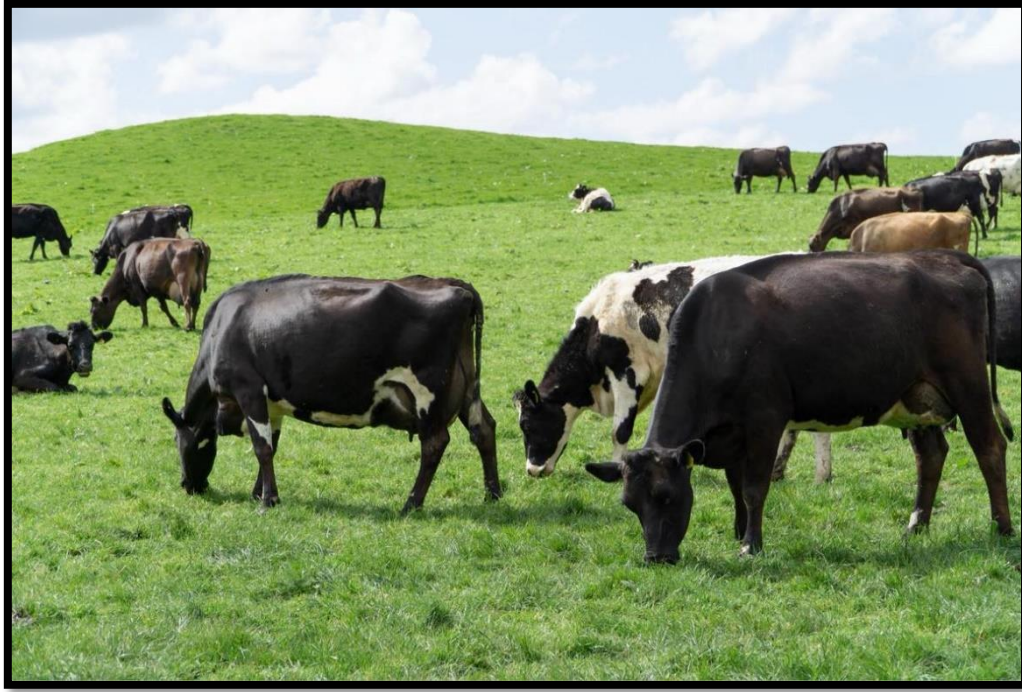


Provide a portfolio of evidence outlining how you would use an outdoor environment to promote and support children's scientific and mathematical thinking.



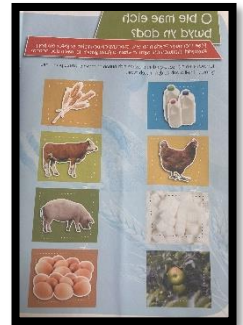
This image of cows grazing on a green hill can serve as an excellent resource for introducing young children to both scientific and mathematical concepts.

Scientific Concepts

Animal Biology and Ecology:

Diving into the fascinating life cycle of cows can be a captivating method to engage young minds with the wonders of biology amidst the great outdoors. Start by sharing that calves enter the world after a delightful nine-month journey in their mother's womb. (Fiverr, 2022) Children can witness these adorable calves in their natural habitats, evolving from sipping on their mother's nourishing milk to savouring lush grass and an array of vegetation. Eventually, these lively calves mature into robust adult cows, endowed with the ability to produce milk and reproduce, thereby illustrating the remarkable processes of biological growth and reproduction essential for sustaining animal populations. Moreover, kids can delve into the vital role cows play within the ecosystem. As cows graze on grass, they help control overgrowth while encouraging fresh plant development. (Science Direct, 2020) Their manure serves as a natural fertilizer, enriching the soil and promoting plant vitality, which in turn nurtures a vibrant array of biodiversity. Observing these phenomena in the wild allows children to appreciate the intricate web of interactions within ecosystems. Through these vivid experiences, they begin to understand how creatures like cows not only support plant life but also create habitats for insects and other wildlife.

The intriguing relationship between cows and humans is another avenue for exploration that can captivate children's curiosity. They can witness firsthand how cows contribute milk for delicious dairy creations such as cheese and butter, as well as how their meat and hides serve as resources for food and leather products. This experience introduces youngsters to the myriad ways animals enhance human existence. By observing these gentle giants in their natural surroundings, children can also investigate the concept of herbivores and the intricate food chain. Cows, as dedicated herbivores, feast on plants that have harnessed energy through the magic of photosynthesis. This energy flows to secondary consumers, illuminating for children the dynamic transfer of energy that sustains ecosystems.(Melletti and Frontmatter, n.d.)



