

ECEY5005

Word count:3825

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Contents:

1. Photograph of outdoor environment to promote and support children's scientific and mathematical thinking.
2. How the environment in the photograph can be used by young children to develop specific scientific or mathematical concepts.
3. Photograph's risk-benefit assessment.
4. Academic writing – enabling adult – supporting science and mathematics outdoors.
5. Reference list

ECEY5005

Word count:3825

2405790

1. Photograph of an outdoor environment to support children's scientific and mathematical thinking.



(Source: my own photograph).

2. How the environment in the photograph can be used by young children to develop specific scientific or mathematical concepts.

This photograph could open opportunities for child-led play, the beach holds a natural environment for children to explore and observe the outside world. There are various natural things on the beach that children could investigate and open their curiosity. They have opportunities to explore sand, sea, shells, pebbles, seaweed, wildlife and more, each of which could be different sizes, shapes and textures. During my learning experience the weather is cloudy, and the children have extra resources such as buckets, spades, gloves and magnifying glasses to support them during their time exploring the environment.

Firstly, the children arrive at the year one classroom, they are five years old, we took our learning outside of the classroom as a whole class. I am observing two children that have been placed into my group. Before leaving I asked "Year one, has everyone got a water bottle and coat?". The children checked their bags independently before we left for the school bus.

At around 10am we arrived at the beach; the children were eager to get off the bus and onto the sand. The children helped themselves to the extra resources we provided, these included: buckets, spades, magnifying glasses and gloves. Providing these extra resources allowed the children to be explore curiously. "Miss, can we go to the sea puddles?" child A asked excitedly, "Of course! What do you think you will find there?" I replied. Child A pulled a magnifying glass from his bag and said, "I can use this to help me; there are lots of rocks in there". We got off the bus and went onto the beach, the children immediately noted that there were lots of pebbles and shells on the sand. Child B stated, "There are so many shells", "there are lots of different shells on this beach" I replied. The children used their buckets and began to collect some shells, the shells were different colours, sizes and shapes. When the children had finished collecting their shells, Child A laid out her coat on the ground and Child B started examining the shells with the magnifying glass and they decided to group the shells by placing them on Child A's coat. Child B said, "this shell has lines on it and this shell has some red on it". Child A held a shell to his ear and listened carefully, "What can you hear?" I asked, Child A placed the shell on my ear and said "listen, you can hear the waves in the sea".

A while after the children navigated their way to the rock pools, child A called these "sea puddles". Some children began to use the spades to dig deeper in the rock pools, some used their buckets to collect water, and some were using their magnifying glasses looking closely in the water. "What can you find in there?" I asked curiously, child A said "Miss, there is green grass on this rock", I replied "that is called seaweed", child B then added "where does the seaweed come from, Miss?", "Seaweed is usually found in the sea and in the shallow areas". The children continued to explore the rock pools. Child B moved a rock "Look! I have found a crab", there was a small white coloured crab under a rock, "Wow! Amazing, that is a great find", child A looked confused, she then said, "why is the crab not red?" I replied, "not all crabs are red, they can be many colours, but that is a great

question". The children used their magnifying glasses to examine the crab; they continued to observe the crab for some time. Child A observed the crabs movement, she asked "why do crabs walk sideways?", the children all began to discuss their thoughts on the crabs movement. "The crab is fast but when it goes on dry sand it is slow" says child B. "That is very interesting! I wonder how many crabs you can find, let's also see if you can find a bigger crab boys and girls". "let's move the rocks, crabs live under them" said child B. The children began to explore under the rocks, the children decided to use pebbles to measure the crabs they found. At the end the children, lined up the pebbles and used them as a representative of the crabs they found. The children began to count how many crabs they found and sorted the pebbles into size order.

The children completed their activity with the pebbles, they then continued to use the pebbles and began to stack them. Child A said "I think we can make a big tower", both children began to help build a pebble tower. They began exploring for bigger pebbles for the bottom of their tower and then used the pebbles they collected for their previous activity as the tower got taller. Child B said "it is getting wobbly", child A said "I think it is because of this middle pebble" as she pulled the pebble away. The tower fell down and both children began to laugh. Before leaving the pebbles, I asked the children, "How could we help the tower to balance better so it does not fall down?", Child A replied "we need more big pebbles at the bottom", child B agreed.

