



I chose the environment in the picture above, as I believe it has a vast range of exciting opportunities to develop young children's scientific and mathematical concepts. The beautiful, calm and peaceful environment is naturally inviting. The environment is rich with a variety of real-life resources, surrounded by lots of greenery, plant life, leaves and trees. An enabling environment like this, supports children's exploration of scientific and mathematical concepts in a variety of engaging experiences. The Welsh Government (2022) supports this by stating that an effective environment should be rich in communication whilst focusing on communication skills with further development in mind. It should be filled with a wide range of real-life resources to build on concept development, be organised which will in turn scaffold the child's understanding of these concepts through practical and visual opportunities. By allowing children to explore this type of environment opens opportunities for them to partake in rich, engaging experiences. There are many experiences the children could engage in looking at this picture, using their senses not only to touch, feel, see and

smell but by climbing, running and manoeuvring around the area discovering new things, whilst learning about various scientific and mathematical concepts.

The Welsh Government (2022a) identify an engaging experience for children in early years as being hands-on and valuable whilst having a significant and meaningful purpose. By providing children with these engaging experiences, young children will be supported in encouraging independence, allowing them to experience risk and challenge, whilst allowing children to be engrossed in great levels of uninterrupted, real-life, active learning.

Supporting the evidence of the benefits of active learning outdoors, Hansom (2016) states that when children engage in active free play, they learn through engagement with the environment around them this in turn will stimulate their brain in many ways. There are no expectations in the outdoors and children are encouraged to use their imaginations with the nature around them offering endless possibilities whilst challenging their brains to think in a variety of new ways.

When, exploring the beautiful area in the picture, there are many scientific and mathematical concepts children can discover, for instance the exploration of life cycles of the flowers, plants, insects and the wildlife around them. Discovering natural habitats and different shapes and sizes of things in the environment around them. The list of opportunities for children to learn mathematical and scientific concepts are extensive. From the picture above, one area that I think is rich in opportunities for discovery of these concepts is the mud kitchen. The mud kitchen can support so many scientific and mathematical learning experiences from transformation of different materials into something else of which supports one of the schematic play's children portray. Weighing, measuring and counting whilst scooping and adding these materials, the list is endless. The enabling environment offers a wide range of natural resources for the children to use in their exploration and play for example, sticks, grass, stones, leaves, mud and so on. By using these resources, the scientific concepts of weight can be introduced. The children can use something as simple as their hands to feel how heavy or light something is or to compare the weights of different materials or items around them.

As a practitioner, in my practice, I like to take a back seat and observe closely. Watching the children in their play and waiting for an invitation or cue to join. Sometimes there may not

be an invitation to join and this is ok too, because as a practitioner you do not want to interrupt children in their engrossed play and learning environment. When joining in the scientific or mathematical exploration of the child, this offers a perfect teachable moment to expand their knowledge. Exploration of weighing could be extended and enrich critical thinking. The enabling adult can enhance the environment by adding further resources to support discovering the concept of weight in this case items such as old iron scales could be added to the mud kitchen. These offer a visually understanding to the children of what loose parts are heavy or light watching the scales go up and down or simply not moving at all. By comparing these and watching the scales move, will also introduce other concepts such as movement, force and gravitation. Research found that using visual aids during exploration and those teachable moments, stimulates thinking and improves a child's learning environment (Shabiralyani, 2015). This could be further enhanced and include the exploration of mathematics by adding digital scales to explore numbers visually when weighing.

An important role as the enabling adult to support collaborative thinking is to ask various open-ended questions, use metacognitive talk and hypothesis in your conversations with children. By using these language skills will encourage the children to join in the exploration and thinking.

This in turn will feed the curiosity of the child and support their critical thinking. Some examples of these, with the concepts of weighing in mind are: -

“Let's see what happens if we weigh the leaf and the rock?”

“What happened to the rock?”

“Why do you think the rock went higher?”

“What would happen if we added more leaves to this side?”.

