

Awe and wonder science, mathematics and the outdoors.



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Google images: Accessed on 19th September 2021.



Feature 1- Lifecycle of a butterfly/Animal life. This feature would develop science and encourage mathematics as children can learn about the lifecycle of a butterfly from their natural habitat- the outdoors, this will promote plant and animal life. There would be a vast amount of curiosity and discovery through science exploring in the outdoors. It would give the children opportunity to explore themselves in the woodland without adult intervention. The activity would be child-led mostly with limited adult intervention. Ensuring boundaries are giving before-hand of how far to go etc. I would provide the children with binoculars/ magnifying glasses and a net so they could try and catch a butterfly and look at it in closer detail. We could talk about the lifecycle and introduce new vocabulary to extend their language.e.g. chrysalis, cocoon, symmetry. I would go through the stages of the lifecycle and put them in order First, next, then and finally promoting and developing mathematics. The children could use the net and have a closer look at the butterflies. What their bodies are like? They have the same pattern on both sides of their wings. Ask do the children know what this means? Explain what symmetrical means? Let the children draw a butterfly and do their own symmetrical patterns. This would be an interesting activity to do when in a natural environment especially with the natural light- would provide shadows and a shady area for drawing. We could have caterpillars in the caterpillar house and the children could watch the lifecycle happen first-hand and see the changes every day and the caterpillar change into a butterfly. They could then release the butterfly back into its natural habitat. I could give a range of different materials and resources for the children to create their own net to catch a butterfly.

The Welsh Government 2015 highlights the importance of science through investigation in the outdoor and indoor environment. They will have encouraging opportunities to help them promote their curiosity and discovery in the world around them by using their five senses and an understanding about places, habitats and living things and care and concern for living things.

Feature 2- I think the stream would be a good idea to investigate floating and sinking and many more other concepts. I think the children could chose different length sticks and in turn to have a race in the water and see what happens or even predict whether they think beforehand their stick will sink/float. I would provide a timer for the children so they could time how far their stick travels through the water. I would provide loose parts such as cones also, the children could use

these to place the starting and end point of where they will start and finish with their sticks. Do they come across any obstacles in the water? E.g. stones to stop the stick travelling on through the water. Does the stick float or sink? Why do they think this? What do they think would happen if we used something heavier? They could experiment and try something heavier and or experiment with all sorts of different materials and discuss if something is lighter it floats if its heavier it sinks. What about if something has holes what do they think will happen and why? These are the sort of questions I would ask the children. Lots of discussion throughout about the different natural materials and the measurement of time and floating and sinking. As the stones are there the sticks cannot pass through but maybe the current will change the direction of the stick or I could ask the children What they think they could do for it to travel further .e.g. make a clear pathway, move stones to let the current push the stick through the water more freely. If we can not move the stones, what else could we do to let the sticks pass? The children after the activity could put the sticks in order of height- smallest to tallest. Provide rulers for them to measure how long they are.

Feature 3- I think this would be great to get the children to do a nature hunt. There is plenty of materials to explore different measurements of size, colour and lots of contrast. Also lots of different log beams for balancing and coordination. The area is full of nature and beautiful natural materials for the children to explore different gradients, patterns and texture. I would provide the children with some resources .e.g. boxes, clipboards, paper, pencils, nets and magnifying glasses. They could take their boxes around the area and put any of their findings in the box. Rather than giving them a worksheet of what to look for they can use the resources and explore independently, they can choose what they want to help them explore. They would be able to search in the water hunting for mini beasts and take a closer look of their findings with the magnifying glasses. Why do they think this mini beast belongs in the water? Lots of discussion about all the natural materials in the woodland they find and how they feel. E.g. rough, smooth and spikey. Also, with the mini beasts they find- What do they think it is? They could research on How many legs does it have? How many spots? They can record their findings on a piece of paper by drawing or writing the name of what they find and doing a tally chart of

how many of each material they got, and which was most popular. Discussion of the change in seasons which explains the reason behind the change in colour of leaves and the greenery around. They could also sort their objects in hoops afterwards- shiny objects, rough objects, spikey objects. There would be plenty of opportunity for exploration, curiosity and discovery within the nature surroundings and a vast amount of new vocabulary to extend their language.