Habitats and Environment:

Utilizing outdoor spaces to illustrate the concept of habitats and environments enables children to engage with tangible examples from the world around them. Visiting farms or lush green areas allows them to grasp that cows flourish in open spaces where they can access vegetation and breathe fresh air. Conversations about these locations highlight how cows depend on particular habitats to fulfil their survival needs, including nourishment, hydration, and refuge. Through outdoor explorations, youngsters can also discover sustainable agricultural techniques. For instance, while on a nature stroll, they might observe how farmers practice crop rotation or manage grazing to maintain the land's vitality. They can witness how minimizing chemical usage or encouraging biodiversity benefits not just the land but the entire ecosystem, including the cows. This experience aids children in comprehending the ties between human behaviours, animal welfare, and ecological sustainability. (Reproductive Biology and Endocrinology, 2014)

Animal Behaviour:

Inspiring children to observe animal behaviour offers a delightful avenue to delve into biology. By visiting farms or watching cows in their natural surroundings, kids can see cows grazing, resting, and socializing. This firsthand observation enables them to learn how cows digest their food and acquire essential nutrients for growth. These experiences also introduce the idea of daily routines or circadian rhythms. Much like humans, cows have their own daily activities, such as feeding and relaxing. Children can draw parallels between these animal patterns and their own habits, enriching their understanding of how various creatures satisfy their daily needs.(Animal Behaviour and cognition, 2017)

Moreover, watching cows throughout different seasons allows children to notice how shifts in weather and surroundings influence animal actions. For instance, cows might graze more frequently during warmer months and seek shelter when temperatures drop. Such observations deepen children's comprehension of how animals adjust to seasonal transformations in their habitats.

Weather and Seasons:

Weather and seasons play a crucial role in shaping animal behaviour, and exploring this outdoors enables children to forge a bond with nature. For example, in spring

and summer, kids can witness cows feasting on lush grass. As autumn approaches and the grass dwindles, they can envision how cows may require alternative food sources, such as hay stored by farmers. This outdoor observation can spark conversations about how farmers prepare for winter by ensuring shelter and storing food, assisting cows in surviving when natural resources become scarce. Children start to recognize the significance of human involvement in animal care and survival across various seasons.(IOWA Science Phenomena, 2022) This immersive experience reinforces the connection between animals, the changing seasons, and the human responsibility of nurturing wildlife.

Mathematical Concepts-

Counting and Grouping:

Engaging in counting and grouping activities in the great outdoors allows children to develop their mathematical abilities within a tangible environment.

For instance, invite children to tally the cows or other creatures they spot in a meadow. After they've counted, direct them to categorize the cows based on visible characteristics such as colour, size, or patterns. By sorting animals, they grasp the fundamentals of classification, learning to arrange items based on common traits. Once the animals are grouped, prompt the children to compare the categories, discussing which has a greater or lesser number of cows. (learning mole, 2024) This nurtures their skills in estimation and numerical comparison. Such activities stimulate children's logical thinking and observational skills while connecting mathematics with their natural surroundings.

Comparison and Estimation:

To illustrate size comparison, encourage children to observe the cows in the field and determine which appear to be larger or smaller. This exercise strengthens their capacity to assess relative sizes and introduces basic ideas of their view. By clarifying that cows positioned further away seem smaller, children can grasp how distance influences perception. Including estimation tasks sparks deeper mathematical reasoning. Challenge children to estimate the quantity of cows in the foreground versus those in the background or to approximate the distances between the animals. This enhances their ability to make informed guesses and introduces them to spatial awareness and measurement.

Children may also estimate the dimensions of the field where the cows roam, introducing basic principles of measurement while highlighting the significance of space for grazing creatures. These endeavours enable children to apply abstract mathematical concepts to their outdoor adventures.

Patterns and Symmetry:



Children can delve into mathematical ideas such as patterns and symmetry by examining the markings on cows. For example, some cows may display unique spots or patches, perceived as recurring patterns. (Young Mathematicians, NoDate) This familiarizes children to the concepts of sequences and patterns in mathematics. Moreover, by observing patterns in nature, like the arrangement of cows or the landscape's contours, children discover that patterns exist in both living beings and their habitats. Symmetry can be discussed by highlighting how the markings on cows or natural elements like leaves may exhibit mirrored or balanced designs. By linking these observations to mathematical principles, children develop an appreciation for the structure and predictability found in both nature and mathematics.

