Section one

(Source: Poole, 2021)

Section two

Upon assessing the photograph in section one, many features that can potentially enhance a child's scientific and mathematical thinking have become clearly visible.

Feature one – Living Things

It is visible that various living things within the photograph can support a child's scientific learning. Living things in the outdoors such as the plants and trees can offer developmental enhancements to children of any age for example, allowing the child's fine and gross motor skills to develop (DCELLS, 2008). Feature one allows children to understand the life cycle of each living thing outdoors, how they grow, and their meaning of life. Children have the opportunity to explore areas with this feature all-year round, allowing them to understand the seasonal cycles, how the flowers and trees change during environmental changes, and how the leaves change colour during different seasons for example during Autumn time, when the leaves turn yellow, orange, and red then start to fall, creating a crunchy and colourful pathway for children's exploration. Feature one provides knowledge and understanding of different textures the leaves may have during seasons, the stems on flowers, and the bark on the trees. Within this feature, children's mathematical thinking can be challenged too, allowing children to be creative through mathematical concepts. During seasonal changes, children may have the opportunity to create patterns or sequencing of leaves and branches, sorting through colour, texture, size, or type.

To develop this feature further, children must have the opportunity to explore this area during every season, allowing the children's knowledge and understanding of how and why the living things adapt during each season, to fully enhance through experiencing the changes hands-on. To enhance the children's experiences within the woodlands, magnifying glasses could be provided to support the children's curiosity. It provides the children with the opportunity to explore further and in more depth to identify smaller living things

within the woodland, for example insects living beneath the soil, on the bark, or on the flowers. This supports the Science and Technology area of learning, enhancing children's knowledge about the life cycles and the understanding of environmental changes (Welsh Government, 2020e). Children may identify specific textures or prints on the bark. Buckets could be provided, enabling children to collect different woodland living items to openly compare and sort their findings, supporting children becoming ambitious and capable learners in line with the Curriculum for Wales 2022, Mathematics and Numeracy cited in Welsh Government (2020a).

Feature two – Uneven surfaces and muddy grounds

Uneven surfaces and muddy grounds have been chosen for feature two. The open-ended feature stated can provide children with the opportunity to promote and explore scientific concepts in natural environments such as forces, gravity, and energy. Whilst exploring the photographic area, children have the opportunity to explore surfaces of which include raised surfaces, slopes and ramps. Not only does this feature support children's scientific thinking skills, but it also provides children with experiences of learning how to walk on uneven ground, enhancing their cognitive thinking and support their balance (Welsh Assembly Government, no date). Children could experience the textures on the ground of which they walk and play on. In line with the Mathematics and Numeracy area of learning, it allows them to extend their sensory skills as well as their vocabulary. Children may investigate how the mud path has been created for example, large quantities of small and big stones.

However, to develop this feature further, many loose parts such as marbles, tyres, balls, hula hoops and conkers could be provided to enhance the children's critical and creative thinking. By providing such open-ended resources, children's Scientific thinking can be challenged, allowing experimentation with the movement of many resources and the children to become creative contributors (Welsh Government, 2020c). Children could use the resources to roll up and down the slopes and uneven surfaces to identify where additional force is necessary and how the mass of each resource will provide different results, supporting their mathematical development. This

feature may additionally provide enhancement in other areas of development, for example the child's social and physical development allowing their well-being to be supported. Children could also be provided with water to experiment how the surfaces change solidity when liquid is added, or this could be supported during an additional rainy day. By doing this, in line with the progression steps, it could provide children with experiences to new textures, learning about solids and liquids, describing how the materials change and if it causes the resources to roll up and down the hill at different paces, supporting problem solving skills and the Science and Technology Areas of Learning, cited in Welsh Government (2020d).

Feature three

Feature three has been chosen to support the children's Science and Technology areas of learning. From the photograph, it shows that light and dark can be an effective area of learning for the children to be challenged in. Children can experience how the light and the sun can travel through the trees and their branches. This allows children to further their developmental experiences through learning how the shadows and shaded areas in the woodland are made with the direct sunlight and enhance their scientific concepts and vocabulary (Montessori Centre International, 2020).
To support the children's mathematical thinking, children will have the opportunity to compare the difference sizes in shadows of the trees as well as their own bodies. This promotes team working and social skills.

