

Awe and Wonder Portfolio: science, mathematics, and the outdoors

Section 1



(Source: Bater, 2021)

Section 2

Feature 1

The trees, plants, and animal life.

The Science and Technology learning area of the Curriculum for Wales (2022) requests that children are given opportunities to learn that the world is full of living things which all depend on each other to survive. Progression 1 of this statement of learning states that children should develop the skill of recognising that plants and animals are living things that grow, moving on to progression 2 of exploring the relationships between living things, habitats and life cycles. To support this, practitioners could provide magnifying glasses to look closely at the plant life and search for insects. Books and printed pictures could be provided for children to try to match and identify the names of plants, leaves and insects. Camera's and computer tablets could be used by the children to take photographs of what they find, ensuring they learn about their responsibility to take care of the natural world. Providing baskets to collect sticks and natural loose parts to create and build small insect and animal shelters, supporting fine and gross motor development, and design technology problem solving skills, while also supporting the children's ability to work co-operatively and practice openings of sustained shared thinking. According to Twani (2021), first-hand experience of caring for the natural environment can provide children with appreciation for nature, ecology and a sense of responsibility for sustainability. This activity can be expanded with large loose parts such as tarpaulin sheets and rope to create large dens for the children to hide in, supporting cooperative sustained shared thinking, problem solving and the development of gross motor skills.

The Mathematics and Numeracy learning area of the Curriculum for Wales 2022 (2020) states that children learn to be able to recognise and explore pattern. To support this, children could be provided with clay circles or foil for leaf printing, or paper and crayons for leaf and bark rubbings. Mountain (2021) recommends Hapa Zome, which is an artistic activity of creating prints of leaves of flowers onto small pieces of material using hammers or pebbles to bash.

Feature 2

The stream.

The Science and Technology learning area of the Curriculum for Wales 2022 (2020) proposes that children are given the opportunity to learn about matter and the way it behaves and defines the universe and shapes lives. Progression 1 of this statement of learning requires children to be able to explore the properties of materials for a particular use, while progression 2 encourages the children to move on with being able to observe and describe how materials change when mixed. To support this area of learning, loose part objects such as spades, spoons, sticks, pots and buckets could be provided for the children next to the stream which could allow the children to dig in the surrounding soil and mud, add this to containers, investigate its properties, then find out what happens if they pour water in and mix the properties together. According to Rupiper (2016) mud play is a beneficial medium of learning for mathematical and scientific skills as it can provide opportunity for investigating, measuring, testing theory and comparison. Further activities using this mud could be to create mud pies and mud faces, and sculptures allowing for creative play and a multi-sensory experience. Jensen and Bullard (2012) states that mud is not only an open-ended resource with multiple holistic development skill building opportunities, also allowing children to develop an appreciation of the earth. Further discussions to support these progression statements could be what happens to the pebbles when they are wet? Paint brushes could be offered, and children encouraged to talk about the changes they see, comparing the dry to the wet. Dropping pebbles in the stream at different points and listening to the sounds made can offer further opportunities of experimentation and to discuss the reasons for different noises.

The Mathematics and Numeracy learning area of the Curriculum for Wales 2022 (2020) asks for children to be provided with opportunities to learn about measurement focusing on quantifying phenomena in the physical world. Progression 1 requires children to be able to use a variety of objects to measure and to make estimates and comparisons with measures. A range of different size containers could be provided next to the stream for the children to fill with the water, the adult can encourage mathematical language to be used such as 'heavier than', 'bigger than', etc,

as well as introducing the concepts of volume and capacity. A large bucket could be provided and the children encouraged to transport the water using smaller containers to fill the larger container, encouraging co-operative working and problem solving opportunities. Collecting pebbles and then identifying similarities, size difference and colour difference could all support the children in developing early geometry skills, as in accordance with the Curriculum for Wales 2022 (2020) which states that for Progression 1 children should be able to explore, compare and use general language of shapes through investigative play. Creative pebble sculptures could support this while also encouraging creation and imaginative skills.