Spatial Awareness and Geometry:

Take kids outside to delve into spatial awareness and geometry by observing the positioning of cows in the pasture. Encourage them to articulate whether the cows are close, distant, standing in clusters or spread out. This activity aids children in grasping spatial relationships and comprehending the concept of distance. (NRICH, 2011) Introduce fundamental geometry by highlighting the shapes found in the cows' bodies and the surrounding landscape. For example, a cow's body might resemble a rectangle, while its head could be likened to a circle or oval. Identifying these shapes in real life bridges abstract geometric concepts with the tangible world, allowing children to grasp geometry in a more tangible manner.

Estimation of Distance:

Instructing children about perspective and distance can involve asking them to compare cows that seem near to those that appear further away. Guide them to notice how cows that are closer appear larger and more detailed, whereas those at a distance look smaller. This introduces them to the concept of perspective. (MDPI, 2019) Have children illustrate cows at varying distances or demonstrate the adjustments in size and detail with different objects. Connecting this to their own experiences with distance like how buildings or trees look smaller from afar, strengthens the idea that perspective changes based on where you stand. Through these engaging activities, children cultivate critical thinking skills and enhance their understanding of how distance influences visual perception in the natural world.

By utilizing outdoor settings as a learning canvas, children can interact with scientific and mathematical principles in a tactile, immersive manner. Whether they are exploring animal biology, understanding meteorological patterns, or building foundational math skills, these experiences nurture a profound connection to nature while stimulating curiosity, critical thought, and exploration. (Science Direct, 2020)



Risk Benefit Assessment:

Activity/ Location:	Farm	Date:	24/9/24
Assessor:	E.Thomas	Review Date:	26/9/24

Risk Rating System: **Green** (Low Risk), **Amber** (Medium Risk) and **Red** (High Risk)

By assessing each activity using this system, you can make a judgment based on whether the benefits of the opportunity surpass the associated risks, guiding decisions to ensure a safe, rewarding experience.

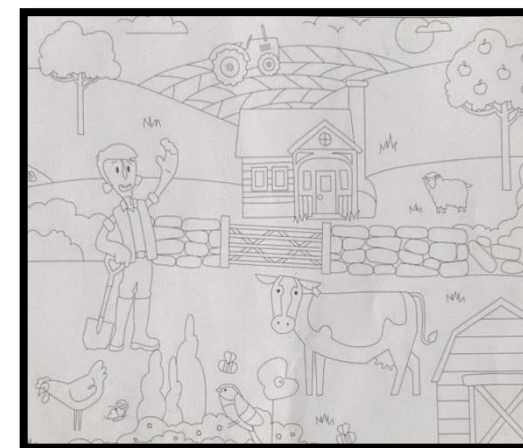
What Activity/ experience while exploring	How Benefit from activity?	Hazard and associated risks	Who at risk?	Precautions in place to reduce risk and harm/injury	Overall risk precaution. Rating: Red/Amber/Green
Animal Observation and Identification- Children can observe the cows by noting their behaviour, markings and sounds. They can also compare sizes and guess which ones are younger or older.	•Scientific learning: This activity promotes observational skills and scientific thinking, allowing children to learn about cow behaviour, biology, and the characteristics of different breeds. •Sensory development: Children engage their senses by seeing, hearing, and sometimes smelling the cows. •Empathy: Observing animals fosters empathy and understanding of other living beings.	•Safety around animals: Cows may become agitated or defensive if children get too close or make loud noises. •Allergies: Grass, pollen, or cows could trigger allergies in some children. •Biohazards: Accidental contact with cow manure or urine could result in hygiene issues, like bacterial exposure.	• Children • ALN Children • Teachers and Practitioners • Farm Staff • Cows/Animals	•Ensure children maintain a safe distance from the cows. •Educate children on how to behave calmly around animals. •Provide hand sanitizers or ensure handwashing after the activity.	R

