



Woodland Area (Evans, 2025)

Awe and Wonder-

Science, Mathematics and the Outdoors.

The setting in the picture provides a multitude of chances for children aged 4-6 years old to explore holistically through play, which aids in the development of particular mathematical and scientific ideas. The natural environment, which consists of a wooden shelter, pond, rocks, plants, trees and a bug house, offers a rich terrain for unstructured play, exploration, and problem solving.(Kedemos Education, 2024). When the children first arrive at the location, they are captivated by the pond's calmness and the tree's reflections in the water. some of the children are interested in the ripples that are forming on the pond's surface and start to gather small stones to throw into it. This unplanned play is a great way to investigate cause-and-effect interactions as well as early scientific ideas about motion and forces. A child throws a little pebble into the pond and observes the formation of the tiny ripples. As another child watches, he picks up a bigger stone and threw it harder, making a bigger splash. The children start talking organically as a result.

"There were many tiny ripples in mine."

"Yes, but mine made a big splash."

The practitioner then kneeling next to the children and providing mild scaffolding said, "Well I wonder why the heavier stone made a bigger splash? What do you guys think?"

The children became engaged and answered, "Because it's heavier, it goes deeper in the water."

The practitioner responded "I think that's an amazing idea. How about using a flat stone instead? Would it splatter the same or differently?"

The practitioner fosters early hypothesis generation and scientific reasoning by encouraging the children to test and forecast their ideas through the use of open ended questions. The children excitedly started to gather stones of all different shapes and sizes and test out how they affect the water. This allows them to organically investigate motion, forces, and how mass affects water displacement.

Another set of children, meanwhile, start collecting sticks and organizing them into patterns and shapes as they show an interest in the natural objects in the surrounding. They start thinking mathematically as they compare the stick lengths. While another child begins building stones into towers, seeing that careful placement

is necessary to balance larger boulders, another child arranges sticks in a line from shortest to longest. The children begin to discuss:

“I made a large tower.” Another child said, “Mine is taller than yours.”

As the practitioner watches the play and participated when ask she responded “Oh, you have built a tall tower. Which one is the tallest? How could we check?”

The practitioner encourages the children to think critically and employ informal measurement methods by posing thought-provoking questions and introducing fresh comparison tactics. This practical investigation of dimensions, form, and analogy facilitates the development of early mathematical reasoning.

A small group of children are enthralled by the pond's ecology there, squatting low to watch insects skate over the water and look for tiny animals amid the rocks. They come across a water snail and are enthralled with its leisurely motions. With a magnifying glass in hand, the practitioner joins them and gently encourages close examination. The children enthusiastically explain the features they observe, such as the sparkling trail and spinning shell of the snail. The practitioner fosters early scientific inquiry and critical thinking in the children by encouraging them to explain what they see, make predictions and employ observation skills through this guided exploration. They expand their verbal and conceptual comprehension by using scientific terms like “spiral, surface and slide”.

Some of the children start playing with floating and sinking in the interim. They add stones, sticks and leaves to the pond and watch as if some of them sink while others stay on the surface. The practitioner watches from a close distance to ensure no risk to the children, however, allows them to experiment by themselves before providing mild assistance. This approach reflects Bruner's (1961) theory of discovery learning, which emphasizes that children learn best through active exploration, with adults providing subtle guidance when necessary. Children learn to categorize things based on their behaviors in water through self-directed activity, which leads to discussion on buoyancy and density. In order to expand this inquiry and encourage children to predict and test whether new objects will sink or float, practitioners may later provide additional resources in order for them to have a greater understanding.

The wooden shelter and the surrounding open space provide additional chances for imaginative play and spatial reasoning in addition to the pond. Some children explore shape, space, and measurement through construction play by building little dens or fake campfires out of sticks and leaves. By offering measuring tapes, rulers, or balancing scales, practitioners can improve this learning and encourage children to compare weights or lengths while they build.