Further discussions and ideas which could support metacognitive learning and sustained shared thinking could be to think about where the water has come from, and where is it going? Practitioners could support the children in taking turns to cross the wooden sleeper over the stream supporting the development of balance. Loose parts wooden planks and pallets could be provided with the opportunity for children to make further bridges to be able to travel over the water, providing problem solving thinking co-operation, partnership working and also supporting the design thinking and engineering learning outcome of the Curriculum for Wales 2022 (2020) which for Progression 1 children can choose materials for a particular use.

Feature 3

Sloping and uneven ground.

The Curriculum for Wales 2022 (2020) highlights that learning about and understanding about forces and energy enables children to learn how to predict what to expect from their surrounding environments and support their future ability to problem solve. Progression 2 statements require children to be able to make predictions as part of scientific explorations and to learn to communicate the effects forces can have on objects and themselves. The Curriculum for Wales 2022 (2020) also proposes that children are given the opportunity to be curious and to search for answers, with progression 1 skills of being able to explore the environment, make observations and communicate how things work, and moving on to

progression 2 asking questions and using experience to suggest methods of enquiry. Loose part objects of foil blankets, tarpaulin sheets, guttering and containers could be provided. The foil blanket and tarpaulin sheet could be placed next to each other, and the children encouraged to collect water from the stream and pour the water down the slopes, identifying on which one does the water travel faster and discussing why that might be. Guttering could also be provided with the children being able to pour water into, identifying what happens if the guttering is on the slope or on a flatter surface. Items for rolling down the banking could be provided, with the children thinking about why the items roll down the slope, are some items faster than others. Could the children also roll themselves down the slope or use loose part items of foil blankets or wooden trays/pallets to create sledges, supporting their vestibular sense.

Section 3

Risk Benefit Analysis

Location / Activity:	Woodland, Bryn	Date:	19 th September 2021
Assessor:	Alexis Bater	Review date:	1 st December 2021

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.

ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
				Area must be risk assessed before each visit with the children. First aid trained practitioner present and first aid kit and mobile phone always to hand. High practitioner to child ratio available to support when needed.	

Close contact with plants, trees and insects when exploring and collecting natural materials and making insect/animal shelters.	To learn about the plants and trees that are growing in the area, as well as any wildlife and insects living in the woodland, discussing the names and differences visible. To begin to gain an understanding of life cycles and natural habitats. To use objects found as mathematical resources. To identify colours, shapes, size. To practice fine and gross motor skills when collecting objects and making small and large shelters and dens. Begin to learn a sense of responsibility and an understanding of sustainable development.	Risk of minor scratches from plants. Risk of injury from low level branches. Risk of insect bites. Risk of allergy reactions from touching plants or insect bites. Risk of splinters from collecting sticks. Risk of children touching dangerous items such as mushrooms, litter, etc.	Children and practitioners.	All children to wear long trousers and long sleeves with suitable footwear to provide protection. Practitioners to risk assess area before children's visit to identify any hazards and remove or minimise if possible. Practitioners to be aware of all children's known allergies and medical needs beforehand. Practitioners to discuss with children the importance of looking out for hazards and to inform adults if they spot any through the guidance of 'Forest Rules', which will also promote the importance of not putting anything to their mouths and washing hands after the activity. Clean bottled water available for handwashing and antibacterial hand gel.	L
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ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
Exploring the woodland site.	To gain a sense of freedom, awe and wonder. To enjoy the opportunity of exploring and learning about nature. To cooperate and work in partnership with peers to problem solve, with new language and ideas for sustained shared thinking.	Risk of a missing child.	Children.	Regular headcounts made by practitioners. Buddy system in operation at all times. All children aware that if they see a child attempt to leave the area they will inform a practitioner immediately.	L

ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
Walking on sloping and uneven ground.	To notice the variety of the land in the natural woodland environment. To practice gross motor skills, improving vestibular and proprioceptive senses. To become aware of their own bodies and abilities. To support their peers in discussing the environment and being safe.	Risk of trip or fall causing injury. Risk of injury from low level branches.	Children and practitioners.	Long trousers and long sleeved tops with suitable footwear with grips to always be worn. Discussions prior to visit about looking ahead and below at all times and hazards to watch out for such as tree roots and slippery leaves.	L

ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
Sliding down slopes.	To begin to gain an understanding of forces and energy and make predictions. To support own vestibular and proprioceptive senses. To enjoy the sensation of movement.	Risk of injury from collisions with objects or peers.	Children.	Long trousers and long-sleeved tops with suitable footwear with grips to always be worn. Wet weather suits recommended. Practitioners to assess the slope area and remove any identifiable hazards. Discussions with children prior to activity to explain the importance of taking turns and keeping each other safe. Practitioners to ensure children do not roll or slide into the stream.	M

ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
Close contact with the stream.	To learn about the nature of streams in the woodland area and where the water is travelling to. To begin to gain an understanding of what effect water can have on its surroundings. To begin to gain an understanding of volume. To practice pouring skills. To begin to make predictions and use scientific and mathematical language.	Risk of falling in water. Risk of drowning.	Children.	No children to be allowed in or around the water without an adult close by. No visit to the area if there has been a large amount of rain causing the stream to rise or flow quickly. All children to wear wet weather clothing, long trousers and long sleeves and wellington boots. Discussions before the visit with regards to 'Forest Rules' around the stream and responsibility of looking after each other.	L

ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
Creating and walking along bridges.	To problem solve, design and make bridges using loose parts. To cooperate and work together. To practice gross motor skills when lifting and moving the parts, to practice balancing when walking across, supporting vestibular and proprioceptive senses.	Injury from dropping the planks, logs and other loose parts. Injury from wood splinters.	Children and practitioners.	Practitioner support available when needed during lifting, moving, building and balancing.	L

ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
Hapa Zome art.	To identify the various plant life growing in the woodland area. To appreciate the colours of nature. To practice fine and gross motor skills during the action of banging pebbles on to the plants and material. To gain an understanding of what happens to materials through specific actions and to begin to make predictions. To create artwork to take home.	Injury from using the pebbles as hammer tools.	Children and practitioners.	Discussions beforehand regarding the safety of using tools. Practice using a similar activity at the setting before visiting the woodland area.	L

ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
Mud play.	To gain an opportunity for experimenting and investigating. To begin to recognise early chemistry concepts through mixing. To practice motor skills through the use of tools and hands. To make creative sculptures.	Risk of infection from bacteria in the mud. Risk of mud getting into mouth or eyes.	Children and practitioners.	Clean bottled water available for washing hands, and for washing face/eyes if needed and antibacterial gel for hands after activity. Practitioners to be aware if children have any cuts and for children to understand that if they do scratch or cut themselves, they need to inform a practitioner.	L

ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
Outside in all weathers.	Gaining an understanding of the weather and seasons and what changes occur to the land.	Injury from slipping on wet ground. Risk of injury from loose debris and swaying branches in high winds. Risk of dangerous water levels during or after heavy rain.	Children and practitioners.	Risk assessment to be carried out prior to visit, no visit to be made in high winds or heavy rain. All children to wear weather appropriate clothing and suitable footwear.	L

Section 4

The Curriculum for Wales 2022 (Welsh Government, 2021) proposes that children need to be encouraged to expand upon their sense of curiosity and search for answers to their questions. Wilson (2012) suggests that the natural outdoor environment is perfect for fostering a natural desire for