The children's time at the beach had come to an end, the children gathered and went back to the bus. Some children had collected some loose parts from the beach to take back to school. All the children had made their own experiences and open-ended play they were eager to talk about.

During the time spent on the beach, the child led activities that have been observed by me have supported progression step one for Science and Technology in the curriculum for Wales and the children have also accessed the progression step one for mathematics and numeracy (Hwb, 2019). The children have also demonstrated the four principles holistically during their outdoor learning. The children have gathered loose parts to support their learning such as shells, pebbles, sand and seaweed. The children were creative during their learning time and used the loose parts to represent living creatures, this enabled them to visually problem solve in a safe way. The children were also curious about some loose parts and shared their curiosity with their peers and adults supporting them, an example of this was when the children discovered that if you put a shell by your ear, then you can hear the waves. The loose parts initiated open ended play for the children and supported their problem solving, imagination and creativity.

Following the time at the beach, the children decided they wanted to use their loose parts in our classroom outdoor area. Child A and B both approached the water area and pulled a stick, rock and shell from their bucket, child A said "I wonder which one will float", Child B replied "I think the stick will", I then added "why do you think the stick will float but not the other objects", both the children looked at each other, shrugged their shoulders and began their experiment. Both pupils were engaged in

ECEY5005

Word count:3825

2405790

their experiment, the children looked surprised, none of the objects stayed afloat. The children had finished their outdoor learning experiences for the day and took their loose parts back inside with them.

3. Photograph's risk-benefit assessment

ECEY5005

Word count:3825

2405790

Name of activity:	Beach outdoor learning
Description of activity	The children can explore the beach and use the extra tools provided. The children can use their curiosity and independence whilst exploring. There may be new textures and objects during their time exploring. The children may steer their learning experience as they wish and create their own meaningful experiences, there will be enabling adults present, they will be observing to extend their learning if necessary.
Appropriate for which ages and abilities	3-10 years
Equipment or resources needed	Activity resources: Buckets, spades, gloves and magnifying glass.
Any special adaptations for different needs	Visual cards for instructions, wheelchair access beaches and trays for shells for children that cannot move around the beach easily.
Benefits e.g. Soft/Hard outcomes, Early learning outcomes, Key stage outcomes	Explore various textures, patterns and colours, curiosity, encourages questioning and interests. Allows creativity, independence and extended learning. Improves overall well-being and holistic development. Children can develop a sense of belonging in the natural world.
Overall risk (refer to separate risk assessment)	Low.
Other comments	The benefits outweigh the risks during this activity. The children are observed closely

ECEY5005

Word count:3825

2405790

	throughout the activity by the practitioner.
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Activity	Hazard (potentially dangerous activity, occurrence or physical item)	Risk (incident / accident that MAY happen)	Likelihood + Severity	Benefit	Action to remove or reduce risk (The whole group can learn to take their own precautions guided by the practitioner)	Who?	When?	Risk Level (when actions observed)
Contact/digging sand	Exploring the sand.	Digesting sand.	3	Developing their fine motor skills and exploring new textures.	Use a spade and close monitoring by adult.	Practitioners	Each time the children dig.	2
Searching rock pools	Handling rocks or objects found in the rock pools.	Sea creatures (crabs) may pinch or jelly fish stings. May have sharp objects.	5	Enhances curiosity and questioning. Promotes scientific observation.	Use spade or gloves to provide protection. Adult to observe children at all times.	Practitioners	When the children are near the rock pools.	2
Climbing over rocks / seaweed	Exploring rock pools, seaweed attached to rocks.	Slipping on seaweed or tripping over rocks	6	Developing gross motor and problem- solving skills.	Adult to support and observe the children and inform children of any hazards.	Practitioners	When children are transitio ning around the rock pool.	4

ECEY5005

Word count:3825

2405790

Handling shells	Sharp edges, living sea creatures may be inside.	Cutting hands.	4	Curiosity, creativity skills. Shells can enhance mathematical and scientific skills.	Wear gloves that have been provided.	Practitioners	When the children are exploring shells.	2
Washing hands	Bacteria and toxins living on natural resources.	Intake bacteria and toxins	3	Promotes hygiene, helps children understand the importance of clean hands and risks.	Use washing hand station before eating, use gloves if possible.	Practitioners	Each time the children have finished their activities.	1

likelihood	x	severity	risk level and acceptability		
			Low - L	medium - m	high - H
1-5	x	1-5	1-5 acceptable risk level	5-12 acceptable with precautions	12+ unacceptable risk level - find ways to reduce risk.

