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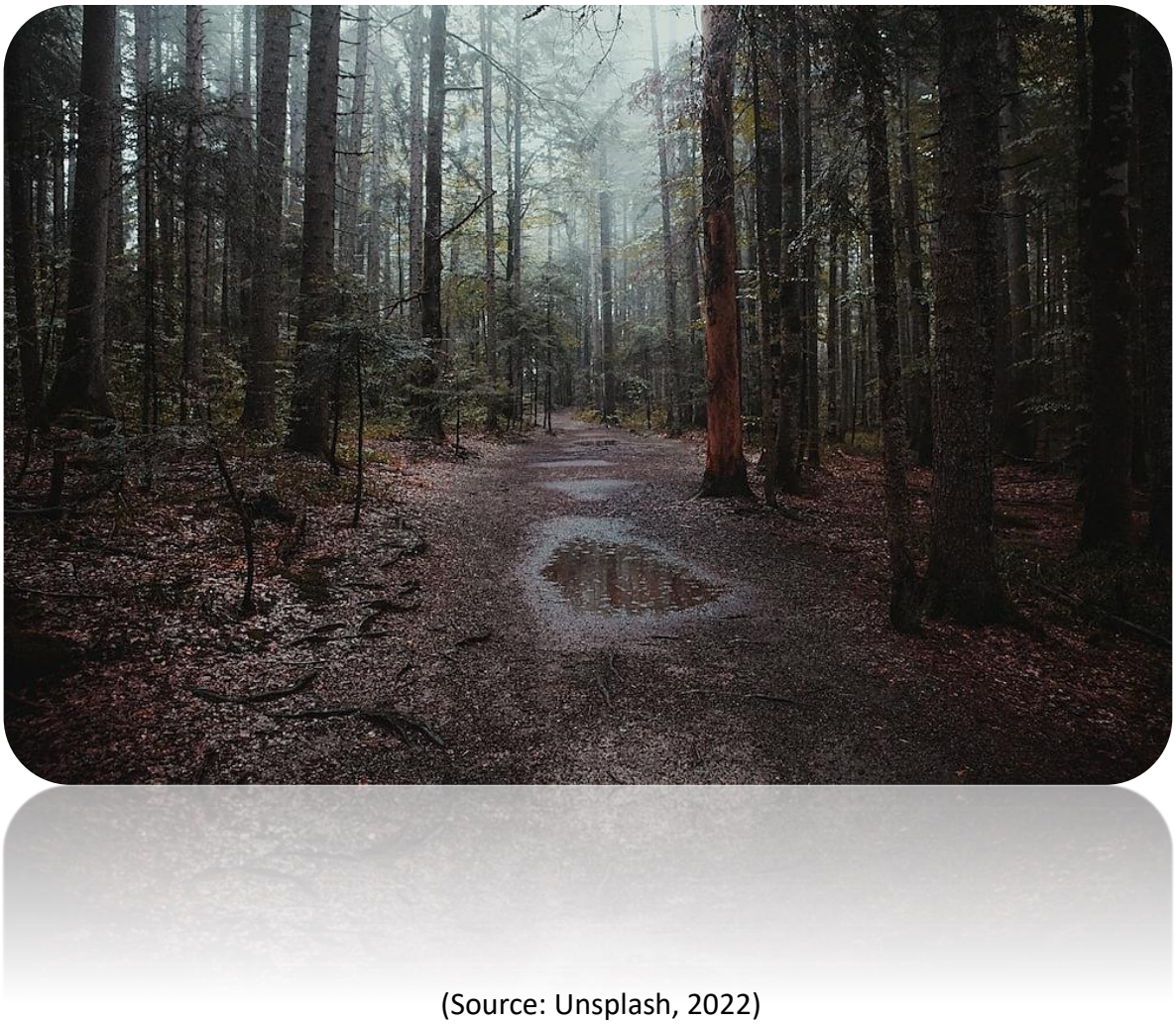
1602015
Word Count: 4215

Awe and Wonder – science, mathematics, and the outdoors

Part 1:



(Source: Unsplash, 2022)

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Part 2:

Learning Journey

An Autumn trip to the Woods on a Rainy day

(Source: Unsplash, 2022)

