

Awe and Wonder – Science, Mathematics, and the Outdoors

Due Date: 21st April 2024

Section 1 (Practical)



Personal Collection (2024)



Personal Collection (2024)

Section 2 (565/1200 words)

Today, I had the privilege of facilitating learning in a natural forest environment, focusing on how the open space and available resources like logs support children's development in science and mathematics. Here's a reflection supported by recent research:

In the forest, the children experienced firsthand the principles of physics through interaction with natural elements. According to Waller *et al* (2010), outdoor environments like forests provide opportunities for children to explore and understand forces such as gravity, friction, and



Figure 1: Outdoor Obstacle Course (CosyDirect, no date)

motion in a tangible way. Piaget's theory of cognitive development aligns well with outdoor learning. Piaget emphasized the importance of hands-on experiences and active exploration in the learning process (Barrouillet, 2015). He believed that children construct their understanding of the world through interactions with their environment. Through playful activities like climbing fallen logs or rolling objects down slopes, children develop an intuitive understanding of these concepts.

The forest's expansive setting encourages children to explore and compare sizes of natural objects. Sailer (2020), highlights the importance of outdoor environments in developing children's spatial reasoning skills, including size perception and estimation. In the forest, children engage in activities like scavenger hunts, where they categorize objects based on size, fostering a deeper understanding of spatial relationships (Skar, Gundersen and O'Brien, 2016; O'Brien, 2019). To further aid children's curiosity, I asked "If we collect acorns or pinecones, how can we group them? Can you count how many are in each group?". The children engaged in this activity by placing the natural resources into groups of size. I then asked later, "Let's measure the circumference of this tree trunk. How many steps do you think it will take to walk around it?". The children enjoyed creating big steps around the tree trunk, realising the size of their step will alter the results. Asking children questions in the early years is crucial for nurturing their curiosity and facilitating their learning and development (Sobel and Letourneau, 2018).

Logs in the forest serve as tangible objects for children to explore concepts of weight and mass. According to Nigg (2021), outdoor environments offer unique opportunities for children to investigate physical properties like weight through hands-on experiences. As children lift, carry, and roll logs of varying sizes, they develop an understanding of weight and learn to make comparisons based on their observations.

The forest provides a natural setting for children to observe and learn about life cycles. Fagerstam (2020) emphasizes the importance of outdoor learning in fostering an appreciation for the natural world and understanding ecological concepts like life cycles. Through guided nature walks and observation of plants and animals, children develop a deeper awareness of the interconnectedness of living organisms.

Logs in the forest offer opportunities for children to explore the properties of materials such as texture, density, and buoyancy. According to Schwan, Grajal and Lewalter (2014), outdoor environments provide a rich context for hands-on exploration of material properties, fostering a deeper understanding of scientific concepts. As children run their hands along the rough bark or float logs in streams, they engage in sensory experiences that enhance their scientific inquiry skills.

In conclusion, the forest environment with its open space and natural resources offers a dynamic setting for children to explore and develop their understanding of science and mathematics. Through hands-on activities and observation-based learning, children build foundational knowledge and skills supported by recent research findings.

RISK BENEFIT ASSESSMENT

Location / Activity:	Outdoor Play – Forest Schooling	Date:	25 April 2024
Assessor:	Angel McGovern-Kemp – Early Years Practitioner	Review date:	23 April 2024

The boxes in the table below will expand as you type into them; pre-entered text is simply for illustration. You should delete irrelevant items and replace with text relevant to your circumstances.

Your overall risk rating – Low, medium or high – is based on your judgement about whether the BENEFITS of the activity or opportunity outweigh the RISKS.

Experience exploring outdoor space in photograph	How will young people BENEFIT from this activity?	Hazards and associated risks	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk after precautions RATING: L/M/H
The insects in the outdoor space being used.	Learning about the animals we share our world with and understanding their presence and impacts they can create to us.	Insects, bugs and animals living and passing through the outdoor space – bites, stings.	Children, Practitioners and Public.	A first aider will be always present with a fully complete first aid kit to hand. The first aider will also have a mobile phone with guaranteed signal. The children will be in the current ratio for the child's age (preschool children above three years of age will be present in a 1-8 ratio).	Low
The animals in the environment the activities are based.	Learning about the animals we share our world with and acknowledge their presence and impacts they can create to us. Understanding the cycle of the animals.	Animal Waste – Infection to children through oral consumption. Passed to practitioners through physical touch unknowingly to be consumed.	Children and Practitioners.	A practitioner will preview the outdoor space to clear any animal waste left in the environment. All staff members will be cautious when handling the children. Children will be shown what the animal waste is and advised to avoid the waste. Waste bags will be brought in precaution to more animal waste to be found post previsit to the outdoor area.	Low