In order to model and extend children's thinking without unduly disrupting the flow of play, practitioners employ observational language and inquiry throughout their exploration. They take on a perceptive, non-intrusive demeanor, paying close attention and intervening only when they believe that mild scaffolding could improve or deepen the educational process. For instance, a practitioner can enquire "How can you make the tower more stable?" when children are stacking stones, or "What would happen if you placed the larger stones at the bottom?" encouraging children to think about stability, balance and problem-solving.

Children are organically interacting with a variety of mathematics and scientific ideas throughout the event. Through the use of sticks, stones and structures, they are applying measurement and comparison abilities, examining floating and sinking through playful experimentation, and investigating forces and motion through their interactions with water and stones. Children's problem-solving and reasoning skills are strengthened as a result of the metacognitive discussions that practitioners start by encouraging them to express their ideas, think back on observations and explore different approaches.

Children are exposed to new scientific and mathematical terms such as heavier, longer, ripples, which further fosters language development. This is in line with the Welsh Government (2022), which places a strong emphasis on active discovery and exploration-based learning. Additionally, the experience reflects Vygotsky's (1978) sociocultural theory, which is evident in the practitioners' sensitive scaffolding that aids children in progressing through their zone of proximal development, and Piaget's (1952) constructivist theory, which holds that children acquire knowledge through direct interaction with their surroundings.

With all things considered, this outdoor setting offers young children an engaging and developmentally rich location where they can naturally interact with

mathematical and scientific ideas through independent, play-based exploration. In line with the Curriculum for Wales 2022, practitioners construct meaningful learning experiences that promote critical thinking, problem-solving and metacognitive abilities by giving children the flexibility to experiment, contribute, and reflect while providing gentle and intentional scaffolding. (Welsh Government, 2022).

RISK BENEFIT ASSESSMENT

Location / Activity:	Woodland area	Date:	10 th March 2025
Assessor:	Ella Evans	Review date:	29 th March 2025

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
Walking on uneven ground	Supports children's vestibular sense. Children will become more aware of their own bodies. They will become aware of slopes and gradients.	The children could trip or fall leading to injuries such as cuts bruises or sprains.	Children and adults.	Make sure children are told about the surface and discuss how it may be a new experience and therefore may want to try out walking at a slower pace until they are familiar with the surface. Play an interactive game with all to help the balancing sense. Make sure children have appropriate clothing and shoes.	L

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
Exploring the pond area (for example looking at pond life).	Encourages curiosity and scientific exploration. Promotes respect for nature. Improves concentration for children.	Risk of slipping into the pond. Risk of drowning. Risk of getting waterborne infections.	Children.	Ensure barriers are put in place such as a fence or rope around the pond for children to be aware of the danger areas. Make sure there are staff around the pond at all times. Teach children about safe boundaries.	H

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
Exploring and collecting the loose parts they can see such as, sticks, stones and flowers.	Enhances sensory exploration. Supports language development through discussions. Physical development – fine and gross motor skills when bending, stretching and other movements.	Risk of handling sharp objects. Risk of injury including splinters or cuts. Low level branches could cause eye or head injury. Children may wonder off becoming lost. Children may collect inappropriate materials such as rubbish. aware of poisonous or irritant plants such as nettles, blackthorns and lords.	Children and staff.	Discuss with children before going out things that may be new and surprising. Consider boundaries- children made aware of things that they should collect, use a game or song to support this. Make sure the children are aware of where they can and cannot go without an adult. Golden rule of nothing in the mouth, wash hands at the end of the activity. Make the children aware of strangers and the procedures.	L

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
Adverse weather conditions.	Children can become aware of the different temperatures, use words to describe the weather. They will be able to identify things in the environment which may be harmful and can act to reduce the risk to themselves and others. Become aware of self-care and monitoring own risk.	High winds can cause trees to fall, branches to fall leading to head injuries. Children may be too hot or too cold causing hyperthermia or hypothermia. Children may become wet causing them to be uncomfortable and distressed. Sun exposure can cause sun burn or heat stroke.	Children and adults.	Monitor the weather before going out- don't go out if winds are too strong and be aware of hot temperature to ensure sun cream is applied. Appropriate clothing to be worn, weather dependent. Hats, waterproofs, wellies or warm layers.	M

