small, but risk can be reduced through ensuring children only jump off one log and do not stack them up and jump off multiple ones at a height. - Safety checks of the area to be carried out by staff daily, minimising risks of injury.	Low

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
Mini beast hunting.	Children are able to learn about the environments that mini beast live in, get a closer look at what they find, and learn about life cycles. Children are also able to develop an understanding of how to love and care for our planet and having a closer look into the life and homes of different mini beasts. Children can benefit from a natural engagement with the environment.	Children may be tempted to touch the bugs without knowing what they are. Without understanding the minibeasts children could get stung or bitten.	Children could be at risk and could also squash mini beasts .	- Children should be educated on the importance of not picking up mini beasts without an adult present and encourage to just look at them through the magnifying glass. - Children should also be told about the importance of not standing on bugs or squashing them.	Medium

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
Tipping and pouring activity using drainpipes.	Children are able to learn about forces and the flow of water, children can rearrange the pipes to different heights, learning about speed, is the water flow faster from higher up or lower down. Children can experience problem solving, placing pipes at different angles, and seeing what direction the water flows best.	Mud can get slippery when wet.	The children and adults present.	- Children can wear wellies and wetsuits outside during this activity by wearing suitable footwear and clothing this will reduce any risk of slipping. - Practitioners can observe and risk assess any excessive water spillages in the moment and adapt the activity accordingly. For example, moving the tubes to a dry area to repeat the process.	Low

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
What can children roll.	Children can use the outdoor area to discover what can roll in the environment. Children will learn about weight, height, and size. This activity encourages children to problem solve, can they roll the objects alone or do they need to work as a team.	Children may struggle with heavy object, causing them to drop them or strain picking up big tyres or pipes.	Children may be at risk.	- Children can be encouraged to work together. - Staff can monitor and observe children at all times, ensuring they do not cause injury through lifting large objects or dropping them.	Low

Section four

According to Parry (2023) when adults are supporting outdoor mathematics and science it is important to encourage children to engage in the world around them whatever the weather. When children are able to experience a wet and windy day, they experience moments such as, how the leaves feel under their feet or the different texture when they touch them. Children learn through real life experiences and the more authentic these activities are the greater the learning opportunities (Parry, 2023, and Parenta, 2014). Wilson (2018) highlights that the role of the adult is to share the space with children, adults can often believe that children learn from being told about the world, in contrast to this, children construct meaning to their surroundings through the physicality of play (Wilson, 2018 and Tovey, 2012). Cole and Vygotsky (1978) and Mark (2013) used Vygotsky's theory to emphasises the importance of a more knowledgeable other, encouraging adults to 'scaffold learning' and see what children are capable of with help they are provided with, moreover, Piaget believed that children think in incredible ways which are different to how adults think and see the world and learn best through their own curiosity. Piaget highlights that children use schemas to help them connect with the surrounding world, in order to support this early development adults should encourage and allow space to explore (Mark, 2013 and Mooney, 2020). Mooney (2020) states that when adults are able to combine these theories children are able to develop holistically and through social interaction. According to Waite (2011) outdoor mathematics, science, and curiosity is beneficial to children in the outdoors as particular environments are able to supply a range of learning opportunities that children may not experience indoors. Moreover, Parry (2011) highlights that it is vital to remember when practitioners support mathematics and science in the outdoors, practitioners do not simply bring indoor activities outside. Richardson (2013) backs this up by highlighting the importance of children needing an enabling outdoor environment. Practitioners are able to support this by facilitating opportunities to engage in activities such as, freedom and space, multisensory experiences, dynamic experiences and connecting with nature. According to Penn state extension (2023) adults who work in these environments need to find connections with the children and nature as a whole. Tovey (2012) researched Froebel's theory, which includes providing a flexible environment responsive to the needs of a child, including materials bought and natural. According to Creative star (2023) Nicholson's loose parts theory valued a holistic environment. Nicholson believed that the most important and interesting loose parts the ones which surround children in everyday life. Children are able to make connections with natural resources such as, rocks, mud, grass, sticks, mini beasts, and sand. According to Spencer, et al (2019) when children are provided with high quality experiences in the outdoors amongst loose parts, it can enhance their development on a whole. Children are more likely to risk take and create their own experiences, this can be done through teamwork or as individuals. Early impact (2023) believe the meaning of loose parts is so that the objects which practitioners provide have no fixed purpose, however loose parts play has incredible benefits such as, helping children find their independence. Early impact (2023) also states that loose parts play has been beneficial to children in the past for many years and is just as beneficial to children in the modern age. However,