Name: Child A

Date: 8th September 2022

9:15am

(Source: iStock, no date)

The sound of the rain from inside the bus captured his attention, it was loud! Child A was excited! He began counting each raindrop on the windowpane and with his 'pointy finger' started following each droplet down the glass, "1, 2, 3, 4, 5, 6, 7"; He was laughing as he tried to keep up with the many droplets aware of how fast and numerous, they were. Distracted by the misty window caused by his own breath, Child A began making shapes including rectangles and circles. Unaware that he was intrigued by the process of condensation; he continued to breathe on the glass, smiling as he proceeded to wipe away the mist, taking long, deep breathes and then shorter quicker puffs while observing the cause and effect of his play. Child A was happy and fully engaged. Suddenly, he turned to his friend and expressed, "I can't wait to go outside in the rain!"

9:30am:

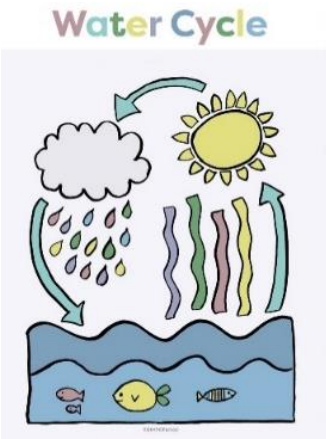
(Source: Active for Life, 2014)

Everyone climbed off the bus, and we found ourselves surrounded by a tunnel of trees, fallen autumn leaves in various colours of brown, red and yellow, and a wide, long, open pathway full of puddles of different sizes and depth. There were many pockets of spaces to explore within the woodland, including sticks of different lengths and stones of varied weight. I placed an empty tray on the ground, and I suggested if anyone finds something interesting to place it in the tray for us to sort through later.

It was still raining, and Child A gaged the many puddles surrounding him and crouching down he began pointing out the rippled patterns caused by the rain. Child A suggested to his friend "the rain is falling from the sky and making all these pretty patterns in the puddles, it's like a small circle growing to a big circle!" Suddenly everyone was running and splashing from puddle to puddle, laughing with each other and enjoying the cold wet sensation on their faces.

Many questions they would explore together, such as where the rain comes from, why the wind blows, how the seasons change and life cycles of bugs, trees and plants. Together they were developing a curiosity for the science and maths behind their present joyful moment.

9:45am:



Child A was pondering in Awe and Wonder; he approached me and asked curiously, “Miss, how did the rain get in the clouds?” Suddenly the rain stopped, and some warm, bright rays of sunlight began to peep through the trees. This caught his attention as he observed the warm light resting on the puddle. Before I could respond, Child A pointed at the sun and then to the puddle, suggesting, “I know! The hot sun will dry it all up and take it away and put it in the clouds ready for next time!” And with that, Child A ran away and continued to splash in the puddles. In his own little way, Child A was exploring the process of the water cycle and the vital role of the sun for evaporation.

(Source: Scandiborn, 2022)

10:00am:

The children began to explore. Some were collecting and sorting leaves into colour groups; other’s investigating the patterns on them using magnifying glasses, counting, matching, and feeling the textures with their fingers; some children were smiling as they observed their reflections in the puddles, others played tag chasing each other’s shadows and some were curiously discovering bugs while making mudpies. (Source: Paulo Sousa, 2021)

Child A and B were collecting stones of different weight and size throwing them into the puddles, excitedly, watching to see who had the best stone to make the biggest splash. Child A shouted, “the big ones are the best!” Child B replied, “Let’s find more big stones and do it again.” I gaged their interest and placed a tree stump next to their puddle and a long plank of wood across the top to create weighing scales. I explained to the children that some stones will be heavy and other’s light. I modelled it for them by placing a small stone one side and a big stone the other, they observed curiously and then I stepped back. It wasn’t long before they discovered the heavier stones forced the scales down while the lighter stones were forced up. They gathered all their heavy stones to one side, counting them all and sharing them out evenly between them, and so continued throwing them into the puddle. After a while, they began finding other natural objects such as leaves, twigs, feathers, and acorns. It wasn’t long before they discovered, the heavy items sunk to the bottom of the puddle and the light ones floated on top.

