

ECEY5005/C

Awe and wonder: science, mathematics and the outdoors

Part 1: Choose a photograph that provides opportunities for development of specific scientific or mathematical concepts



Part 2: discuss how the environment in the photograph can be used to develop specific scientific or mathematical concepts

Within this photograph there is a small river, leaves, trees as well as some stones. There are many links to science and mathematics within this photograph which is why I chose to use this photo from my local nature reserve. Trees are vital for us human beings and there is an opportunity here for us to explain to children of the early years community how trees provide us oxygen so that we can breathe fresh air. Trees store more than three quarters of the world's accessible fresh water and more than half of bad carbon dioxide, so without them the planet would be in trouble as there would be less water available as well as an uprise of bad carbon dioxide. Although trees are naturally helping our planet, they are a good tool for children to play in as they can climb the trees which develops the children's gross motor skills as well as their strength and coordination. Climbing trees also allows children to evaluate risk taking and as we know, risk taking is good as long as no serious harm can occur. Risky play is also good as it can build a child's emotional development as they will get a sense of overcoming fears, feeling excited but also a sense of danger. Through climbing trees, children will learn to keep their emotions under control and focus on not falling. Within my photograph there are many trees of different sizes so that children can build their skills to their ability. If they are not so confident then they can start on a smaller tree and then as their confidence grows, they will be able to go onto a larger tree. Whilst climbing trees is fun, there are many opportunities for talking about smaller details of the trees such as the shapes or patterns on the trees and the leaves as well as talking about the seasons, tree growth and any bugs that may be found. The children can create their own scavenger hunt for what bugs they have found which helps them develop their creative skills as well as their knowledge and understanding of the world around them. If there is a nest within the tree, we can discuss what type of nest it is if known and why the children shouldn't touch it. If the type of nest isn't known, then we can all try and find out together. Trees are a good link to science, but they can also be linked to mathematics as we can simply count the trees as well as discussing shapes, patterns and colours.

Within the photograph we can see a small river. Rivers are connected to the sea and is influenced by rainwater and the input from surrounding areas. If an area has higher pollution, then the water would be more polluted. Within the river children can splash around in the water which will improve their balancing and strength as well as their communication and social skills as water play enables children to explore and interact with one another. We can do a science experiment using the river and other materials to find out what sinks and what floats. We can use a variety of materials that may all look different as well as feeling different to explore different textures. The children can learn the concepts of light and heavy but also why things float and why some things sink when placed in water. Small stones can also be thrown into the river to make ripples in the water and again children can learn the concepts of how the water ripples are made.

There are many leaves within the photograph that can be linked to mathematics and science. The children can play a game of how many orange leaves can be found, how many green leaves can be found and so on. This helps the children to develop their counting skills but also develop their sense of colours. The life cycle of a leaf can be discussed with the children simply that the leaves life begins in the spring and ends in the autumn. We can also discuss as to what makes the leaves change colour. Amongst the leaves on the ground there may be many bugs and creatures living there. The life cycle of insects and butterflies can be spoken about (metamorphosis).

Loose parts are an important part of play for children's holistic development according to Simon Nicholson (1970) who stated that the loose parts in our communities and environments will empower creativity. The more flexibility a space, material or object has, the more opportunities that are available for imagination and creativeness. Within my photograph there are many loose parts available at present but would be different loose parts as the seasons change. In the current photograph there are leaves, sticks, stones and some flowers which can be used to make a variety of things and it would allow the children to use their imaginations as well as improving their fine motor skills. The most important thing about loose play I believe is that it is child-led. The children are in charge for loose parts play, and they decide what materials they use and for what they are going to use them for. Loose parts can also be used to link with scientific concepts as different textures can be

discussed as well as shapes and sizes to link with mathematical development.

Within the new curriculum for Wales, there are 4 purposes for the children of Wales. These purposes are that they will be ambitious and capable learners, enterprising and creative learners, ethical and finally informed citizens as well as being healthy and confident individuals. Within the curriculum there is a focus on areas of learning and experience where there is a focus on science and technology as well as mathematics and numeracy (Welsh Government, 2021). Within the area of science and technology, the new curriculum focuses on the disciplines of biology, chemistry, computer science, design and technology and physics. The aim of focusing on those areas is to enhance learners' knowledge and understanding of the world. According to the Welsh Government, 2021 mathematics and numeracy help learners to become ethical and informed citizens as it provides them with tools to enable them to analyse data critically which will then enable them to develop views on social, political, economic and environmental issues.