4. Academic writing – enabling adult – supporting science and mathematics outdoors.

To begin, it is important to understand what exactly ‘outdoor learning’ is and the importance of it being implemented in the early years settings. Outdoor learning is exploring various outdoor environments, these could include: the beach, forest, park, lakes or even school premises, the child experiencing any of these environments will have the opportunity to explore the natural world and make use of natural loose parts to support the child’s holistic development and overall well-being. Outdoor learning can be structured or unstructured, adult-led or child-led, however, either way the children can access any part of the curriculum through their learning experiences (MPT, 2024). During covid-19 it was discovered that children’s mental and physical well-being was improved when they spent time outdoors. It has also been noted by professionals that outdoor learning supports children physically, emotionally, socially and their cognitive development (Welsh Government, 2023). Outdoor learning does not only need to be held in educational settings, but it can be supported at home too.

Outdoor learning offers many benefits for children, not only does it provide the child with their right to play and experience nature outdoors, but it also provides them freedom to explore their own interests and environments around them. Having access to outdoors provides opportunities for children to access any part of the curriculum and enhance their cognitive development. It is believed to support self-regulation and lifelong learning, whilst recognising the risks and being able to adapt to changes (White, J. 2020). Furthermore, the children that have the opportunity to learn outdoors will have many other beneficial impacts, these are some of the benefits: physical health, they will consistently use movement and play, this can help the development of their motor skills. Mental wellbeing, being outdoors can support the reduction of anxieties, support self-regulation and build a sense of belonging for the child. Social skills, building the confidence to work as a team and take on a leadership role. Finally, children can become curious in the natural world and use their imagination to be creative. They will be able to explore and develop independence whilst seeking support when needed.

A theorist that supports outdoor learning is Reggio Emilia, Reggio believes that classroom and outdoor learning become one, when the children are learning indoors, they can still access natural resources and natural light still shines through windows and windows can be opened, however, outdoors, children can freely explore a wide variety of natural resources but also gather resources to use inside and out. Reggio’s approach is known to be different to everyday classroom learning, it is child-led, child-centred and it is all about the child’s curiosity and interests, it has also been scientifically proven that children who have the opportunity to learn outdoors are more advanced problem-solving and their creativity (Art Sprouts, 2025). Reggio states that providing children with ‘risk’ outdoors will allow them to experience new opportunities and more awareness (Reggio Children, 2022). The Reggio approach also suggests that children learn in the moment and must be observed by adults to

pro-long their interests with open-ended questions rather than closed ones and suggest new ways to further opportunities (Hall, K.ed. 2010). Reggio considers environments to be a key impact to a child's learning, reflecting this Reggio promotes forest schools to support young people's overall well-being and holistic development.

Enabling environments are the starting point to a child's learning experience, it is usually where a child feels safe, creates new opportunities and starts to socialise (birthto5matters, no date). In relation to science, children could have access to areas with plants and natural growth, this can simply be in a woodland area or garden area in setting, the children could explore and enabling adults could provide extra resources such as watering cans, seeds, shovels to pro-long the interest, the adults could then observe to understand the child's process and how they choose to use the resources within their learning environment (Estyn, 2024). Children will then learn how to support living things and how to maintain our natural environment. Whilst being outside in these areas children could also experience mini-beasts and create their own learning around this, enabling adults can provide extra resources such as magnifying glasses, shovels and buckets. During the outdoor exploration, children will observe different types of weather, children will be advised accordingly in regards to what the child may need to wear (gloves, sun hat...) by the adult working with them to ensure they are safe during their time outdoors. If children have the opportunity to explore forests they may find logs, mud, old tyres, practitioners could then step in and ask open ended questions such as "What happens if I roll this log down the bank?" or "What will happen if I add water to the dry mud?" and provide prompts to invite curiosity about different forces and textures for these objects. Practitioners and professionals working closely with children may facilitate a Forest school, these have recently been brought into settings, allowing the children to explore the natural world, become confident, resilient learners and begin their open-ended learning through natural resources (Learning through landscapes, no date). In relation to maths, children can use loose parts to initiate the learning, there are many environments that hold natural resources to promote mathematical learning, children can measure, count, estimate and more! As stated previously, loose parts play a vital role in the child's outdoor learning in all areas of the curriculum, especially science and maths. Loose parts boost creativity and imagination during play, it also supports children to begin cooperative play and socialise in the outdoor environment (Play Wales,2017).