Experience exploring outdoor space in photograph	How will young people BENEFIT from this activity?	Hazards and associated risks	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk after precautions RATING: L/M/H
Physical hazards and things to be careful with; rocks, slippery patched ect.	Children will gain special awareness and learn to be cautious with their surroundings and how to alter the environment to create a safer space to learn and have fun.	Slips, trips and falls – Bumps cuts and bruises.	Children, Practitioner s and Public.	A first aider will be always present with a fully complete first aid kit to hand. The first aider will also have a mobile phone with guaranteed signal. The children will be in the current ratio for the child's age (preschool children above three years of age will be present in a 1-8 ratio). A member of staff will preview the outdoor environment to ensure that the space is appropriate for the children and cleared of objects in which could inflict harm on the children.	Low
Tavel to the Outdoor Environment being used during Outdoor Learning	Gain knowledge of road safety.	Moving vehicles.	Children and Practitioner s.	All children attending the outdoor environment will require to wear a high visibility reflective over vest which will allow all children to be clearly spotted by drivers. An explanation of road safety will be demonstrated to all children. The children will be in the current ratio for the child's age (preschool children above three years of age will be present in a 1-8 ratio).	Low

Section 4 (1225/1800 words)

Supporting early years children in engaging with mathematical and scientific concepts in outdoor environments is crucial for their holistic development (Robertson, 2017). This essay will evaluate various theoretical frameworks, research findings, and practical strategies employed by adults to facilitate such learning experiences. The discussion will encompass the integration of loose parts, affordance, open-ended play, sustained shared thinking, observation, curiosity, Reggio Emilia approach, and insights from prominent theorists such as Bruner, Piaget, Vygotsky, and Froebel. Additionally, it will touch upon specific research documents and address potential barriers and challenges.

According to Flannigan and Dietze (2018), one effective approach to fostering mathematical and scientific exploration in outdoor settings is through the integration of loose parts. Loose parts are materials that can be moved, manipulated, and combined in various ways, providing children with opportunities for hands-on experimentation and problem-solving (Spencer *et al*, 2021). By incorporating loose parts such as sticks, stones, and natural materials into outdoor environments, adults can create rich learning experiences that encourage children to explore mathematical and scientific concepts organically (Olsen and Smith, 2019). For instance, children can use sticks to measure distances, observe patterns in natural materials, and construct simple structures to understand principles of balance and stability.

Psychologist Gibson introduced a concept of affordance. Stated by Fayard and Weeks (2014) It emphasizes the relationship between the characteristics of an object or environment and the actions it affords to individuals. As explored by Chong and Proctor (2019) in outdoor settings, adults can leverage affordances to create opportunities for mathematical and scientific exploration. For example, a slope in the landscape affords opportunities for children to investigate concepts such as incline, gravity, and velocity by rolling balls or sliding objects down the slope. By recognizing and capitalizing on affordances in the outdoor environment, adults can scaffold children's learning experiences and encourage them to engage with mathematical and scientific concepts in meaningful ways (Leather and Gibson, 2019).

Open-ended and child-led play are fundamental principles in early years education that promote exploration, creativity, and problem-solving (Arnott, 2019). According to Duffy (2022) when children are given the freedom to direct their play experiences, they are more likely to engage with mathematical and scientific concepts authentically. Adults can support this type of play by providing open-ended materials and prompts that encourage inquiry and experimentation (Ingleslev, 2023). For example, setting up a water table outdoors with various containers and tools allows children to explore concepts such as volume, capacity, and buoyancy through hands-on exploration and discovery.

Early childhood educators Siraj-Blatchford and Sylva introduced a concept of sustained shared thinking. According to Broady (2014) the importance of adult-child interactions is emphasized, in co-constructing knowledge and understanding. In outdoor environments, adults can engage in dialogue with children about their observations, hypotheses, and discoveries, fostering critical thinking and deeper engagement with mathematical and scientific concepts (Purden, 2016). Through open-ended questioning, adults can provoke children's thinking and encourage them to articulate their ideas, leading to richer learning experiences (Neale and Pino-Pasternak, 2016).