There is also a new curriculum for funded non-maintained nursery settings. The aim of this curriculum is that it enables children to learn and develop in the way described in the above four purposes. It is also suitable for all children of all ages, abilities and aptitudes. It will also provide appropriate progression for all children. There are 6 new areas of learning and two of which are science and technology as well as mathematics and numeracy. Engaging experiences is a core aim within this curriculum and the experiences that are offered within early years should be hands-on, meaningful and purposeful to the child. These experiences should encourage independence, offer risk, challenge and opportunities to experience success after the experiences. The experiences should also promote and develop the children's holistic development as well as enabling children to make connections across from their learning experiences (Welsh Government, 2021).

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Part 3- risk benefit assessment for the outdoor space provided in your photograph

RISK BENEFIT ASSESSMENT

Location / Activity:	Local nature park (area in photo)	Date:	01/10/2022
Assessor:	Katie Organ	Review date:	In 10 weeks

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 risks	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury
Climbing trees	Children will develop their gross motor skills and increases resiliency. Climbing trees helps develop focus and concentration. Climbing trees provides a rich sensory experience for children. Climbing trees enable children to feel a connection with nature and the community around them.	Children can fall off trees Branches could snap Risk level- medium	Children that are climbing but also others around them	Children can begin on smaller trees so that their confidence grows before they move onto bigger trees. Adults will check the branches are sturdy before allowing children to climb them. Ensuring the trees are within the designated area.
Scavenger hunt	Children will develop their problem-solving skills as well as improving their abilities to look for objects and their team working skills. Scavenger hunts can be customised to children's abilities.	Uneven ground can cause someone to fall or trip. Risk level- medium Animal faeces Risk level- high	Children and adults are at risk of uneven grounds and both at risk of animal faeces	Ensuring that the children and adults look at their footings and where they are going and to not go in areas that look too uneven. Supervision will be in place to ensure the safety of others. Supervision in place to ensure that no animal faeces will be touched. Encouraging washing hands and keeping fingers out of noses and mouths to ensure good health.

Experience exploring outdoor space in photograph	How will young people BENEFIT from this activity?	Hazards and risks	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury
Sink or float activity on river	Children will learn the concepts of heavy and light and why certain objects sink and why some float. Children learn coordination and controls hand-eye movement. Language development with new terminology.	Uneven ground could cause someone to fall or trip on ground or in river. Risk level- medium Rocks or stones may be too heavy for some people to lift. Risk level- medium/high	Children and adults both at risk due to uneven grounds but also due to heavy objects.	Ensuring that everyone looks where they are going and to avoid areas that look to uneven. Supervision in place always. Advice on not to lift items that are too heavy.

Part 4- adults supporting science and mathematics outdoors as well as theory and research

One way that adults can support child led play is by metacognitive talk which is when the adult says out loud what the children may be thinking (Cambridge Assessment International Education, no date). Some things that adults may say to support this learning is '*what would happen if we pushed harder*'? Adults are also able to support sustained shared thinking which is a method by which children learn. Sustained shared thinking happens when children are thinking hard and critically about different topics. Thinking hard and critically relies on their thinking and problem skills (Learning Journals, no date). Sustained shared thinking is important as it allows children to share their thoughts or feelings. Sustained shared thinking can also be seen as an open-ended question. Scaffolding is another way an adult can support children. The scaffolding theory based upon the ideas of Vygotsky was later developed by Bruner in 1976. Scaffolding is a form of help from a more knowledgeable individual such as an adult to help a child to solve a problem or help them achieve a goal that would have been impossible for them at that moment in time (Aubrey, K. and Riley, A. (2019).

Montessori was born in Italy in 1870 and she is one of the most well-known educationalists within the field of education (Aubrey, k. and Riley, A. (2019)). Montessori placed the child firmly at the centre of her work and she saw the child as individual and unique and with guidance, would develop their inner potential. Montessori emphasised that social liberty was importance compared to a curriculum which was designed to meet the needs of society. Therefore, she developed activities around the needs of the children through observations but also through what the environment could offer. Montessori also stated that the outdoor area should be used as an expansion of the classroom. According to Daly et al, (2006), Montessori was one of very little philosophers who rejected the idea that children learn best through curriculums that are only there for societal needs. Montessori incorporated both nature and nurture within her work and had an influence on key theorists such as Piaget and Erikson. John Dewey was one critique of Montessori and stated that she Montessori was limiting children's creativity and Dewey believed that children should be allowed to explore materials in whichever way they wished to.

According to Tovey, (no date) Froebel believed that a garden was central for his theory, and he believed it was a place where children could learn at their own pace alongside adults who shape their learning journey. Froebel had many key ideas for his beliefs which were that children should have freedom with guidance and the key role of the adult is to be observant, supportive and to enable extending play and learning (Tovey, no date). Tovey (no date) states that outdoor play has many opportunities as well as offering many things to young children. These things include it allows children to have a first-hand experience with nature which is essential for growing minds. It also gives children a chance to have space and freedom so that they can try new things and provide them with opportunities to explore and investigate how the world works. By playing outdoors there are also opportunities for curiosity and enquiry states Tovey, (no date).