“I think this side could go up, what do you think?”

By asking these questions supports the children's critical and independent thinking. Piaget said that he saw children as “little scientists” who are ambitious capable learners, enterprising

and creative contributors of their own play and exploration. These points have been used today in the implementation and creation of the Curriculum for Wales.

The Welsh Government (2022b), introduced The National Curriculum for Wales to offer children a holistic way of learning. There are four purposes which make up this beautiful curriculum, allowing and supporting children to be:-

Ambitious, capable learners -

Enterprising creative contributors

Healthy confident individuals and;

Ethically informed citizens

These four purposes are not only designed to help the children reach their fullest potential using a holistic approach but also to help and guide practitioners to become enabling adults. The enabling adult will need to support the children by not only by knowing what they teach but how and why they teach it through providing rich experiences and hands on exploration allowing the children the time and flexibility in which to do so and letting them lead their own play. Froebel described children as curious, active, creative learners. Learning best through rich, hands-on experiences, problem solving, talking and playing (Tovey, 2022).

An enabling adult will understand that by allowing the children to repeat and carry out actions in different surroundings supports their critical thinking. The enabling adult should support children to build their independence, resilience and self-belief (Welsh Government, 2022c). Vygotsky's Zone of Proximal Development refers to activities that a child cannot do alone or with others of the same ability but can collaborate with others who are at a higher skill level (Gray, 2013a). The enabling adult becomes the more knowledgeable other supporting the child in their exploration and learning.

There are many ways of extending the activity of exploring weight, by using the mud kitchen sink and filling it with water. Again, this is a great way to scientifically explore weight by watching the heavy resources sink and the light one's float and the exploration of cause and effect and having the following critical thinking conversations: -

EA: "Why do you think the rock sunk to the bottom?"

C: “Its heavy”

EA: “What do you think will happen if we put the leaf into the water?”

Extending the scientific exploration could be enhanced by asking the children what happens when we push the leaf into the water by talking about resistance.

This could be enhanced again by taking the idea of the scales and making a human scale. The children could make a seesaw like scale, using the rocks and planks of wood, with guidance and support, to weigh each other. This activity would be hands on and allow the child to experience other scientific concepts such as high and low so if one child is higher than the other that means that they must be lighter than the other.

All these scientific and mathematical concepts are interlinked in some way and the mud kitchen can be used in a multitude of ways providing a rich and engaging experience. Many young children enjoy the scientific exploration of transforming, by mixing different materials in the natural environment together and counting whilst they scoop the materials in then watching the scientific transformation of these materials combine into a new material. This again supports the growth of scientific and mathematical concepts such as mixing, combining, weighing, and measuring. If we guide children and allow them the freedom to explore the outdoors this will not only build their knowledge in science and appreciation for the natural world around them but also help to support their learning and practice in many basic skills of mathematics (Cohen, 2019).

RISK BENEFIT ASSESSMENT

Location / Activity:	Ecological Area/Mud Kitchen and surrounding area	Date:	24.09.22
Assessor:	Claire Bolch	Review date:	24.10.22

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?	Hazards and risks	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
Searching for Natural Loose Parts in the mud	Children will enjoy the element of exploration. Children will benefit from social interactions and communication with others. Problem solving skills Sensory benefits supporting wellbeing. Supporting scientific and mathematic concepts.	Encountering mud and soil can sometimes cause illness as the mud or soil if ingested could cause sickness. If it has been a wet day the ground could become very muddy and slippery causing injuries, trips, falls, bruises broken bones etc.	Child /Adult	Adults to supervise children at all times and to model good practice of the use of the soil how to handful it and not to place into the mouth explaining that it could make us ill. Supply hand washing facilities after the exploration has concluded to ensure all germs and bacteria are cleaned away. Again explaining to the children why we wash our hands after playing in the outdoors. Adults to ensure the children have appropriate footwear on to prevent ant slips or falls and to model using walking feet around the area.	Low Low
Using the iron weighing scales	Children will benefit from the visual learning of the scientific concepts through the movement of the scales. Using real life everyday	Scales falling on feet or hands if not lifted correctly causing bruising and broken bones.	Child / Adult	Adults to model correct use of the real-life scales. Explaining to the children that they must ask for help to lift the scales as they could hurt themselves. Supervision by adults.	Low