Counting and Estimation Games- Children can count the cows in the field or estimate how many there are from a distance, they can also count how many cows are lying down, standing up or eating grass.	•Mathematical skills: This activity enhances counting, grouping, and estimation abilities. •Critical thinking: Children practice estimation, comparison, and observational skills. •Engagement: Counting cows in the field is an interactive and fun way to apply math in a real-world context.	•Overexcitement: Children may get too close to the cows in their excitement or become loud, which could agitate the cows. •Tripping hazards: Uneven terrain in the field could cause falls or minor injuries.	• Children • Teachers and practitioners • Cows/Animals • ALN Children • Children with Allergies	•Have children stay within a safe boundary from the animals. •Choose a flat, open area for counting and set clear rules for movement in the field.	G
Nature walks with Livestock- Children can walk around the field, observing not only cows but also other natural elements like plants, birds, and insects. They could then document their findings by drawing or taking notes.	•Physical activity: Walking in nature promotes physical fitness and gross motor skills development. •Environmental awareness: Children learn about ecosystems, the role of cows in farming, and how animals and plants coexist. •Mindfulness: Nature walks can help children relax and engage in mindful observation.	•Exposure to insects: Children may be bitten by insects, such as ticks or mosquitoes. •Physical injury: The uneven field could lead to tripping or falling. •Interaction with cows: Cows may block paths or become startled by the group.	• Children • Teachers and Practitioner • ALN Children • Cows/Livestock • Children with asthma or allergies.	•Choose a path that is far from cows and guide children to be calm and quiet. •Apply insect repellent and encourage children to wear long sleeves and closed shoes. •Check children for ticks after the walk.	R
Supervised livestock feeding- With guidance, children can feed the cows grass, hay, or special feed. This will help them learn about the cows diet and digestion.	•Animal care learning: Children gain hands-on experience in animal care and management. They will also learn about what cows eat and how they grow. •Responsibility: Feeding animals teaches responsibility and kindness. •Interaction: Direct interaction with animals can foster a love for nature and agriculture.	•Safety with animals: Cows may accidentally step on or nudge children while being fed. •Allergic reactions: Some children may be allergic to cow feed or hay. •Bacterial exposure: Contact with cow saliva or manure during feeding could pose a hygiene risk.	• Children • Teachers and Practitioners • Cows/ livestock • Any other visitors also feeding the cows.	•Have children feed the cows from a safe distance. Using tools or feeding stations are necessary. •Always supervise feeding activities closely. •Encourage handwashing immediately after feeding.	A

Drawing and Photographing- Children can sit at a safe distance and draw pictures of the cows or take photographs of the animals and the landscape.	•Artistic expression: This activity encourages creativity and helps children develop fine motor skills through drawing or photography. •Attention to detail: It encourages close observation and appreciation for details, colours, shapes, and patterns. •Memory building: Photographs can serve as a keepsake and memory of the experience.	•Distraction: Children may wander too close to cows while trying to get a good view or photo. •Tripping hazards: Children focusing on drawing or photography might trip over uneven ground.	• Children • Teachers and Practitioners • Cows/ Livestock • Farm Workers • Other farm visitors	•Establish a clear boundary where children must stay to safely observe the cows. •Use portable seating such as blankets or stools to keep children stationary.	G
Role-play and Storytelling- Children engage in a role-play game where they pretend to be farmers taking care of the cows, feeding them or managing the farm. Alternatively, they can invent stories about the cows daily lives.	•Imaginative play: This helps develop creativity, language skills, and social interaction. •Role understanding: Children learn about the role of farmers, the work involved in animal care and the importance of agriculture in our food supply. •Teamwork: They can work together in groups to manage their own farm.	•Overexcitement and noise: Loud play may disturb or startle the cows. •Loss of focus: Some children might wander away while engaged in role-play.	• Children • Teachers or Practitioners • Cows/ Livestock • Farm Workers • Other farm visitors	•Keep role-playing activities in a designated area away from the cows. •Ensure children are still supervised and reminded of safe behaviour around animals.	G

Conclusion:

Farm outdoor activities with cows can be incredibly enriching for children, providing valuable opportunities for learning, play, and physical development. While there are risks, they can be effectively mitigated through proper supervision, education on safe behavior, and adherence to hygiene practices. By balancing the risks with careful planning, these activities can offer immense benefits and foster a deep connection with nature, animals, and farming.



Evaluating How Adults Support Early Years Children in Engaging with Mathematical and Scientific Concepts Outdoors.

Introduction

The outdoor environment presents a unique and dynamic context for early years education, particularly in the domains of mathematics and science. This setting offers a range of opportunities for young children to explore, investigate, and understand fundamental concepts through direct interaction with the natural world. Adults play a crucial role in facilitating and enriching this learning experience. This evaluation explores how adults can support and encourage early years children in engaging with mathematical and scientific concepts outdoors, drawing on theoretical frameworks and research in early childhood education. Key ideas such as the use of loose parts, affordance, open-ended play, sustained shared thinking and the influence of various educational approaches and theorists will be discussed.