To develop this feature further, children could be provided with resources such as rulers to measure the shadows of their peers, the trees, or the flowers. They could be provided with opportunities to mark make with resources such as chalk or natural resources such as sticks on the muddy ground, drawing around the shadows created by the sunlight. This enables the opportunity for the children to visually see their shadows and allow them to re-visit their findings and compare throughout the duration of their outdoor experience. This can then support the Mathematics and Numeracy area of learning, recognising patterns from their findings (Welsh Government,

2020b). It also allows the children to enhance their knowledge and understanding of why the shadows move throughout different times of the day. This would further benefit their understanding of night and day and make sense of the world in which they live (Welsh Government, 2015).

Section three

RISK BENEFIT ASSESSMENT

Location / Activity:	The Woodland	**Date:**	13th September 2021
Assessor:	Keeley Poole	**Review date:**	13th March 2021

The boxes in the table below will expand as you type into them; pre-entered text is simply for illustration. You should delete irrelevant items and replace with text relevant to your circumstances.
Your overall risk rating – Low, medium or high – is based on your judgement about whether the BENEFITS of the activity or opportunity outweigh the RISKS.

ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
Exploring and walking on uneven grounds and slopes	Experiencing uneven grounds enables children to find their vestibular sense known as their balance. Children will become aware of different gradients in natural environments and become aware of their own bodies and the movements they make when rolling down slopes, or experimenting with different resources, rolling up and down and how much force they require.	Children may trip and fall causing cuts and grazes, bruises or bumps and other further possible injuries such as sprains or fractures. The surface may become slippery during the change of weather.	Children and adults	Ensure appropriate clothing and footwear are worn in the woodland such as, wellington boots, long trousers, long-sleeved tops, and a raincoat weather permitted. If uneven grounds are unfamiliar areas for the children, ensure that they are prompted to become familiar with areas with uneven surfaces and to walk slowly before further experimentation. Playing a game beforehand can provide the children with the sense of balance and being in control of their body and its movements.	L

Children exploring in the woodland, comparing, and sorting natural resources and exploring different textures they give such as trees, flowers, and insects they may find	Children are provided with advantaged experiences in the woodland that are restricted indoors. They can learn about and connect with the outdoor experiences, the living things, and aware of the creatures/insects that live within and the importance of being gentle and cautious. Exploring and collecting natural resources can support physical development, enhancing their fine and gross motor skills whilst using their pincer grip, stretching, jumping, and bending to collect resources. Children gain mathematical opportunities by counting and sorting the natural resources. Opportunities for the children's senses to be	The children could have allergies from living things such as pollen, or stings and bites from plants such as stinging nettles and woodland insects such as bees. Tree branches may be low and in reach of children, causing injuries to their eyes or head injuries resulting in possible grazes or infections. Children exploring independently may collect rubbish or inappropriate findings that have been	Children and adults	Health plans to be completed by the parents and staff, raising awareness of any allergies and/or health conditions. Ensure individual health care plans are assessed prior to the outdoor visits. Ensure epi-pens are consistently carried when off the school premises and follow their health plan. Ensure children are aware and cautious of their allergies if the children are at an understanding age. Discuss with the children about the boundaries, ensuring children are educated on what should not be collected or touched, the rules of nothing to be put in their mouths, and to wash their hands after the outdoor learning session.	L

ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
	enhanced, their touch and smell when collecting resources and their sight and sound listening to the trees and the leaves blowing or the insects buzzing. Children can explore the living things in depth in hands-on experiences, the life cycles, habitats, and the relationships between each living thing.	abandoned in the woodland and put in their mouths.			

ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
Children exploring independently in the woodland	It allows children to develop resilience when have the opportunity to explore the chosen area independently. Children's independence can be enhanced through confidence building. Children's social development could be supported as children who explore independently in the woodland may work as a team to explore and collect resources, promoting teamwork and their social skills.	Children may wander off alone and get lost and potentially causing injury if the child has a fall The woodland may be a public area, allowing public individuals access to the area	Children	Ensure that children are aware of woodland rules, providing children with important information – always ensure that they can see a teacher and providing boundaries to ensure the children's safety. Ensure that there is a practitioner circulating the selected woodland area, continuously. Provide children with safety talks such as 'stranger danger'.	L

ACTIVITY	How will young people BENEFIT from this activity?	Possible hazards	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk RATING: L/M/H
Children climbing the trees in the woodland	Climbing trees consists of supporting children's physical activity, promoting their hand-eye coordination, vestibular and gross motor skills. It allows children to become aware of their abilities and identify the risks of climbing trees, such as the height and branches breaking. Climbing trees enhances the children's critical thinking skills, analysing the height of each tree, how do they climb up and how can they get back down to the ground. It allows children to make links with nature and bring awareness of being kind and looking after the natural environment.	Children may climb too high. Children may have cuts splinters from the wood, or grazes from tree climbing or resulting in further injuries such as fractures if they fall from the trees.	Children	Children must wear suitable clothing to be able to carry out this activity, such as long-sleeved tops and trousers and trainers. Adults must be always near and present and aware of the protocol steps to ensure the children's safety. Discuss with the children height limits.	L

Section four

Mathematic and scientific learning are important elements to a child's learning (NAEYC, 2010) indoors as much as outdoors. However, the indoor environments may create more barriers than explorational experiences when participating in gross child-led activities (Early Movers, no date). Therefore, Moser and Martinsen (2010) state the outdoor environments can provide many more fundamental opportunities to facilitate a child's learning with the correct scaffolding from adults and interaction with peers to support social development. Additionally, adults can support and encourage children's engagement with mathematics and scientific learning in the outdoors by providing the learners with a stimulating environment of which they can play with endless open-ended resources and opportunities (Oxfordshire County Council, no date). Following this, in line with Piaget's theory, it encourages children's discovery and experimentation, enabling Piaget's little scientists to enhance their life skills (Welsh Assembly Government, no date). With stimulating environments, Piaget's theory (Belyh, 2019) encounters children to experiment within further progressions of learning, in line with the New Curriculum for Wales 2022 (Welsh Government, 2020g), empowering their individual schemas to grow and gain more awareness of the world which provides them with a full scientific, sensory experience (Muddy Puddle Club, 2020).

Moreover, Massey (no date) acknowledges as part of the adult's role, they must ensure the correct support, materials, and environments are provided for the skills to develop and to implement in activities independently, strengthening resilience, and in line with the New Curriculum for Wales 2022, allowing the individuals to become capable and ambitious science and mathematical thinkers in learning (Welsh Government, 2020f). Similarly, to support children's learning through a mathematical and scientific concept Maynard, Waters, and Clement (2013) discuss that it is the adult's duty to ensure children are provided with high affordance, experiential natural outdoor spaces which enable child-initiated play to take place. They go on to say that these spaces encourage curiosity, provide opportunities for holistic areas of learning to flourish and provide children with opportunities to explore and enhance their learning in more depth through a scientific and mathematical concept. In agreeance, Community Playthings (2018) indicate that

it is the adult's responsibility to ensure the children's outdoor learning environments are inviting and secure, allowing children to be stimulated and challenged through supporting experiences. Therefore, adults who embed the outdoor space into children's learning allow room for underachievement in their development to decline (Campbell and Speldewinde, 2020).