	resources increases knowledge and understanding of the world around them. Learning scientific and mathematic concepts, high, low, heavy, light. Promote Problem solving skills and critical thinking. What would happen if? Why did one side go up? How can we make the other side go down again?				
Water play in sink	Promoting hand eye coordination Scientific exploration	Immersion of face in water could lead to choking or even death	Adults/Children	Adults to closely and continually supervise water play and ensure an adequate number of children are safely around the area of water at all times.	Low

	Mathematical Concepts Increases well being Promotes language and communication skills Problem Solving Skills Why did it float? Why did it sink? Sensory exploration	Slips and trips may cause injury such as bruises cuts and broken bones Ingesting dirty water may cause sickness		Adults to ensure children have appropriate footwear on the prevent slips and trips Adults to explain to the children that the water in the mud kitchen could possibly make them sick if they drink it.	
Climbing the tree	Promotes physical development Builds confidence Enables risk management Offers element of risky play	Falling out of the tree could cause injury, broken bones, cuts and bruises Cuts and scrapes whilst climbing up	Adult Child	Adults to risk assess whether the child is physically able to attempt climbing the tree is it a realistic height could it cause serious harm. Adults to help or assist children in their attempt to climb making them aware of the hazards before doing so and how to remain safe. If the adult can see the child would be at risk offer and think together about something else they could	Low

Rolling Tyres	and confidence building Offers multisensory experiences	Dropping tyres on toes, being too heavy to carry could cause injury to child or adult	Child and Adult	maybe climb. E.g the stone boulders	Low
Looking for insects	Supports physical development Scientific exploration of movement and forces, pushing, rolling, pulling and trajectories.	Children putting the insects in their mouth could cause sickness	Children	Adults to model use of tyre to roll across grass and down banking. Adults to explain that the tyres can be very heavy and to ask for help to lift from an adult or a friend and to make sure the area is clear before they start to role it.	Low

Threading Leaves with sticks	Support knowledge and understanding of the world around them. Exploring life cycles of various bugs and insects and gaining knowledge of their natural habitats. Supporting mathematic concepts by looking at the size and shape of the insects and counting how many we can find	Children may climb to reach up for leaves high on trees or to collect sticks from branches on tree and may fall and injure themselves	Child ren	Adults to ensure they explain to the children the importance of the world we live in and how we must look after nature and the living things. Also that eating insects can make us ill. Ensuring the children wash their hands after exploring Adults are to supervise the children and what insects they are able to handle without causing themselves harm. Adults to supervise and observe play.	Low
------------------------------	--	--	-----------	---	-----

	Supports cognitive development Explores mathematical and scientific concepts by counting how many leaves they can thread and the size and shape of the leaves, comparing big to small. Supports hand eye co-ordination and fine motor skills. Supports sensory play feeling the textures of the leaves and sticks and the difference between the leaves and sticks textures and sounds of soft, rough,			Adults to model picking the leaves and sticks that are low down on the floor and explain to the children that they could fall if trying to climb up high and to ask for help and assistance first before attempting to do so.	
--	--	--	--	--	--

	smooth, crunchy.				
--	---------------------	--	--	--	--

Evaluation

White (No date), states that young children develop at their best holistically, when offered free play and experiences in the outdoors, every child deserves this right to the wonderful experience nature has to offer. White continues to add that to enable children to unlock the potential the outdoors has to offer, enthusiastic and knowledgeable adults are fundamental. Supporting this Tovey (p.g 62, 2012) mentions Frederick Frobel and his creation of the first Kindergarten. By following Froebelian pedagogy, will offer children space and freedom, opportunities to experience risk and challenge, whilst provoking awe and curiosity during play in the natural world. In addition, White and Tovey both agree that to enable children to unlock the potential that the outdoors has to offer, enthusiastic and knowledgeable adults are fundamental in providing a rich learning environment.