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
Children exploring independently in the surrounding environment.	Children explore the environment, make observations and communicate their ideas. Children can identify things in the surrounding area which may be harmful and can act to reduce the risk to themselves and others.	Children may wonder too far. Risk of children having minor trips and falls. Encounter with stinging/biting insects or plants.	Children.	set clear boundaries with the children before they start exploring. Use visual boundaries allowing the children know the area to stay within. Teach children to stay in sight of adults and call out if needed.	M
Climbing trees, logs or natural structures.	Building physical strength, balance and coordination. Enhances risk assessment and problem-solving skills for the children. Boosts their own confidence and resilience.	Risk the children could fall from a height causing bumps to the head. Slip or loss of grip. Minor cuts, splinters or scraps.	Children.	Inspect the area, trees/logs surrounding for stability and safety ensuring they won't be a serious risk to the children. Set climbing height limits with the children. Make sure staff are always supervising closely. Encourage safe hand and foot placement with the children.	L

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
Wildlife encounters – interacting with the bug house, observing the insects.	Develops fine motor skills, fosters empathy and care for small creatures and improves their observation skills. Children can have the opportunity to learn about other living things, their habitats and life cycles	Potential stings or bites. Allergic reactions could occur. Small cuts or splinters depending on the materials used for the bug house.	Children and adults	Teach safe handling of bugs. Ensure a first aid kit is on hand. Make sure you are aware of any allergies before going out.	L
Digging and playing in soil or mud.	Enhances their fine motor skills, promotes curiosity about nature, and encourages sensory exploration.	Contact with sharp objects (stones, litter). Exposure to soil-borne bacteria or fungi.	Children.	Inspect area for debris before allowing children to play in the area, ensure handwashing after the activity is done. The children will be provided with child-safe digging tools.	L
Building dens with branches and leaves.	This will enhance creativity and problem solving. Develops teamwork and collaboration skills. Boosts resilience and confidence.	Branches may fall on children, or they may be sharp and cause injury such as scratches to the children.	Children and adults	Teach safe handling of branches, ensure supervision during den building by adults.	M

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
Using magnifying glasses and binoculars.	Promotes observation and scientific inquiry. Develops focus and attention to detail.	Risk of dropping or breaking the equipment. Minor eye strain.	Children.	Use child-friendly, durable tools. Teach children to handle the equipment with care. Staff supervision while children use in case something breaks and needs cleaning	L

How adults support early years children in engaging with mathematical and scientific concepts in an outdoor environment.

Children can interact meaningfully and practically with mathematics and scientific concepts through outdoor learning, which is becoming more and more acknowledged as a potent method to early childhood education. Outdoor surroundings, as opposed to standard classroom settings, offer children rich, dynamic locations where they may engage with nature, try out objects, and witness real-world occurrences. The groundwork for fundamental cognitive abilities including inquiry-based learning, critical thinking, and problem-solving is laid by these experiences. The Curriculum for Wales (Welsh Government, 2022) emphasises the value of experiential learning and promotes an educational system that fosters inquiry, curiosity, and the acquisition of fundamental scientific and mathematical knowledge via interaction with the natural world.

Although science and mathematics are frequently thought of as abstract subjects, children gain a deeper and more intuitive understanding of these ideas when they are exposed to them in a concrete way, such as when they measure sticks, count leaves, or examine how water flows through various surfaces. According to research, hands-on, exploratory activities are very beneficial for young children because they foster social-emotional development, creativity, resilience, and cognitive development (Waite, 2011). Additionally, children's natural curiosity and feeling of wonder are naturally supported by outdoor settings, which provide an internal drive to pose queries, try theories, and participate in discovery-based learning.