The 2015 Donaldson successful futures new curriculum highlights the importance of science in a child's early years by stating:

Science involves acquiring knowledge through observation and experimentation, and technology applies scientific knowledge in practical ways. This area of learning and experience capitalizes on children and young people's curiosity about natural, physical world and universe through investigating, understanding, and explaining. They learn to generate and test ideas, gather evidence, make observations, carry out practical investigations, and communicate with others.

(Donaldson 2015).

RISK BENEFIT ASSESSMENT

Location / Activity:	Outside Woodland Area with free-flowing stream	Date:	21.09.2021
Assessor:	Sarah Pugh	Review date:	17.12.2021

The boxes 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
Walking on uneven ground	Becoming aware of their bodies and balancing and the space around them with the different gradients and patterns. (Spatial awareness). Upper body strength	Children may fall, slip causing them to have cuts, bruises, or another injury maybe head. (Concussion)	Children and adults	Explain to the children about the uneven surfaces and that they will have to walk carefully. Show them how to do it and how not to.	M

Exploring in the water	• Becoming aware of the free- flowing current in the stream. • They will have an awareness of capacity. • Time • Length • measurements • Become aware of their own bodies and spatial awareness. • Increased new vocabulary • Ordinal numbers.	Children may slip in the water. They may have a head injury. Cuts, scrapes, bumps or even concussion.	Children and adults	Ensuring the children have suitable waterproof gear. Explain that they'll need to walk carefully in the water, no running in case they slip. Explain about the algae and moss which can make walking in the water more slippery. Making sure the water is not deep just enough for them to be able to walk through.	M
Exploring the surroundings	• Children will be able to learn about living things in their natural habitat • Learn about different living things	• May touch thorns on bushes • Injury from low branches- head	Children and adults	Explain to the children about the boundaries and how far they can go. Place cones to how far they can go so they can see visually. Also, that they may come across new things and make them aware of the things not to collect and what they can collect. No putting hands in mouths etc. Provide gloves	M

	• Explore lifecycles- Learning new vocabulary to improve their language skills • Looking after a living thing- learning the importance and being kind to living things. • What they need? Light? • Fine motor skills- Picking up objects • Gross motor skills- jumping, bending. • Scientific skills through binoculars and magnifying glasses- see things closer and more detail	• Allergic reactions- bee stings, bites. • Children may get lost. • Poisonous plants. • Collect rubbish		like we would wear if litter picking may be less likely to put their hands in their mouths, then. Fluorescent jackets for children so they can be easily seen the woodland.	
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Outdoor weather conditions.	• An awareness of the weather. Discuss different weather and temperatures- such as: cold, hot, freezing. • Discussion about suitable and appropriate clothing in the different weather. • Exploration of what happens when water is frozen. (Science experiment). • Discussion of the change of seasons.	• Sun exposure can cause sun stroke, sun burn. • With it raining- it can cause the children to become wet and irritable. Can cause the surroundings to become slippery especially with algae and moss. • Icy conditions- slippery, icy, icicles.	Children and adults	Keep up to date with the weather and check regularly. Providing appropriate weather gear for the correct weather. Hats and sun cream when warm and sunny. Waterproofs and wellies if wet. Wear gloves.	M
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		Strong winds- will cause trees and branches to fall down, this could impact head injuries or other injuries.			
Exploring in the mud	- Children will identify the different textures through sensory play through touching, seeing. - They will identify when water is added to mud it sticks together.	- Children could be touching the mud and there is broken glass which would lead to cuts. - There could be dog or cat mess in it.	Children and adults	Explore the area, explain to the children what they may need to look out for. What they can and cannot touch.	M