Simon Nicholson a British architect used the term loose parts to talk about items and materials that could be utilised in an open-ended way (Keith, p.g.104, 2017). Loose parts can be added to create a mathematically rich environment, by using these unanchored resources will ensure children have free play to move these and use them to investigate, experiment and question. The loose parts teach children that maths is everywhere in the outdoors (Robertson, p.g.30, 2017). The curriculum for funded non-maintained nursery settings, encourage daily outdoor play and real experiences to support exploration of mathematical concepts. In agreement with Robertson the curriculum supports the proposal that the outdoors offers rich opportunities for natural resources whilst engaging in open-ended mathematical and scientific exploration (Welsh Government, 2022d). Maes (2015) mention the affordability of supplying children with loose parts. The outdoors provides affordable opportunities to play with loose parts. The beach, park or forest opens opportunities for children to explore and collect loose parts using them to create and construct whatever their heart desires. Even the use of a back garden lets children explore larger loose parts that may not be able to be explored inside.

A project called The Science Outside the Classroom project are a group of educators working together to discover new opportunity to children to develop crucial science competencies including problem solving, critical thinking, measuring and comparing to name a just a few (Murray, 2019). Siraj (2015) explains a process called 'Sustained Shared Thinking' this process supports children's critical thinking and problem-solving skills. Siraj describes Sustained Shared Thinking as a key skill to enable practitioners in pre-school settings to support children's cognitive development. It is a moment in which two or more people collaborate intellectually to process a concept problem solve and evaluate. All people involved must contribute to develop and extend the learning. Supporting this the role of the enabling adult according to the New Curriculum for Wales is to support and encourage children to work collaboratively to problem solve (Welsh Government, 2021). Adults who engage in metacognitive talk can support children in their mathematical and scientific exploration.

Welsh Assembly Government (2008) state that children who learn about science follow a three-step process, planning, developing and reflecting in pairs or groups to allow for critical thinking and learning of scientific exploration, this in turn leads to superior end results. Supporting this The New Curriculum for Wales say to allow learners to make informed decisions that have an impact on well-being and the environment they need to be able to evaluate (Welsh Government, 2022)

Although outdoor play is recognised as having holistically beneficial impacts on a child's development, for many, the opportunities to engage in this type of meaningful play can be restricted. A study carried out, showed that adult perception of how competent children can be, varied. Some participants labelled children as having a limited ability to manage risk, while others argued that children have a natural ability to navigate through risk and develop these skills through unstructured outdoor play (Cheng, 2022). There is a growing like mindedness that the society we live in has become overly focused on decreasing or eliminating risk in children. Research suggests that overprotecting children can have long-term effects on their well-being and mental health (Gill, 2010). The media can take a certain amount of ownership in adults and parents' perception of allowing children to manage their own risks. Almost every day the news has an awful story of something happening to a child, but they omit to supply adults with the positive that hundreds of thousands of children

play freely outdoors without adult supervision and become healthy, wiser and confident individuals (Gray, 2013b). With all this in mind Sandseter (2011) supports a balance between the safety of children and children's need for free play opportunities in a stimulating and challenging environment. Sandseter explains that even though children who are very active and experience more risks, suffer more minor injuries. In return these children will psychologically benefit from natural adaption to alleviate fear and the positive effect of risk taking in play.

Supporting the aspect of child-led play, early years settings who follow the Reggio Emilia approach provide children with opportunities and rich environments to express their own creativity. They support cognitive development by asking open-ended questions to guide the children to build scientific concepts together (Coskun, 2022). Reggio Emilia pre-schools plan for children's learning through their child initiated free play and with a well-planned outdoor space providing soil, bushes, trees and sand to enhance learning opportunities (Garrick, 2009).