Theoretical Frameworks and Their Application

Constructivism and Jean Piaget:

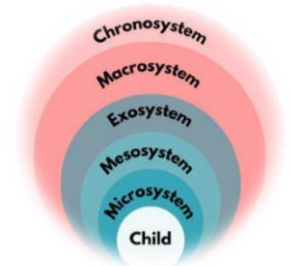
Jean Piaget's theory of cognitive evolution serves as a crucial lens for grasping how children acquire mathematical and scientific principles. Piaget's constructivism underscores that children actively build knowledge through their engagement with the world around them. (Educational Technology, 2022) In outdoor environments, this theory supports the idea that tactile experiences with organic materials and natural occurrences enhance cognitive growth. For example, when children utilize loose elements like pebbles, twigs, and foliage to construct or design patterns, they partake in concrete operational reasoning, as Piaget elucidates. Such activities foster spatial awareness, categorization, and pattern identification, all vital aspects of early mathematical education. (Very Well Mind, 2024) Adults can aid this process by offering diverse resources and promoting experimentation, enabling children to forge their own comprehension of mathematical ideas through hands-on interaction and observation.

Social Constructivism and Lev Vygotsky:

Lev Vygotsky's social constructivism enriches Piaget's theories by spotlighting the significance of social exchanges in learning. Vygotsky's idea of the Zone of Proximal Development (ZPD) emphasizes the necessity of providing assistance and scaffolding to aid children in accomplishing tasks they cannot yet tackle alone. (Early Years TV, NoDate) In an outdoor context, adults can scaffold children's learning by posing thought-provoking questions, steering their observations, and encouraging collaborative endeavours. For instance, if children are investigating a garden, an adult might inquire, What catches your eye about the various shapes of leaves? or How many unique colours can you identify? Such inquiries prompt children to think critically and engage in ongoing shared thinking. By offering suitable support and promoting dialogue, adults assist children in cultivating a richer understanding of scientific and mathematical ideas. (Educational Technology, 2020)

Ecological Systems Theory and Urie Bronfenbrenner:

Urie Bronfenbrenner's Ecological Systems Theory highlights the interplay between individuals and their numerous environmental contexts. (Explore Psychology, 2024) This viewpoint accentuates how various layers of the environment, including the immediate outdoor space, affect children's growth and learning. In outdoor settings, Bronfenbrenner's theory stresses the value of providing diverse and enriching experiences that resonate with children's immediate surroundings. For instance, investigating different soil types, water sources, or plant varieties grants children insights into ecological processes and mathematical concepts like measurement and comparison. (First Discoverers, 2018) Adults can amplify these experiences by creating opportunities for children to connect with their environment in significant ways, such as measuring rainfall or observing plant growth.



Source: Image, Explore Psychology, 2024)

Phenomenology and Maurice Merleau-Ponty:

Maurice Merleau-Ponty's phenomenological approach highlights the significance of sensory and embodied experiences in the formation of knowledge. According to Merleau-Ponty, learning is rooted in direct sensory engagement with the surroundings. (Britannica, 2019) Outdoor settings align well with this perspective, as they provide rich sensory experiences that are crucial for understanding scientific and mathematical concepts. For instance, touching the textures of various materials, witnessing the shifting colours of the sky, or hearing the melodies of nature enables children to develop their observational abilities and scientific reasoning. Adults can facilitate this by motivating children to utilize their senses to investigate and articulate their surroundings, thus merging sensory experiences with intellectual learning. (Literacy, Theory and Criticism, 2017)

Pragmatism and John Dewey:

John Dewey's pragmatic ideology underscores the importance of learning through experience and tackling real-world problems. Dewey championed an education system that links theoretical understanding to practical experiences, an idea that finds great relevance in outdoor contexts. (Stanford Encyclopedia of Philosophy, 2018) Nature's surroundings offer genuine scenarios for children to implement mathematical and scientific principles. For example, measuring the height of a tree or tallying the variety of insects in a given area allows children to utilize their knowledge in tangible situations. Adults can bolster this by orchestrating activities that promote exploration and problem-solving, thereby reinforcing Dewey's belief in learning through action.