10:30am

Child A was walking in and out of the trees kicking the leaves. Intrigued by the various colours, he came running over, “Miss, why is this leaf brown and this leaf green?” Since Child A is aware of the different seasons, I asked him for the last season that he could remember the leaves being green; Child A replied, “Summer”, and I proceeded to ask what the weather is like in Summer, and he replied, “hot and sunny”. After pondering a moment, Child A proposed, “It’s Autumn now, and it’s not hot and sunny anymore, so the leaf turns brown.” With a magnifying glass, Child A began looking closely at the leaves, identifying specks of colour on the green leaf, small spots of yellow and brown, understanding the process this leaf was going through because of the change in season and weather.

(Source: Jacob Lund Photography, 2020)

10:45am:

(Source: Creative Star Learning Ltd, 2011)

Child A and B were gathering sticks and twigs. Child A was explaining, “we need so many”, Child B stated, “I will find all the long ones”. Child A protested, “No, I want to find all the long ones”. I intervened and suggested, what about the shorter sticks? Child A agreed and decided to find the shorter sticks. I stood back to observe their play. Child A volunteered to lay down on the ground suggesting Child B use the sticks to see how tall he is. From head to toe, Child B placed the sticks and when finished suggested Child A do the same. Suddenly they were both standing and comparing heights. I asked them curiously, “Who is the shortest and who is the tallest? Child A responded, “I found all the short sticks and I am the shortest!” Child B yelled, “And I am the tallest!” I then suggested they order the sticks now from shortest to longest.

11:00am:

It was almost time to go and so I gathered everyone for a short circle time. Throughout the morning, children had been collecting Autumn objects and placing them into the tray. We took time to look, touch, smell and listen as we discussed the objects. Everyone shared in sorting, matching and counting; new vocabulary related to Autumn was learned, including new discoveries about the change of season and weather conditions. I was pleased to have observed the many scientific and mathematical concepts the children were discovering, exploring, investigating, and engaging in. This natural, authentic space provided many

stimulating opportunities to inspire Awe and Wonder, and Child A engaged entirely, asking questions, identifying problems, and finding solutions (Welsh Gov, 2022), Da iawn, Child A!

(Source: Play of the Wild, 2020)

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Part 3:

RISK BENEFIT ASSESSMENT

Location / Activity:	Exploring the outdoors on a cold, windy, rainy day - Woodland	**Date:**	8th September 2022
Assessor:	Amy Muriithi	**Review date:**	8th March 2022

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 whethe 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
Exploring characteristics of Autumn including colder, wetter, windier weather conditions.	Develop an awareness of the changes in seasons and the characteristics of those changes e.g., leaves changing colour and falling off the trees; less sunlight, a drop in temperature; more wind and rain compared to Summer. Develop a curiosity about the water cycle – where does rain come from? How does the clouds fill up with rain? Why does it rain? Where	Hypothermia due to cold weather conditions and cold water. If wind speeds are high, trees could fall, objects and people could be blown over, and injuries could occur as a result. Slippery surfaces due to rain which could cause slipping and sliding, particularly in the muddier areas in and	Staff and children.	Ensure the weather is checked before taking the children on the walk. This is to be sure wind speeds are safe and there's no weather warnings that suggest avoiding the outdoors. Ensure children and staff are dressed appropriately for the weather for example, layers of clothing for good insulation, good walking boots/wellies and waterproof coats and trousers, hats, scarves, gloves, and earmuffs for children with sensitive ears. Shoes/wellies with good grips. Golden rule, children must walk until they are familiar and comfortable with their surroundings.	L

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
	does the water go next? Use of senses to explore the characteristics of Autumn including wind and rain e.g., the wet feeling of rain on their faces; the sound and sight of the wind on the trees and the cold sensation as it touches their face; the fresh, crisp smell of the Autumn air and the crunchy sound of leaves under their feet.	around the trees, resulting in injury. Head and eye injuries if they walk into low branches or fallen down trees due to the impact of the wind.			
Splashing in puddles	Develop a curiosity for the water cycle. Gross motor development as they explore the nature of movement; how the body works in terms of movement. Exploring the ripples/patterns /reflections in the puddles,	The ground under the puddle could be uneven, slippery and/or deeper than expected; the muddy water could make it hard to see clearly, resulting in injury due to loss of balance.	Staff and children	Staff members assess the puddles to check the depth and as above, golden rule children walk until they are familiar and comfortable with their surroundings.	L