Adults have a crucial part in this process. Through questioning, scaffolding, and the development of interesting outdoor learning opportunities, educators, carers, and other professionals serve as facilitators, assisting children in making sense of their experiences. Prominent psychologists and educators, including as Friedrich Froebel, Loris Malaguzzi, and James Gibson, have developed theories that provide light on how children learn via play, engagement with their environment, and unstructured inquiry. Gibson's affordance theory explains how children perceive and interact with their environment based on the opportunities it offers, Malaguzzi characterised the environment as a "third teacher" that encourages curiosity and learning, and Froebel highlighted the value of play and nature in early education. These viewpoints

demonstrate how adults can plan outdoor activities to optimise learning while giving kids the latitude to experiment and deepen their comprehension of scientific and mathematical ideas.

Furthermore, outdoor education promotes holistic development, which enhances kids' social, cognitive, and physical abilities. Children's mathematical and scientific thinking is influenced by activities like sorting natural things, tracking seasonal changes, and playing with weight distribution and balance. Adults can direct children's investigation and assist them in making connections between their findings and more general ideas in science and mathematics by engaging in prolonged shared thought. Adults may assist children develop a lifelong curiosity for learning by creating an atmosphere where they feel free to test theories, ask questions, and consider their results.

This essay will examine how important it is for adults to encourage young children to interact with mathematics and scientific ideas in natural settings. It will look at the theoretical underpinnings of outdoor learning, the ways in which adults may support learning through both scheduled and unstructured activities, and the wider developmental advantages of interacting with science and maths in natural environments. In order to demonstrate how outdoor learning environments, when properly supported by adults, may offer rich, meaningful experiences that improve children's comprehension of mathematical and scientific concepts, this talk will analyse important theories, research, and educational frameworks.

The significance of play, exploration, and social contact in the learning process is emphasized by educational theories. Piaget (1952) stresses active learning through sensory experiences, whereas Montessori (Maria Montessori Institute, 2025) emphasizes experiential, child-led learning. The Reggio Emilia Approach (2022) and Bruner (1961) promote inquiry based learning backed by meaningful interactions, while Vygotsky's (1978) concept of scaffolding implies that adults are essential in helping children extend their thinking. Adults can facilitate children's meaningful and pleasurable engagement with mathematical and scientific concepts by implementing techniques into affordance, persistent shared thinking and loose parts play.

Although there are many advantages to outdoor learning, issues like instructor confidence, resource scarcity, and safety concerns can reduce its efficiency.

However, with careful preparation and encouraging adult participation, Siraj-Blatchford, Sylva, Muttock, Gilden and Bell (2002) believe that the outdoor environment can transform into effective learning places where children can play, explore, and discover while acquiring critical math and science concepts.

Understanding how outdoor settings foster early mathematics and scientific engagement is made easier by theories of child development and learning. Vygotsky, Montessori, Piaget, and Bruner are among the educational theorists who highlight the value of social interaction, experiential learning, and scaffolding in cognitive development. The Curriculum for Wales, which advocated for a child-centered, play-based approach that fosters curiosity, inquiry and problem solving in the real world, is a great example of how these theories have closely correspond with contemporary educational frameworks (Welsh Government, 2022).

According to Montessori's idea, learning should be child-led and experiential, with children interacting with their surroundings to gain knowledge (Montessori, 1912). Due to the fact that natural settings give children the chance to investigate mathematical ideas through self-discovery, her method promotes outdoor learning.

According to Vygotsky (1978), learning is improved by discussion and cooperation with more experienced people, which emphasizes the need of social interaction and scaffolding. This is especially important in outdoor settings, when adults can encourage children's exploration. This strategy is further supported by the Curriculum for Wales, which promotes cooperative learning opportunities where children discuss and reason to better grasp the activity. (Welsh Government, 2022).

With its emphasis on the environment as the "third teacher" and promotion of inquiry based inquiries, the Reggio Emilia approach also provides insightful information about outdoor learning (Reggio Emilia Approach, 2022). According to this method, adults facilitate learning by offering abundant, unrestricted chances for exploration and children are viewed as active participants in the construction of knowledge. This is in line with the four purposes of the Curriculum for Wales, namely the goal of producing innovative, ambitious individuals who are capable of critical thinking. (Welsh Government, 2022).