Exploring through stones and logs	- Children will develop gross motor skills through jumping from stone to stone. - Balancing on a log beam and becoming aware of spatial awareness. - Hand eye coordination through balancing	- Grounds may be uneven which could cause uneven balance and children to fall- cuts, head injury, other injuries. - Surfaces could become slippery which could lead to an injury.	Children and adults	Play a game- Speckled frogs to encourage children what to do safely and slowly. Explain that they need to walk carefully to get to what they are doing.	M
Collecting materials	- Collect natural materials. - Explore through number by counting, ordering. - Fine motor skills- through grasping the materials	Children could be collecting sticks or twigs which could lead to them having	Children and adults	Explain to the children what to look out for and what to touch. Provide grabbers and buckets for them to put their findings to limit the risk of splinters.	M

		splinters or cuts. • Could come across poisonous plants. • Have an allergic reaction.			
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It is important to expose children to risk as this can set them up for adult life and support them in how to deal or cope with it. The outdoor environment in settings can expose children to risk by climbing, balancing etc and rather than the child giving up as they are in fear of being hurt or from falling and hurting themselves, the role of the adult is to support/encourage\assist and show them that it is ok and that they are there to help them. This in time will build upon the child's confidence and self-reliance. (Gill 2010).

Boyd-Enniskillen 2003 concurs with this as they state that if you make an environment free from hazards then that would mean it is not challenging enough for the child. This would give the children less experience in making decisions for themselves and they would have less opportunity to gain confidence and boost their self-esteem.

When children explore and experiment in the outdoors and the natural environment it contributes to their well-being and resilience. This encourages them to become more independent and capable learners and less reliant on the adult. Providing them with a natural strength around natural organisms and forces. (Play Wales 2021).

A child's outdoor learning environment can be enhanced by the surroundings having richly resourced materials for the children which are exciting and encouraging. Also, by providing the children with open-ended flexible resources that can be changed or used in a variety of different ways. The outdoor environment is much more effective when focusing on what the children could be able to do rather than what they need to do. It is essential that opportunities in the outdoors are engaging and are meaningful experiences for the children that meet their needs with their development in all areas of the curriculum. (The Early Years Foundation Stage 2007).

White (2014) explains the importance of the outdoor environment to children and also how all children have the right to experience the outdoors. Children develop at their when they have access to a stimulating and encouraging outdoor environment. White also states that children should be outdoors as much as indoors. The outdoor environment has a real close contact with seasons, elements and the natural world that they would not be able to access in the indoors. Also, the outdoors gives children a great opportunity to access all 5 areas of their sensory development in close contact.

McClain explains the positive outcomes of learning in a Reggio Emilia environment and describes:

The emphasis on exploration and collaborative learning in Reggio Emilia-inspired environments fosters children's inquiry and discovery. By participating in everyday experiences in both indoor and outdoor environments, children co-construct knowledge through social exchanges with peers and teachers. Vandermaas-Peeler and McClain (2015) found that children who worked with a teacher in a garden at a Reggio Emilia-inspired preschool utilized inquiry skills such as observing, predicting, evaluating, and comparing as they prepared the garden beds and planted and harvested crops throughout the school year. Their social interactions with their teacher fostered mathematical and scientific inquiries as well as ecological awareness and positive affective responses to the natural world. In a qualitative study of natural sciences education in a Reggio Emilia-inspired preschool. (McClain and Vandermaas-Peeler, 2016, pp. 40-41).

Tovey (no date) describes Froebel's theory and what he believed and this concurs with (McClain 2016) as his theory was that children learn to show their own ideas, feelings and experiences through different open-ended materials. This he thought would let children explore the different areas of meaning. These he called- forms of knowledge, forms of beauty and forms of life. Any of the aspects would include science and mathematical understanding through the child's life, shape, symmetry, pattern and cycles of life and death and growth.

An adult's role in the outdoor environment is key and vital as they must provide opportunities, stimulation, challenge and progression. Thus, giving children the chance to explore the outdoors independently, with limited adult intervention. However adult intervention can be and should be implemented to encourage and support the children by asking them challenging questions or implementing challenging environments where children will have to stop and think. Activities in the outdoors need to be fun and involve real life and natural materials to keep the stimulation in the children so they don't get bored and this which will lead to an increase in their motivation which will increase perseverance and a greater understanding. (Foundation Stage, 2006).