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
	how it changes and the sounds.				
Walking/running on uneven ground on the main walk path and/or further into the woodland spaces on either side.	Discover different ways to move e.g., crawling, rolling, jumping, tip toeing, climbing, sliding. Develop co-ordination, enhance spatial awareness, improve balance, strengthen muscle and bones. Exploring different gradient, height, and depth including textures e.g., soft grass, crunchy leaves, wet puddles, soggy mud.	Children and adults could easily slip and fall on uneven ground, trip on sticks or wobbly stones, or fall because uneven ground has been hidden by leaves/puddles. This could cause sprains, breaks, fractures, cuts, bruises, and head/eye injury.	Staff and children	Staff to check the surrounding area to assess if there are any spaces that should be out of bounds because the risk is too high for this stage of development. Golden Rule – children are to walk until they are familiar and comfortable with their surroundings.	L
Collecting Autumn objects e.g., sticks, stones, leaves, concurs, acorns.	Developing mathematical concepts e.g., counting, matching, sorting, more, less, many, few, big, small, long, and short.	Children could pick up natural objects that are sharp or too heavy e.g., sticks and stones, and could cause	Staff and children	Staff to check surrounding area and dispose of items safely if they could cause harm. Explain to children that there are some things that we must not touch and if they are unsure to come and ask a member of staff. Talk about what things could be	L

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
	Identifying scientific concepts e.g., what makes heavy and light including floating/sinking, why leaves change colour in Autumn, life cycles of trees/plants and other living things. Physical development is explored both through gross motor and fine motor, reaching, bending, lifting, stretching.	splinters, cuts, pulled muscles and infections. Unaware of danger, children could pick things up that they shouldn't e.g., animal poo, litter that has been thrown, broken glass. Children might have a reaction to a poisonous plant.		new or unfamiliar and show pictures to support them so they can identify such things to avoid. Golden rule – children are not to put anything in their mouth, and they must wash hands at the end.	
Finding/identifying/exploring and investigating, insects, and plants.	Developing an awareness of living creatures exploring their life cycles, and their habitats learning how to treat them respectfully with care and kindness. Since Summer has now developed into Autumn, children may be starting to understand the	Children might have a reaction to an insect bite. Children could react to a poisonous plant. Children may eat poisonous berries.	Staff and children	Talk about what things could be new or unfamiliar, things to avoid touching – have some visuals to show the children before they explore e.g., foxglove, which could still be present in woodland areas in September, although it is beautiful to look at, it is extremely poisonous. Explain to children they must not touch any of these visuals that are being shown and if they are unsure, they must ask. Golden rule – nothing must be put in their mouth and wash hands when finished including if they have touched anything that could cause a reaction e.g., poisonous plants.	L

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
	importance of bees and the value of plants even if they are poisonous to touch e.g., foxglove plants are loved by bees and could be found in the woodland during Autumn. Children may find blackberries and pick them, supporting mathematical development including counting, more, less, many, few.				
Child led scientific/mathematical adventures	Children exploring their own ideas and passions within the woodland without being told what/how to play.	Children could wander away from the group and get lost or hurt.	Children	Ensure there are boundaries for the children e.g., red ribbons creating the outline of the play space explaining to them that they cannot go beyond the ribbons. Ensure every child/adult is wearing a high vis jacket so everyone can be easily identified. Stranger danger conversations.	L

Part 4:

Mathematics and Science are 2 subject areas that work closely together, and their intertwined relationship is crucial to them both, maths being an essential element of science, and, in a reciprocated manner, science inspires and stimulates maths (Dr. Wright and Prof. Chorin, 1999). Research suggests that from inside the womb mathematics and science are already being explored, developing babies are curiously exploring the biology of their very existence before they have even entered the outside world; as they grow through the unborn stages, they begin to engage with their senses (The National Children's Bureau, no date). The first stage Piaget suggests is from birth to 18 months, the sensory motor stage (Woolfson, 2001), but one might argue that this stage begins long before birth because at 10 weeks gestation they move and wriggle, stretching their limbs, already exploring movement and force; at 23 weeks gestation they discover sound, hearing mum's heartbeat, her breathing, her blood pumping and her unique voice; they begin to experience the taste from the foods she is eating; and responding to the sensation of her gentle touch (Metland, no date). Furthermore, young children are naturally exploring science and maths in the world in which they live, investigating and experimenting curiously both indoors and out, but for the purpose of this assignment, outdoors will be the focus for example, children might explore a park, a beach, a river, a woodland, a garden, or their school/nurseries outdoor provision (Russel, 2022).