Key Concepts and Strategies

Loose Parts and Affordances:

Incorporating loose parts such as natural elements and commonplace objects, enhances children's interaction with mathematical and scientific ideas by presenting limitless opportunities for exploration and innovation. Loose parts foster experimentation, problem-solving, and critical thinking, which are essential for learning in these fields. Affordances indicates the potential actions that an object or environment enables. (Cankaya et al, 2023) In outdoor spaces, loose parts offer a multitude of affordances that can support various learning endeavours. For instance, a collection of leaves may facilitate sorting, counting, or pattern-making tasks, while stones could serve for measuring or building. Adults can amplify these chances by thoughtfully choosing and providing a diverse array of loose parts, encouraging children to investigate their characteristics and applications. (Exchangepress.com, 2015). This method nurtures a richer understanding of mathematical principles such as numbers, shapes, and measurements, in addition to scientific concepts related to materials and natural phenomena.

Open ended play:

Open-ended and child-directed play is essential for nurturing curiosity and involvement in early childhood education. Such play empowers children to steer their own learning journeys, delve into their passions, and cultivate their ideas within a versatile and encouraging atmosphere. (HFL Education, 2023). Nature rich environments naturally facilitate open-ended play, presenting a large amount of stimuli and chances for discovery. For instance, kids might utilize sticks to create designs in the soil, construct buildings from natural elements, or observe and document shifts in the weather. Adults can enhance this experience by fostering an atmosphere that promotes experimentation, offering minimal guidance, and allowing children to pursue their own interests and inquiries. (Evans. E, 2022) Child-led play also nurtures sustained shared thinking, where adults and children come together to investigate concepts and tackle challenges. By listening to children's thoughts, posing insightful questions, and participating in collaborative activities, adults can amplify children's thinking and enrich their grasp of mathematical and scientific ideas.

Sustained Shared Thinking:

Sustained shared thinking involves continuous dialogue and interaction between adults and children that bolsters cognitive growth. This technique is particularly fruitful in outdoor scenarios, where children's wonder and observations can be examined thoroughly through discussion and cooperative exploration. (Brodie, k, 2012) For example, if kids are watching the behaviour of insects, adults can involve them in conversations about their observations, pose questions that stimulate deeper contemplation, and motivate them to formulate predictions and validate their hypotheses. This engaging process aids children in developing their scientific reasoning and mathematical skills while also enhancing their communication and teamwork abilities. (Nursery Story, 2021)

Observation and Assessment:

Observation serves as a vital tool for comprehending and supporting children's learning in outdoor settings. By carefully observing children's engagement with their environment, adults can discern their interests, strengths, and avenues for further growth. Assessment in outdoor contexts goes further than simply evaluating children's performance. it encompasses recognizing their engagement levels, exploratory processes, and problem-solving approaches. Adults can leverage observation to customize their support, present suitable challenges and plan forthcoming activities that align with children's interests and developmental requirements.(North Central Michigan College, 2021)

Creative Educational Strategies

Reggio Emilia Methodology:

The Reggio Emilia approach highlights the environment as the “third teacher,” cherishing the significance of children’s curiosity and exploration. This philosophy complements outdoor learning, as it motivates children to engage with their surroundings and articulate their understanding through varied forms of expression. (Reggio Children, 2022). In natural settings, the Reggio Emilia approach advocates for the use of organic materials and imaginative play to nurture inquiry and innovation. Adults can enhance this by crafting enriched learning atmospheres that ignite exploration and contemplation, and by documenting children’s journeys to illuminate their thinking and encourage further discovery.(Day nurseries.co.uk, 2024)

Friedrich Froebel and Nature-Based Learning:

Friedrich Froebel's educational philosophy, which embraces nature and outdoor play in early education, underscores the value of children's natural curiosity and the significance of play in the learning process. (Early Education,2021) Froebel's notion of “free play” aligns with allowing children to investigate and learn through their interactions with the environment. In outdoor contexts, Froebel's principles can be realized by offering chances for unstructured play and exploration, urging children to connect with the natural world and partake in significant activities. Adults can enhance this experience by honouring children's independence, facilitating their play, and weaving natural materials and experiences into the educational landscape. (My Teaching Cupboard, 2024)

Conclusion

Supporting young children's engagement with mathematical and scientific concepts outdoors involves drawing on a range of theoretical perspectives and practical strategies. The integration of constructivist, social constructivist, ecological, phenomenological, and pragmatic theories provides a comprehensive framework for understanding how adults can facilitate learning in outdoor environments. By utilizing loose parts, promoting open-ended play, engaging in sustained shared thinking, and

applying educational approaches such as Reggio Emilia and Froebel's principles, adults can create rich and meaningful learning experiences that foster children's curiosity, problem-solving skills, and understanding of mathematical and scientific concepts. Despite challenges, the benefits of outdoor learning in supporting early childhood education are significant, offering children opportunities to explore, discover, and connect with their environment in meaningful ways.

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