Overall, these support the Curriculum for Wales' emphasis on experiential cross-disciplinary learning and highlight the benefits of outdoor learning in early

mathematics and science education. In early childhood education, outdoor settings can be effective venues for promoting curious and conceptual knowledge by fusing constructivist ideas, social engagement and guided discovery.

Compared to traditional indoor classrooms, outdoor settings offer a more flexible and participatory learning environment where children may think mathematically and scientifically through hands-on inquiry (Waite, 2017). Problem solving, exploration, and the practical application of ideas are all improved by outdoor learning, according to Bilton (2010), especially when adults lead controlled and unstructured exploration. A useful tactic is loose parts play, which reinforces early mathematics skills by encouraging sorting, classification, and pattern making with natural objects such as twigs and pebbles. (Daly and Beloglovsky, 2015). Through hands-on experimentation with size, symmetry, and sequencing, these open-ended materials foster creativity and spatial awareness in children. Nonetheless, some critics contend that play with loose parts is not always conducive to intentional learning and lacks the framework required for profound mathematical comprehension (Sarama and Clements, 2009). Activities such as measuring tree trunks, calculating distance, and arranging natural things into different patterns or orders can help children develop their spatial awareness and measurement skills in addition to loose parts. Children's comprehension of size, shape, and proportion- skills crucial for subsequent mathematical reasoning is strengthened by these exercises. Furthermore, outdoor play foster's executive function and problem solving abilities as demonstrated by games such as obstacle courses, hopscotch, and scavenger hunts that call for strategic thinking, counting and directional language according to Gifford (2005). Proponents of outdoor learning contend that children connect with concepts more deeply when they are physically involved in the learning process (Waite, 2017), despite some educators claims that structures indoor lessons with direct instruction are a better way to reinforce mathematical learning.

Due to the fact that children naturally participate in inquiry based learning through observation and experimenting, outdoor environments offer great opportunities for scientific exploration in addition to mathematics. Children learn fundamental science concepts like buoyancy and gravity through activities like cause-and-effect experiments as stated by Tunnicliffe (2015). Children also get introduced to biological and environmental science through weather and ecosystem studies, which

include monitoring seasonal changes, insect behaviors and lifecycles. Siraj-Blatchford, Sylva, Muttock, Gilden and Bell (2002) acknowledged that in order to extend children's thinking through sustained shared thinking- a notion in which adults and children work together to solve issues and explore ideas. They believe that adults play a critical role in outdoor learning. Deeper engagement and scientific reasoning are promoted by posing open-ended questions.

Ultimately, outdoor learning becomes a potent instrument for fostering the development of fundamental science and mathematical skills when adults strike a balance between structured supervision and unstructured inquiry. Children learn important concepts more thoroughly through engaging and developmentally appropriate experiences and meaningful conversations. Even though there are drawbacks, the advantages of outdoor learning indicate that it is a worthwhile addition to conventional early childhood education.(First Discoveries, 2016).

Conclusion

Early childhood educators have a crucial role in assisting young children in making connections between mathematical and scientific concepts in outside environments. In accordance with the Curriculum for Wales, practitioners foster children's critical thinking abilities by scaffolding, probing, and encouraging exploration. In these settings, social interaction and discovery-based learning are crucial, according to theorists like Vygotsky and Bruner. Children's confidence, curiosity, and problem-solving skills are all improved when scientific and mathematical ideas are incorporated into outdoor play, according to research and educational literature. Adults design meaningful and developmentally appropriate learning experiences by striking a balance between opportunities for individual inquiry and structured supervision. Outdoor settings can become productive learning environments with appropriate planning and adult assistance, despite obstacles like teacher confidence, resource constraints, and safety concerns. When done right, outdoor learning may be a very effective way to help kids develop their conceptual knowledge, curiosity, and lifelong interest in science and maths.

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