Observations by adults are vital, The Froebel Trust (2022) follow the view of Frederich Froebel, a theorist who learned so much from observing children when they play alone, or with family and friends. Froebel used his observations to further his understanding of children's learning through self-activity using their senses, everyday experiences and fundamentally their interests supporting mathematic and scientific exploration and then to further children's curiosity and learning. By observing children closely, an adult can identify schematic play interest. Louis (2016) explains that schemas are repeated patterns in a child's behaviour they are an important part of children's self-initiated play linking to strength and development of a child's cognitive structures in the brain. Many practitioners become experts at spotting children's schemas, and it is their role as the enabling adult to support these schemas by enabling the environment around them. Piaget described children as constructivists, creating knowledge by exploring the physical world around them. Observing commonalities in a child's behaviour allows an adult to identify the schema of which the adult must support to progress learning effectively (Garrick, 2009a)

Children are naturally curious and through multi-sensory play and real-life experiences develop and understanding of mathematical concepts. Children should have the opportunity

to explore and play in the outdoors to further these concepts in everyday life. Adults should model appropriate mathematical language to help children develop further (Welsh Government, 2022e)

Reference List

Cheng, T., *et al.* (2022). *Perceived challenges of early childhood educators in promoting unstructured outdoor play: an ecological systems perspective*, *Early Years*. DOI: 10.1080/09575146.2022.2034140. Accessed: on 30 September 2022.

Cohen, L.E., and Waite-Stupiansky, S. (2019). *STEM in Early Childhood Education: How Science, Technology, Engineering, and Mathematics Strengthen Learning* (1st ed.). ROUTLEDGE: NEW YORK. <https://doi.org/10.4324/9780429453755>

Coskun, L. (2022). *The Reggio Emilia Approach in Early Childhood Education Volume 4, Issue 1*, 74 – 86. Available at: [Muallim Rıfat Eğitim Fakültesi Dergisi » Submission » The Reggio Emilia Approach in Early Childhood Education \(dergipark.org.tr\)](https://dergipark.org.tr/MuallimRifatEgitimFakultesiDergisiSubmissionTheReggioEmiliaApproachinEarlyChildhoodEducation). Accessed on: 02 October 2022

Garrick, R. (2009). *Playing Outdoors in Early Years 2nd edition*. LONDON: CONTINUUM INTERNATIONAL PUBLISHING GROUP.

Garrick, R. (2009a). *Playing Outdoors in Early Years 2nd edition*. LONDON: CONTINUUM INTERNATIONAL PUBLISHING GROUP.

Gill, T. (2010). *Nothing Ventured... Balancing Risks and Benefits in the outdoors*. Available at: [747 Nothing Ventured text \(uwtsd.ac.uk\)](http://747NothingVenturedtext.uwtsd.ac.uk). Accessed on: 01 October 2022.

Gray, Peter. (2013). *Free to Learn*. NEW YORK: BASIC BOOKS;

Gray, Peter. (2013a). *Free to Learn*. NEW YORK: BASIC BOOKS.

Hansom, Angela, J. (2016). *Balanced and Barefoot*. CANADA: RAINCOAST BOOKS.

Keith, L. (2017). *Developing Young Children's Mathematical Learning Outdoors: Linking Pedagogy and Practice* (1st ed.). LONDON: ROUTLEDGE.

<https://doi.org/10.4324/9781315300672>

Louis, S. (2016) *The importance of schemas in every child's learning*. Available at: [The importance of schemas in every child's learning \(communityplaythings.co.uk\)](https://communityplaythings.co.uk). Accessed on: 01 October 2022.

Maes, A. (2015). *Playing with Loose Parts at Home: an oversight*. Available at: [Playing with Loose Parts at Home: an oversight \(littleworldsbigadventures.com\)](https://littleworldsbigadventures.com). Accessed on: 02 October 2022.