Observation plays a crucial role in supporting children's mathematical and scientific learning in outdoor environments (Campbell *et al*, 2018). By observing children's play and interactions with the environment, adults can gain insights into their interests, abilities, and misconceptions, allowing for targeted scaffolding and support (Pollit, Cohrssen and Seah, 2020). Additionally, adult observations can inform planning and provision, ensuring that outdoor spaces are rich in opportunities for mathematical and scientific exploration (Robertson, 2017).

Curiosity and discovery are inherent motivators for learning in early childhood (Johnson and Watts, 2018). As Heggen and Lynngard (2020) explain, by fostering a sense of wonder and awe in the outdoor environment, adults can ignite children's curiosity and inspire them to investigate mathematical and scientific phenomena. For example, adults can create scavenger hunts or nature walks that encourage children to observe and identify patterns, shapes, and textures in the natural world. By capitalizing on children's innate curiosity, adults can create meaningful learning

experiences that promote mathematical and scientific understanding (DiYanni, Cream and Diaz, 2023).

The Reggio Emilia approach, originating from the Reggio Emilia region in Italy, emphasizes the importance of the environment as the "third teacher" and values child-led, project-based learning (McNally and Slutsky, 2017). In Reggio-inspired outdoor environments, adults act as facilitators and collaborators, supporting children's investigations and inquiries into mathematical and scientific concepts (Thornton and Brunton, 2015). Through long-term projects and investigations, children have the opportunity to delve deeply into topics of interest, engaging in hands-on exploration, documentation, and reflection (Robson, 2017).

The importance of children's active engagement with their environment in constructing knowledge is highlighted through Piaget's theory of cognitive development. According to Barralouitte (2015), Piaget believed that children progress through stages of cognitive development, with each stage characterized by distinct ways of thinking and understanding the world. In outdoor environments, adults can support Piagetian learning by providing opportunities for children to engage in sensorimotor exploration, concrete manipulation, and symbolic representation of mathematical and scientific concepts (Oogarah-Pratap, Bhoola and Ramma, 2020; Kazi and Galanaki, 2020)

Similarly, Vygotsky's sociocultural theory emphasizes the role of social interaction and cultural tools in children's cognitive development (Marginson and Dang, 2017). According to Vygotsky, learning occurs within the zone of proximal development (ZPD), the difference between what a child can do independently and what they can achieve with the support of a more knowledgeable other (Daneshfar and Moharami, 2018). In outdoor environments, adults can scaffold children's learning by providing guidance, modelling, and collaboration, allowing them to explore mathematical and scientific concepts within their ZPD (Demirbaga, 2018).

The importance of play-based learning and the use of educational materials known as Froebel Gifts were highlighted by Froebel (Hoskins and Smedley, 2018). These gifts, which included geometric shapes and building blocks, were designed to promote children's exploration of mathematical and scientific concepts through hands-on manipulation and construction (Smedley and Hoskins, 2020). In outdoor

environments, adults can draw inspiration from Froebel's principles by providing open-ended materials and opportunities for children to engage in creative, exploratory play (Tovey, 2016).

Research in early years science and mathematics education provides valuable insights into effective pedagogical practices and the benefits of outdoor learning (Rintakorpi and Reunamo, 2016). For example, outdoor play positively impacted children's mathematics achievement, particularly in the areas of spatial reasoning and geometry. Similarly, outdoor experiences enhance children's scientific inquiry skills and environmental awareness.

Despite the benefits of outdoor learning, there are also barriers and challenges that educators may face in implementing effective practices. These may include limited access to outdoor spaces, safety concerns, and pressure to prioritize academic outcomes over experiential learning. Additionally, adults may require training and support to effectively facilitate outdoor learning experiences and integrate mathematical and scientific concepts into play-based activities.

In conclusion, adults play a vital role in supporting early years children's engagement with mathematical and scientific concepts in outdoor environments. By integrating loose parts, leveraging affordances, promoting open-ended play, fostering sustained shared thinking, facilitating observation and inquiry, drawing on approaches such as Reggio Emilia, and incorporating insights from theorists such as Bruner, Piaget, Vygotsky, and Froebel, adults can create rich learning experiences that promote holistic development. Research in early years science and mathematics education highlights the benefits of outdoor learning, while also acknowledging potential barriers and challenges that educators may face. Through thoughtful planning, collaboration, and reflection, adults can create meaningful outdoor learning experiences that inspire curiosity, foster critical thinking, and lay the foundation for lifelong learning.

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