Enabling adults could provide resources to prevent the exploration being cut short, it is also the adults role to ensure that the environment is set up and engaging for the children and will provide meaningful learning opportunities (Kiviranta, L. *et al.*,2023). During the learning experiences, the adults are required to observe and wait for cues, this is to allow the child to initiate their own learning and follow their own interests rather than being directed by the adult. However, if the adult feels the learning needs to be extended then they could ask the child open ended questions to extend the activity and enhance the child's engagement. It is important that adults reflect on what the child's learning focus is and how they can support it subtly, for example, if it is science, the adult could set up an engaging water area with access

to jugs, buckets and other tools, ensure the children also have access to logs, pebbles, mud and other loose parts, however, when the areas are set up, the adult must allow the child to use the areas independently and navigate their own learning experience. Natural Resources Wales (2023) states that maths can be supported by adults just by taking a child outdoors, children can make symmetrical pictures using natural resources such as sticks and stones if they are giving the opportunity. Adults can model some ideas to the child, especially if the child is in need of extra support, this may be because they have additional learning needs or lack in confidence outside of the classroom.

Although the outdoor learning provides children with fun, meaningful learning experiences, there are sometimes challenges that could prevent some settings from enabling them to have the opportunity to have meaningful learning experiences outdoors. Some could say that many teachers prefer to stick to traditional teaching indoors and see outdoors as a privilege and playtimes, it is not seen to meet the curriculum pressures (Welsh Government, 2023). Many settings are not able to access the funding to enable them to provide engaging areas outdoors for the children to learn, they may be unable to buy the extra resources to extend the child's learning. However, financially it is not only resources that can cause effect, if settings have low financial income, then this could also affect staffing which could lead to less time spent outdoors due to risks rising, not only does this have a significant impact on the child's development but also the child's well-being. A resolution for this could be to use more natural resources and seek support from other settings, taking any old resources and upcycling them and seeking community support. Another challenge may be that some settings do not have access to outdoor areas that can be used, this could be because they have a smaller setting or risk assessments may be too high for the children to access the area. However, the adults could support the children to an alternative area, this does not need to cost, it could be a nearby location that allows the children to explore. A more common risk could be behaviours, some children can be a higher risk when outside setting, this could be due to past traumas or additional learning needs. This, however, should not stop children from their learning experiences, they may need extra support from the enabling adults around them. The adults working with these children could provide visuals and extra sensory resources to support the child to regulate before returning to their learning experience. There are many risks that come with outdoor learning, these can vary from the weather, loose parts being sharp and also taking medical needs into account. However, although these risks could occur it is important to understand that there are ways to prevent negative experiences. If the weather is poor, for example, it may be icy, precautions need to be taken such as wear gloves and coats but also being aware of the slippery grounds. Adults will be expected to have children's health care plans and medication in case of emergency whilst learning outdoors.

To conclude, Science and Mathematics can be found in many outdoor environments, whether that be using loose parts or observing the outdoor area and asking questions to their peers or adults. However, it is down to the child to create the

ECEY5005

Word count:3825

2405790

learning experience through play or personal observation. It is clear that children need enabling adults to create enabling environments for them to have confidence to develop independence and resilience, this then leads the child onto making meaningful learning and accessing the curriculum through play. This research has also shown that there are risks to outdoor learning, however, there are also so many benefits a child can get from just being outdoors.

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ECEY5005

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2405790

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