children face many more challenges in the modern age which can impact the interest in loose parts, these barriers include, technology, less play space and the micromanagement of a child's time keeping. If practitioners are able to implement loose parts play into an environment it can counteract these barriers and keep children connected to reality and imaginative play (Early impact 2023 and Play outside NS 2020). Early impact (2020) also states that loose parts can support a child's mathematical and scientific development as children learn about, size, design, capacity, the property of the materials they use and sustainability. Tovey (2012) believes that these natural resources inspire children to question how and why things work in certain ways. Questions linked to mathematics and science may include, what is it? How does it feel? How many are there? Adults are also able to shape outdoor learning to link to mathematics and science by providing resources such as, buckets and spades or magnifying glasses, many other tools can be added that will allow children to investigate further and become curious learners (Tovey 2012, Penn state extension 2023 and Mazzoco et al 2021). Tovey (2012) explains further that Froebel believed materials alone were not enough and adults need to be engaged and observe the play in order to support learning. Through observations adults can gauge when it is appropriate to join play or ask open ended questions to support curiosity. In contrast to this Penn state extension (2023) believes it is just as important to allow children to make their own connection with nature, this allows children to bring meaning to their understanding of the environment. Many Mathematical and scientific outdoor adventures link to the current curriculum, for example Welsh government (2023) states that learners make sense of the world through experience. Evidence backed up by the Welsh government (2023) shows that when children make use of mathematics and science outside new theories and developments can be made. Children begin to question existing ideas and concepts, furthermore, challenge these existing concepts, Tovey (2020) agrees and further explains that children will naturally learn in these situations, allowing them to question the environment, sustainability, and things such as climate changes, immediately linking to mathematics and science. Waite (2011) states that although mathematics is seen as mental construction, it is also something that should be done, furthermore, experiencing physical objects can help children make sense of mental objects. Practitioners should encourage mathematical learning that goes beyond running around outdoors in the hope it meets the mathematical criteria and instead offer enriched environments with alternative pedagogies that follow current curriculums (Waite, 2019). Welsh Government (2022) and Mazzoco et al (2021) believe that all mathematical learning begins with critical and logical thinking. Mathematics in the outdoors can lead to problem solving, allow children to freely explore different approaches, develop arguments and justify any conclusion they may have come to find. According to Hamlin (2012) When implementing science into an outdoor area it is important to remember that children learn about the world that surrounds them through their senses. Children in a natural environment will observe and form connections to the objects around them, thus, gaining knowledge and understanding. Hamlin (2012) and Mazzoco (2021) believe that in order to support scientific outdoor learning practitioners need to be providing opportunities to problem solve and discover what may happen when certain objects are touched or moved.

Practitioners should ask open ended questions to further support understanding and concepts. Mazzoco (2021) expands further and states that when Practitioners support mathematics outdoors practitioners can expand learning by implementing these open-ended questions. Questions such as, 'Why do you think these sticks are different sizes?' These sort of questions inspire Children to investigate, question and explore further, enabling the child to gather a deeper understanding of the world around them, through their own guidance, thoughts, and curiosity (Mazzoco 2021). According to Hamlin (2012) some challenges educators may face could include, feeling reserved about implementing mathematics and science outdoors, this can be through lack of experience and even struggling to find ways to implement these subject into a completely foreign environment. Another challenge to promoting outdoor mathematics and science is managing the risk, in the outdoors there are generally more risks, such as loose parts, sticks, naturally climbing resources and heavy objects. However, risk taking is a learning opportunity and with regular risk benefit checks these risks can be monitored and managed (Ouvry 2003 and Gill 2016). Theorists such as Froebel focus on the benefits of the outdoor environment and the benefits outweigh the risk. These benefits are proven through reports that focused on improved developments across schools and the use of forest schools. Hayward (2018) states that forest schools have a unique relationship with science, in the ways that science in the forest naturally offers links to the curriculum. In contrast to this Hayward (2018) also states that forest schools should not be used as a place to solely deliver science lessons, instead a special environment to assist curious minds and positive attitudes towards learning. Similarly, to forest school research the Scandinavian reports prove that it is in a natural environment that is most beneficial and develop better motor skills through this type of learning (Ouvry 2003, Maynard 2007 and Gill 2016). Wood (2017) describes Scandinavia education as somewhere where it is not unusual for children to spend their school days outdoors ninety five percent of the time, Educators from other countries have visited Scandinavian schools to gain a better insight as to why these school were more successful and score higher across the board (Wood, 2017). Once other educators saw the benefits, they started to implement this style of learning into their own education systems. Some of the benefits noted include, more engaged learning, health boosts, better social skills, improved performance, and equality to lower income households. Research based on outdoor play was carried out by Bilton (2016) and findings indicated that in England the main use of outdoor play was to reflect indoor activities, whereas in Wales the main use of outdoor play was for physical development, however Wales supplied considerably more mathematical activities in the outdoor area than in England. In the development of outdoor play, Wales leads the UK, seeing outdoor learning as a vital part of learning (Welsh Assembly Government, 2009). Research carried out by Cremin (2015) suggests that motivation through play and curiosity that is supported by adults can give children the opportunities to find and solve scientific and mathematical problems. This allows children to become 'little scientists' this is a term used by Maria Montessori who believed all children observe environments in a way that encourages them to make 'what if' discoveries. Adults who allow children to become stewards of the planet, create caring children, who treat living things with care and the enjoy and respect the forests and meadows.

Everyday children's interest's, preferences, and capabilities change more than adults realise. In everyday play adults must focus on the present moment, and not previous happenings. Allow children to become part of a practitioner's world, but more importantly practitioners need to step into their world (Cremin 2015). According to Play outside NS (2020) magic can happen when children are simply left to play in an environment. Play outside NS (2020) believe it encourages children to explore as individuals, children should have access to these opportunities to express themselves freely based on personal interests, ideas, and curiosity.

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