In connection with section one and two of the portfolio, the environment demonstrated (Poole, 2021) could provide high affordance (Gibson, 1979 cited in Gieseking and Mangold, 2014) with use of loose parts and open-ended transportable materials, as stated by Nicholson (1971), of which provide an all-round purpose in children's holistic learning (Play Scotland, no dateb). Children's creative thinking skills and vocabulary can be challenged as suggested by Nicholson (1971) by providing rich environments of which contain effective materials that can be used in ways that the child desires each time. In line with Gibson's Affordance theory (Gieseking and Mangold, 2014), providing variables that have more than one meaning, promotes children's skills in building and fixing new things, using trial and error to develop problem solving skills using different materials (Play Scotland, no datea). Similarly, Rahardjo (2019) suggests loose parts incorporated into play allows children to address and experiment with the challenges, benefiting their learning through science and mathematical concepts, enhancing their skills, and understanding of measurements, estimation, number and patterns. Therefore, for the loose parts theory to be effective, knowledgeable staff need to be present to ensure children are provided with environments filled with natural or man-made loose parts to facilitate their learning in mathematical and scientific concepts (Play Wales, 2020). Considering this, PACEY (2021) states adults providing children with a rich play environment outdoors allows encouragement for discovery, exploration, problem solving and teamwork enhancing the children's critical thinking skills and in line with the New Curriculum Wales 2022 progression steps, children will be able to explore the range of materials provided and choose individual materials for a specific use (Welsh Government, 2020d), encouraging trial and error and exploration of their schemas.

However, challenges could occur during outdoor play for the adults. Machan (2016) states without compassionate and creative adults within their role, scaffolding children's learning, their knowledge, and experiences will not be facilitated effectively. In line with Bruner's

theory, no date cited in DCELLS (2008) adult involvement is at the heart of importance to scaffold children's skills, allowing extended progression to children's development, holistically whilst on the perimeter of their child-led play. Bruner believed for this to succeed; adults must support and build on children's existing skills following the spiral curriculum to develop and encourage the next set of skills (MacBlain, 2018). Additionally, allowing children to experience the materials in play more than once, solidifies their understanding of the different concepts that the variables can bring to their learning, progressing their scientific and mathematical skills (Tucker, 2014). Similarly, repetition of self-chosen play with natural materials in the outdoors, in accordance with the Montessori approach cited in Constable (2012) allows the children's learning to become embedded in their development and flourish their life skills.

Welsh Government (2015) discuss within the Foundation Phase Framework, in order for the children to reach their potential in all areas of learning, adults need to be aware and understanding of the opportunities the outdoors can provide to a child's learning. However, adults may need support from higher professionals to recognise the outdoor opportunities available, and how to scaffold the children's learning for example, ensuring that the correct open-ended resources are provided and being open minded to how the materials could be utilised by the children during their child-led play, in a variety of ways (Nicholson, 1971). Croner-i (2019) states forest school practitioners have training prior to supporting the children outdoors, therefore, have an advantage of knowledge on how to support the children, what potential beneficial risks the outdoors can bring, and how the children's learning can be scaffolded efficiently. However, Tinney *et al* (2020) share that early year's practitioners in a mainstream setting potentially do not have the advantage of this experience. They go on to say it is often that practitioners are known to experience negative memories with science during their time in education causing them to lack in confidence when scaffolding children in scientific experiences.
Moreover, supporting the children's development through mathematical and scientific concepts, practitioners often worry how to facilitate the children's learning when responding to questions or providing appropriate materials to encourage scientific talk (Tinney *et al,* 2020). Similarly, practitioners who have not experienced training for the outdoors, Little and Eager (2010) suggest they may

find it challenging to allow children to take risks identifying them as hazardous rather than beneficiary risks that promote their skills and awareness of risk-taking and being independent in such big open spaces. This instantly creates barriers on the children's learning and movement when for example referring to section one (Poole, 2021), the children may want to explore the height of the trees through climbing or rolling down the small slopes. Moreover, Learning through Landscapes (no date) state the children's needs are not being met if opportunities are not provided by the adults, to experience beneficial risks during play outdoors, through scientific and mathematical concepts. Gill (2010) states children engaging in activities with managed risks, participate in purposeful and thrilling learning experiences. Adults who show fear when children are engaged in activities with risk can create barriers and influence the children to negatively question their capabilities, underestimating their skills and their confidence to explore.