However, Khan, M (2019) explains how Piaget's theory of constructivism suggests that children learn at their best through independent learning and exploring. When children learn through discovery and exploration in their own natural environment, they gain an increasing new knowledge. Although Vygotsky's theory of social constructivism suggests that when adults and

children have close connections learning will occur in a social environment and promote children's learning.

It is when children have access to the great outdoors with a variety of resources it is likely they will work together with peers and further their interests. They will broaden their imagination whilst working with peers, problem solving and further language skills. They will become more socially involved with peers where they'll have to discuss, negotiate and they'll have to learn to work together. Thus, becoming more obvious and freely through child led activities rather than teacher led, as children may become withdrawn and shy when there is teacher interaction and may not participate as freely as they would in a child led activity. (Croner-I, 2009).

Hershey-Goodling (2016) argues that the role of the adult is important in the outdoors and is to make sure the children are engaged in the learning and play. This is to ensure they reach levels of knowledge that they could not do on their own. Children are drawn to nature and the outdoors, and it is the role of the adult to ensure they experience the outdoor environment and that they are nurtured to extend this. The role of the adult is important for learning and the children's development in the outdoors.

Dowdell (2011) highlights how the outdoor environment is encouraging to promote children's development and learning. It is essential and vital that children have access to nature and natural materials in the outdoors with plenty of space for them to use their imagination and an adult to provide stimulus.

Wisbey (2011) states that for a child to become an effective mathematician they need to have a positive attitude towards mathematics. An aid to assist this is giving the children the understanding that maths is all around us and giving them the opportunity to experience the outdoor environment independently and become creative learners. The outdoor environment can give children the opportunity to construct on a larger scale and investigate things like shadows, light and weather, bringing science into the picture and children experiencing and modelling this without adult intervention and not realizing they are learning maths and science through experimental play. Children will naturally use mathematical skills as a part of their outdoor involvement through counting, measuring, and exploring shapes and this is where the science comes in through the shape making in the shadows and the light from the sun.

The Welsh Government 2015 believes also that children will develop their own understanding and knowledge of mathematics through practical activities. They will grasp the concept of using mathematics in practical activities real life problems. Children will solve problems in a variety of different ways and estimate and explore in both the indoor and outdoor environment. They will gain an understanding of measurements and investigate shape through pattern and textures which will encourage them to become independent thinkers and learners.

The Montessori theory is designed for children to be hands on learners and their play be self-directed in a natural environment with natural resources to encourage this. Montessori believed that a classroom filled with natural resources and a beautifully crafted environment encouraged children to have a deeper meaning of maths, science, social interactions and much more. (Montessori no date).

When loose parts are added to the outdoor environment, children can change and adapt the materials to suit their own needs. McClintic, S (2014) suggests that when adding natural materials such as: milk crates, adding wood boards and branches to a playhouse the children will recreate something and turn it into a spaceship etc. When loose parts are added to the children's play experience it makes their learning more fun and intriguing and complexity can keep the children interested.

Fox (2016) concurs with this as they state how important it is to supply children with loose parts. Also, when children use the loose parts in activities or independently, they try out their own ideas and are thriving to learn from this. Therefore, it matches their developing skill level, which investigates opportunities for divergent thinking. They also highlight that nature provides a wide range of loose parts that show patterns and textures.

Moser and Martinsen (2010) explains that the outdoor environment in Norwegian is essential to a child's social development and learning through play in the outdoors. Their outdoor environment was challenging, stimulating and attractive for the children. Thus, providing plenty of opportunities to explore and experience with partnership in other children and adults. They found in Norwegian that the children's development was reinforced through the vast amount of time they spent in the outdoors.

In the USA there are approximately 20 prominent nature pre-schools affiliated with nature centres. These being very similar to the forest kindergartens in Germany where both adults and children spend most of their school day in the forest or the outdoors. These schools have a main focus on using the gardens for learning and play and thus occurring for the majority of their school day in all weather conditions with a great emphasis on child-led play with interactions towards a local and cultural identity and environment. (Ernst and Tornabene 2012).

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