Murray, J. (2019.) *Routes to STEM: nurturing Science, Technology, Engineering and Mathematics in early years education*, *International Journal of Early Years Education*, 27:3, 219-221, DOI: 10.1080/09669760.2019.1653508

Robertson, J. (2017). *Messy Maths : A playful, outdoor approach for early years*, CARMARTHEN: CROWN HOUSE PUBLISHING.
<http://ebookcentral.proquest.com/lib/trinity/detail.action?docID=4891298>.

Sandseter, E. and Kennair, L. (2011). *Children's Risky Play from an Evolutionary Perspective: The Anti-Phobic Effects of Thrilling Experiences*, Volume 9, Issue 2. Available at: <https://doi.org/10.1177/147470491100900212>. Accessed on: 02 October 2022.

Shabiralyani, G, et al. (2015). *Impact of Visual Aids in Enhancing the Learning Process Case Research: District Dera Ghazi Khan*, Vol.6, No.19. Available at: [EJ1079541.pdf \(ed.gov\)](#). Accessed on: 24 September 2022.

Siraj, I, et al. (2015). *Assessing Quality in Early Childhood Education and Care : Sustained Shared Thinking and Emotional Well-Being (SSTEWS) Scale for 2-5-year-olds Provision*. Available at: <http://ebookcentral.proquest.com/lib/trinity/detail.action?docID=3563913>. Accessed on: 02 October 2022.

The Froebel Trust. (2022). *Observing Young Children*. Available at: [Observing young children \(froebel.org.uk\)](https://froebel.org.uk). Accessed on 01 October 2022.

Tovey, H. (2022). *Outdoor Play and Exploration*. Available at: [Layout 1 \(froebel.org.uk\)](#). Accessed on: 24 September 2022.

Tovey, H. (2012). *Bringing the Froebel approach to your early years practice*. USA: ROUTLEDGE

Welsh Assembly Government, (2008). *Science in the National Curriculum for Wales*. Available at: [SCIENCE NCO Jan 2008 \(E\) \(gov.wales\)](#) Accessed on: 02 October 2022.

Welsh Government, (2022). *A curriculum for Funded non-maintained nursery settings*. Available at: [A curriculum for funded non-maintained nursery settings \(gov.wales\)](#). Accessed on: 18 September 2022;

Welsh Government, (2022a). *A curriculum for Funded non-maintained nursery settings*. Available at: [A curriculum for funded non-maintained nursery settings \(gov.wales\)](#). Accessed on: 18 September 2022;

Welsh Government, (2022b). *A curriculum for Funded non-maintained nursery settings*. Available at: [A curriculum for funded non-maintained nursery settings \(gov.wales\)](#). Accessed on: 18 September 2022;

Welsh Government, (2022c). *A curriculum for Funded non-maintained nursery settings*. Available at: [A curriculum for funded non-maintained nursery settings \(gov.wales\)](#). Accessed on: 22 September 2022;

Welsh Government, (2022d). *A curriculum for Funded non-maintained nursery settings*. Available at: [A curriculum for funded non-maintained nursery settings \(gov.wales\)](#). Accessed on: 30 September 2022;

Welsh Government, (2022). *Introduction to Curriculum for Wales Guidance*. Available at: [Introduction - Hwb \(gov.wales\)](#). Accessed on: 24 September 2020.

Welsh Government. (2021), *Enabling Pathways*. Available at: [enabling-pathways-consultation-document_0.pdf \(gov.wales\)](#) Accessed on: 02 October 2022.

Welsh Government. (2022), *Area of Learning and Experience, Science and Technology*. Available at: [Science and Technology: Statements of what matters - Hwb \(gov.wales\)](#). Accessed on: 02 October 2022.

Claire Bolch

Student Number: 2104728

Module ECEY5005 Awe and Wonder –

Word Count: 4277

Science Mathematics and the outdoors

White, J (no date). *Learning through Landscapes, Early Years Outdoor Vision and Values for outdoor play*. Accessed on 28 September 2022.