However, Early Education (no date) state children experiencing beneficial risks through play allow them to make big, holistic movements in mathematical and scientific concepts, enhancing their knowledge and understanding of their proprioception sense, repetition of their schemas and vestibular sense such as experiencing the forces of climbing the trees and their senses through sorting and collecting variable open-ended materials, achieving the four purposes in line with Welsh Government (2021). Therefore, risks should not be removed from children's free-play and adults must ensure they approach risk-taking with a more manageable and encouraging attitude (Gill, 2010). Adults providing opportunities for children to experience risks is at the notion of their learning to enhance their development and become healthy individuals who are confident in participating in physical activity in which involves risk (Welsh Government, 2020g).

Additional challenges may arise for practitioners in relation to having access to the outdoor, natural spaces and providing the time to enhance the children's scientific and mathematical areas of learning (Chantrell, 2015). Therefore, knowledgeable and encouraging staff, in line with Froebel's theory must ensure children are provided with wealthy outdoor environments that offer a wide range of purposeful opportunities which allow them to enhance their development in their own time through rich open-ended, first-hand

experiences (Tovey, no date). In line with the Froebelian Approach cited in Tovey (2012), with their needs being met, children are able to connect with the scientific concepts that surround them in the outdoor environment. Furthermore, it is recognised in relation to the approach, adults providing children with experiential outdoor environments, enables children to explore their development holistically (Garrick, 2009). This allows adults to support their areas of learning more effectively, in line with the New Curriculum for Wales 2022, as all areas of learning are connected, allowing opportunities for staff to facilitate the children's learning in a more integrated and successful approach (Welsh Government, 2020g). Similarly, in line with Welsh Assembly Government (2009) allowing these skills to develop to the child's potential, enables them to become more competent in their learning. In agreeance, Welsh Government (2021) discuss this enables children to understand the scientific and mathematical concepts and the importance of the natural world around them.

Inevitably, for practitioners to support and encourage all children outdoors through scientific and mathematical concepts effectively, training must be carried out covering all aspects of the outdoor space and how to facilitate their learning, from providing the correct materials (Learning through Landscapes, 2021) such as loose parts to being aware of how to scaffold each child's learning effectively through shared sustained thinking and metacognitive talk. In line with Vygotsky and Bruner's theories cited in Brodie (2014) show that the role of the adult in children's learning is a key element of their developmental process. The child and adult must have a positive relationship, allowing them to work as a team rather than 'the practitioner and the child'. Through this, Brodie (2014) states both individuals have the opportunity to learn from each other, as well as the practitioner carrying out the effective role of the more knowledgeable other facilitating the child's metacognitive thinking skills. Therefore, adults must show that they are interested and focused when the child seeks adult involvement, encouraging children to become open and share their thoughts and ideas (Brodie, 2014). However, White (2011) states the key element of an adult's role highlights importance in their attitude and behaviour towards the outdoors. More recently, White (2013) discusses that adults must be committed to providing children with rich experiences

outdoors to enable children to make use of their holistic skills, through accessing effective areas and experiences which the outdoors can offer.

Adults supporting sustained shared thinking and metacognitive talk encourage children to explore their individual ideas and make links to the world and with sufficient training practitioners are confidently able to support scientific learning (National Quality Standards, 2012). Similarly, Smidt (2015) shares to promote metacognitive talk, practitioners must suggest, prompt, and ask open-ended questions, at the correct stages and ques of their learning through play. However, Siraj-Blatchford *et al* (2002) state adults who carry out effective pedagogy stimulate sustained shared thinking and scaffolding. In addition to this source, Wright and Gotwals (2017) cited in Tinney *et al* (2020) express adults must support and encourage children to ensure appropriate science talk is incorporated in their learning. Therefore, children must have supportive and encouraging adults around them who respect and enjoy the outdoors, mirroring an effective role model (Constable 2012). Overall, children who feel they have adults that show interest in their learning, enhances the potential in the children's development and well-being, entering their child-led worlds, scaffolding the children's interests outdoors through mathematical and scientific concepts (White, 2011).