children's inquiry, curiosity and wonder through authentic nature play and this is beneficial for all areas of development. White (2011) states that the outdoor environment offers a sense of freedom, climate, whole body sensory experiences that the indoor environment simply cannot, and this means that children can behave, engage, and interact with the environment differently too. Waite and Pratt (cited in Waite, 2011) supports this, explaining that the outdoors promotes experiential learning, in particular practical science, through embodiment, enjoyment, and engagement. According to Tovey (2020) Froebel believed that the garden and playing outdoors was central to a child's learning, allowing for prospects of gaining an understanding of and appreciation for nature and life, as well as a sense of freedom, adventure, and rich sensory experiences. Froebel (1967, cited in Tovey 2020) stated that children should be able to experience nature first-hand and discover its variety naturally. Furthermore, Thomas and Harding (cited in White, 2011) suggests that play in the natural outdoor environment enhances different opportunities for meeting the play needs of children, developing holistically. Similarly, Isaacs (1929) discussed that children have an innate desire of adventure, and the need to practice certain skills such as running, climbing, and digging to gain knowledge and skill to make sense of the world and their place within it.

According to Robertson (2017), gaining mathematical understanding for young children is not just a cognitive process, being in the outdoors provides opportunities for the hands, heart and head to experience, making learning maths a social, emotional and physical process also. Pestalozzi (cited in Grigg, 2016) promoted learning from life and nature and activities such as counting pebbles. MacBlain (2018) adds that Pestalozzi suggested that children should be free to learn independently through following their own interests. According to Aubrey and Riley (2019), Piaget advocated the significance of child-led play, and ascertained children learn through their opportunities to interact with their surrounding environment through intrinsic schemas allowing them to practice skills and reach a sense of equilibrium once a skill is mastered. Thomas and Harding (cited in White, 2011) states that Piaget explained that through play and the practice of these skills were 'thoughts in action' and this is how children learn about the world. Furthermore, Brierly and Nutbrown (2017) declared that children are naturally inquisitive and have an intrinsic desire to explore and investigate, and schematic actions support the ability to find out and problem solve.

The provision of open-ended materials are important in the Froebelian outdoor environment, reveals Tovey (2020), delivering children with opportunities of discovery, imagination and problem solving. According to Wilson (2012) loose part items that can be used in numerous ways

that provoke investigation, dramatic play, creative and constructive skills should be provided. Rahardjo (2019) supports, stating that loose parts play promotes inventiveness, problem solving and imagination, all skills which support science, technology and mathematical learning as well as interaction with their peers. Nicholson (1971) declared that the opportunity to experiment with variable loose parts as children are essential for building creativity and cognitive skills and that often purpose-built play areas are actually restricting the children's curiosity and intrigue. Moser and Martinsen (2010) however declares that while open ended natural materials are beneficial for play and learning, traditional toys and activities do also have their place in supporting children's development.

The Curriculum for Wales 2022 (Welsh Government, 2021) advocates that learning and development is individual to each child. According to Waters (2019) it is the role of the practitioner to positively respond to children's interests and play, and support learning through communication to enhance the learning and engagement. Fisher (2016) supports this, stating that practitioners have a responsibility to role model creativity and cognitive thinking, and can encourage children's thinking and learning through language and the process of metacognition. Wilson (2012) highlights that open ended questioning from practitioners can strengthen and deepen children's thinking and understanding. Isaacs (cited in Solly, 2015) declared that children were natural discoverers, reasoners and thinkers and promoted the importance of the adult carefully observing children in their play and offering questions to enhance these skills. Practitioners need to be facilitators of play in the outdoor environment, respecting children's individuality and interests and McGraw (cited in White, 2011) suggests that observation is the most important practitioner tool for this but adds that it only becomes valuable when analysed and followed on through the facilitation of provision, extension and role modelling. Wilson (2012) supports this, stating that practitioners need to act as enablers of play, encouraging imaginative and cognitive learning. Vygotsky (1978, cited in Tucker, 2005) laid emphasis on the importance of social interaction with a more knowledgeable other to assist a child's learning and understanding, therefore while child led play is important, influence from others is also important. Siraj-Blatchford et al. (2002, cited in Fisher, 2016) implied that practitioners modelling language through social interaction can support a child's learning as through imitation.