Bruner believed children learn through discovery, developing their own understandings without first being taught; he thought this to be effective learning (First Discoveries, 2022). Similarly, Piaget agrees, suggesting children are like 'little scientists' creating their own theories; he understood the value of allowing them to explore their ideas by stepping back without teaching/correcting them too quickly, allowing for a natural process in learning and developing, therefore allowing for open ended and child-led play with the adult acknowledging observation as a vital role for a practitioner (David, 2006). Piaget believed in developing creative and innovative minds capable of discovery, by enabling experiences related to everyday life. He could appreciate that cognitively, a child is different from an adult, yet within the framework of the child's mind, their ideas make perfect sense, for

example, if a 2-year-old expresses that the moon has gone to bed because he is tired, this does makes sense (Davidson Films, 1973). Albert Einstein once said, “I never teach my pupils, I only attempt to provide the conditions in which they learn”; Montessori agrees and like Piaget, she believes in allowing the process of learning to unfold naturally, celebrating individuality, and creating excellent, holistic learning environments for them to grow; for example, practitioners might consider a cross-curricular learning environment where children are not merely focussed on one area of development but exploring a variation. Contemplate a child playing in the mud kitchen in the garden, stirring mud and water in a pan to make her baby porridge for breakfast. As she plays this role, she is identifying, discovering, and exploring mathematical and scientific concepts of chemistry, biology, and physics such as, measuring, counting, observing changes in consistencies, bending, and stretching, while also developing language, literacy, and imagination by recording, recalling, communicating, and creating (Charlotte Mecklenburg Schools, no date; Waters-Davies, 2022). Equally, Welsh Gov (2015) suggests that learning should be an endless practice, children developing gradually as they grow and mature. According to Welsh Gov (no date), the outdoors provides an excellent learning environment for children, offering unique experiences for them to be creative, problem solve, hypothesize, investigate, and take risks; it allows for exploring different stimuli such as the weather conditions, the seasons, sound, smell, and texture. If children are interacting first hand with wildlife, observing how plants and animals respond to different seasons and weather changes, they can develop a love and respect for nature, becoming ethical informed citizens within their outdoor surroundings; all these features can link to the development of both mathematics and science (Welsh Gov, 2015).

However, research suggests that many early years settings battle with a lack of adequate play space outdoors. In 2015, over 400 settings in the UK took part in a survey and results revealed that there is a lack of, space, resources, appropriate training, positive attitudes and concerns for health and safety, including Education and Care policies and regulations hindering an outdoor focus. These challenges are preventing young children from developing in the outdoors (Davey, 2016; Nursery World, 2016). According to Learning through Landscapes Trust (2020-2021) in their Annual Report, outdoor play should be acknowledged as an essential part of education, no matter the age and stage of

development. Furthermore, Wales is a country that promotes the importance of play, including the quality of provision that encourages the exploration of the natural word, for example, practitioners allowing children time, space and permission to investigate varied weather conditions, trees/plants, bugs and soil; a space that is rich in play opportunities, one which invites flexibility, adaptability, and variety of interest for example, natural objects like sticks, stones, leaves and furthermore, loose parts like crates, logs, tyres, tarpaulin, pipes. This increases the possibilities of development including, socialising, creativity, resourcefulness, challenge, and choice within the context of mathematics and science and it should not be ignored. According to article 31 of the Un convention on the rights of the child, children residing here in the UK must be allowed access to play activities (Welsh Gov, 2014; *Children and Families Measure 2010; Unicef, no date).*