Piaget's theory is based on that children have played an active role in the learning process and have behaved like little scientists as they experimented, observed and learned about the world. There are 4 stages of Piaget's theory which are the motor sensory period (0-2 years), pre-operational period (2-7 years), concrete operational period (7-11 years) and finally the formal operational period (11 years+). These stages reflect that how children's

behaviour changes as their development changes (Positive psychology, 2021). Similarly, to Piaget, Erikson also states that children's development occurs when interaction is made with the outdoors and both Piaget and Erikson stated that children are participants who are active in the world and that development happens in stages (Positive Psychology, 2021).

For children to develop outdoors, there are certain requirements that the environment needs. The environment needs to have a choice as well as freedom, but boundaries must be put in place first. The environment must also provide opportunity for challenge and risk as well as providing time for the children to enjoy the environment. Group work and individual work must also be provided by the environment so that children's social skills can be enhanced.

Schemas are a pattern of repeated actions according to Athey (2007). They are often described as children's fascinations and there are many different types, and some children have multiple, and others only have one. Schemas can be observed and understood by early years practitioners.

Early years practitioners play an important part in supporting outdoor play for children. According to First Discoverers, (no date) the outdoor environment should be approached by adults in the same way as the indoor classroom so children see both environments equally as important. Vygotsky's scaffolding theory comes into play here as children will begin their learning by saying I can't then it becomes show me, then tell me and then it becomes I can. Early years practitioners have important roles within the outdoors and the first is to plan and identify children's needs as well as to set up any resources needed prior to going outdoors. During the time outdoors the adults must work and play with the children as well as observing their learning and the effectiveness of the experiences. At the end of outdoor play, an evaluation must be done to reflect on outcomes and to navigate whether the experience was a positive learning aim for the children (First Discoverers, no date).

The Te Whariki approach states that children should learn with and around others (Sellers, 2013). They however also state that children should have a good sense of themselves. Children need opportunities to develop their problem-solving skills as well as their imagination and physical skills. The Te Whariki approach was formed around four main principles which are empowerment, holistic development, family and community and finally

relationships. From these four purposes there are five strands of child development which are well-being, belonging, contribution, communication and exploration. This type of approach does not assess children's learning or development against their pre-set milestones, but it does however encourage teachers to understand what children are trying to achieve and what is possible for them to achieve (Ruby Veazey, 2022).

According to Day nurseries (2021), the Reggio Emilia approach within early years education means that all play is child led and that the children are seen as curious individuals that have the potential and power to develop and learn from their environment but also the relationships that they develop with others. Children are viewed as strong individuals who should be given opportunities to reach their full potential rather than being viewed as children with needs that must be fulfilled. Learning within this approach is child led which means they are in control of their own knowledge and gives the child choices over their curriculum and what they want to learn. This way of learning according to Day nurseries (2021) encourages children to develop their self-expression, communication and their problem-solving skills. As children are influenced by everything around them, the environment within this approach is seen as the third teacher. The community, surroundings and resources of each setting impact their learning experience as well as their progress. Within this approach, teachers observe the children and work with parents or guardians to discover how each child learns best as each child learns differently. As every child learns differently, they should be encouraged to use a range of materials, resources and strategies to express themselves. With use of the observations and ideas from parents or guardians, teachers can then plan and adapt the environment if needed based on the child's interests to encourage their potential to be fulfilled (Day nurseries, 2021). The learning process is classed to be of much higher importance compared to the final product and teachers can create projects in depth that is based on information from parents or guardians as well as observations but most importantly, the interests of the children. Many nurseries across the world follow the Reggio Emilia approach, however not one nursery will be the same as another due to each setting having its unique environment and community (Day nurseries, (2021).

Whilst outdoor learning is achievable for many settings within early years education, there are some barriers that affect some settings from outdoor learning. Rickinson et al, (2004, p.

36) states that outdoor learning was not perceived to be 'real' learning and that planning for outdoor learning was more complicated than planning for indoor learning. Some barriers that are known to prevent outdoor learning are a lack of time or resources as well as a lack in confidence from teachers when it comes to outdoor learning. There is also a fear and concern about health and safety and sometimes risk assessments may seem to much hard work or cannot be done due to lack of time. The old curriculums have had certain requirements which have limited opportunities for outdoor learning (The Outdoor Playbook, no date), however the new curriculum for Wales has emphasised the importance of outdoor learning for children. According to (The Outdoor playbook, no date), learning outdoors has the potential to improve the children's physical wellbeing, emotional and social wellbeing as well as allowing different types of learning which will include increased creativity as well as providing environmental education and awareness of sustainable practices.

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