First-hand experience of differing weather and seasons are important in accordance with Froebel's teachings Tovey (2020) reveals, however, according to McGraw (cited in White, 2011), the practitioner's mindset is central and often a negative viewpoint to going outdoors in bad weather

for example can become a barrier for children's opportunities for learning. Bilton (2010) asserts that early years practitioners do not have the right to prevent children from accessing the outdoors and the valuable learning experience it offers. According to Waite and Pratt (cited in Waite, 2011), it is possible sometimes for practitioners and teachers to be less positive about learning outdoors as there may be less possibility for planning and control of what learning takes place, however Bilton (2010) proposes that is the greatest benefit of the outdoor environment, stating that the experience should be unstructured, and children should be able to lead in modifying and controlling the environment. Wilson (2012) states that child led imaginative play in the outdoors, where they are able to pretend that one thing can represent many things is an important skill that is needed for future academic achievements. Gibson (1986, cited in Falcini, 2014) refers to this as play affordance, the link between imaginative perception and action. Bottrill (2018) states that children see the world with a sense of wonder, discovery and joy and they have a desire to connect with the world through touch, therefore the outdoor environment and the imagination sparks a connection to learn about the world. Research carried out by Bilton and Waters (2016) found that Welsh practitioners were more likely do think of the outdoor environment for supporting holistic learning particularly for literacy and numeracy, and that English practitioners were more likely to view outdoor provision for supporting physical, emotional and social development, likely to be because of the promotion of the outdoors in the Foundation Phase curriculum.

According to Weinstein (2018), the outdoor environment supports children's sensory development naturally, just walking on the uneven ground of a woodland can meet a child's vestibular input need and this will then support a calming effect on the body. White (cited in Weinstein, 2018) states that nature provides the tools to support a child's sensory foundational system (tactile, vestibular and proprioception skills) which are essential for holistic development. Weinstein (2021) reports that providing opportunities for physical activity and movement, particularly post the Covid-19 pandemic, is essential as it has been identified that some children (particularly in inner cities) are struggling with balance and proprioception due to not having the chance to practice their gross motor skills during the lockdown. Manners (2021) states that balancing activities are vital to support the vestibular system continually as it essential for laying the foundations for the development of other senses. Greenland (2021) stresses that children need plenty of movement opportunities to build their core body senses of touch, proprioception, vestibular sense and interoception, to be able to self-regulate and gain body ability confidence. Furthermore, Thomas and Harding (cited in White, 2011) suggests that

the outdoors allows for a whole-body sensory experience, which not only supports physical development but can support the learning of scientific concepts.

McMillan (1930, cited in Solly, 2015) specified that the outdoor environment for children should offer the opportunity for children to play adventurously and become brave whilst taking risks. The Curriculum for Wales 2022 (Welsh Government, 2021) proposes that all children in Wales will be supported to become ambitious, capable learners and healthy, confident individuals, and recognises that challenge and measured risk are essential skills to learn. Hall *et al* (2010) discussed that the Reggio Emilia Experience puts focus upon providing an environment that stimulates and challenges with the promotion of experiencing and exploring their surroundings. Similarly, the Forest School curricula in Denmark views risk and challenge as vital life lessons and it is the role of the adult to support this (Williams-Sieghedsen, 2011). Waters (2019) proposes that if practitioners are risk averse or do not encourage challenge, children may become daunted by the prospect and therefore may not reach their full potential. According to Wilson (2012) children who are prevented by safety conscious adults from activities outdoors such as rolling down hills or digging dirt are being denied the opportunity to learn meaning and concepts holistically. Gill (2010) supports this, emphasizing that adult anxiety of risk can negatively impact upon children's development of resilience, subsequently having an adverse effect on self esteem and mental health in later life. Solly (2015) however notes that practitioners must recognise that each child is unique and observation to identify skills and fears are essential so that children are supported appropriately, practitioner planning in conjunction with child led learning will best support holistic development. The role of the practitioner, according to Fisher (2016) is to scaffold, affirm and consolidate the children's learning and that quality interactions supporting child-initiated play and learning is key.

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