So, how might practitioners break through these barriers and challenges to enable mathematics and science to be explored in the outdoors? Learning through Landscapes (no date) have over 30 years' experience and believe practitioners could consider relevant training. They provide workshops equipping practitioners with knowledge and understanding on how to make the best of their outdoor space by building on their own ideas as a staff team within their setting, reviewing, and reflecting on their existing practise and addressing their individual settings current obstacles. Their course provides insight to shared vision and values concerning outdoor play; explores the planning and creation of exceptional spaces; and encourages and supports staff confidence, abilities, and knowledge. Furthermore, trained practitioners who are equipped to provide an outdoor learning space to support young children's mathematical and scientific development are also supporting the Donaldson curriculum and the Foundation Phase for learning in the outdoors; children who are provided with exceptional spaces can become ambitious, capable learners; enterprising, creative contributors; healthy and confident individuals and ethical informed citizens who are progressing in the joys of challenge; building upon current knowledge and applying it in varied contexts; asking questions and solving problems, all while exploring mathematical and scientific concepts but playing leading roles within their child initiated play (Harris, 2019; Welsh Gov, 2015; Welsh Gov, 2014; Welsh Gov, 2009). If practitioners are trained adequately for outdoor learning, they can provide a space that enables this learning and development effortlessly, simply by seeing the opportunities the space

provides, including resources provided by the practitioners themselves, or by nature itself, for example, practitioners might provide magnifying glasses and clear containers for bug hunts, whereas nature provides the soil, rocks, leaves and logs to explore the bugs habitats; both allow for discovering and investigating curiously that which is the beauty of shape, symmetry, colour, organisation, order, pattern and quantity; maths which help to set the very foundation for later learning; a curiosity that explores and investigates the world in every aspect and furthermore, stimulating critical questions such as why, how, when and what, such questions that fuel science (Wisbey, 2018). By providing such outdoor spaces for learning, practitioners are supporting children in becoming competent as they learn through doing. Dewy believed this is important and enables children to be actively interacting in their learning process; but also ensuring they are supported by practitioners who have provided a space that creates opportunity for excellent developmental results. Practitioner might consider the following questions when planning their outdoor environments:

- How can this space help the children grow?
- What skills are the children exploring?
- How does the environment expand what they currently know?
- How can the experiences enable them to learn more about their world?
- How can the explorations enable them to reach their fullest potential (Malone and Tranter, 2003, p. 283–303; Wisbey, 2018).

Malaguzzi supported this with his role in the unfolding of the Reggio Amelia approach; his philosophy suggests that practitioners should be advocating for children by seeing them as curious, competent, knowledgeable beings full of potential interested in the world around them. He suggests, the environment to be their teacher and the teacher being their guide. Furthermore, this approach proposes practitioners observe the children's curiosities, intentionally learning what they currently know and the challenges that they face; by doing so they construct their work and the environment appropriately, including sustain shared thinking between the children, other staff, and families; everything is connected and in relationship and by doing so maths and science can be explored greatly in the outdoors. Malaguzi was a believer in children constructing their own understanding through experiences, and he believed everyone has an equal voice in learning, therefore suggesting

collaboration is crucial (Grand Rapids Child Discovery Centre, no date; The Compass School, 2017).

To conclude, it has been learned that babies are exploring maths and science from the early weeks of life inside the womb, and thereafter into the early years of childhood and beyond. With concepts being explored curiously every day, children are engaging in new discoveries, identifying life cycles, problem solving, creating, and taking risks in the name of maths and science. It is evident that the outdoors is an essential space that practitioners should use to provide support and encouragement of the ongoing development of scientific and mathematical concepts, and it must be understood that these learning subjects are intertwined in many ways, both science and maths working together in unity through enabling adults, enabling environments, and enabling experiences. Furthermore, nature has an abundance of resources to engage the early learning of the youngest of children and creates opportunity for a love and passion for learning these skills for example, movement, force, measurements, weight, length, sorting, matching, order, shape, consistency, and symmetry. However, it has also been suggested that there are many barriers and challenges that might obstruct the scientific and mathematical learning in an outdoor space and recommended that early year's practitioners undergo relevant training to provide exceptional support for the growing development within this area of learning. Practitioners must value the importance of provision and observation, allowing young children to learn mathematical and scientific concepts through hands on experiences outdoors – allowed to joyfully ponder their explorations with both Awe and Wonder.

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