



ECEY5005/C Awe and wonder, science, mathematics and the outdoors



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All photos from this page are taken by myself September 2022.

Part 1



(Own photo 2022).

Part 2

This picture is from a forest area where the children use to carry out a number of different outdoor activities that also include mathematics and science. According to the Welsh government 2021 the national curriculum is everything that a learner experiences, not just what is taught but how it's taught and why it is taught, not just in a classroom however the whole school experience. The curriculum guidance promotes collaboration and cross-disciplinary planning, and learning. In this picture there is a log circle, where children gather to show what they have done or to collect resources and receive information on the task. On the floor of the log circle there is bark and around is a number of different types of trees and bushes this allows a number of different exploring for the children Although this is a forest area some activities may require extra equipment such as pen, paper, clay, trays for gathering

ect. As children become more confident with exploring the environment there may be an option to add to the environment and make some changes to be able to allow the children to continue to explore and grow for example adding round logs to be able to create a path with different sizes and heights this allows the children to gain confidence with moving at different heights and width of the round logs.

Bringing mathematics and science to the outdoors sounds tricky however when looking at it in more detail the outdoors is science and science is mathematics therefore linking all together allowing children to explore the outdoors and combine the curriculum. Devlin 2000, 2002 suggests that mathematics is the science of pattern.

When looking at the curriculum for mathematics and science it is important to think how the outdoors can enhance the learning experience for the pupil while giving opportunities to follow the curriculum. There are a number of mathematical and scientific concepts that can link to the outdoors nicely. One is patterns. looking at different patterns within the forest. There are patterns from the bark and patterns of different leaf shapes as well as the pattern within the leaf. Children learn about different patterns, why these patterns are important, what makes each pattern different and what makes patterns the same.

Within mathematics patterns are more than just art however it allows for prediction of what will come next. Within the forest area the pupils can use a pen and paper to rub the pattern of the bark onto the paper allowing the bark pattern to come alive using different colours allowing the children to see if all bark has the same pattern or if each tree has a different pattern on the bark why these patterns are different or the same. Pupils can also use clay to recreate the pattern of the bark with teachers asking pupils questions about what they see within the clay, or picture they have created, does each tree have a slightly different pattern if so why? What do the pupils think of this pattern, why is this pattern interesting.

Children may ask why different trees have different patterns? Starting to understand that there is more than one type of tree and as the trees age the pattern becomes more profound.

Children also start to understand how everything has its own identity. Linking this to science and biology by identifying similarities between human bodies and trees for example the roots of the tree and similar to the legs of a human and that the body of

a human is similar to the trunk of the tree in the sense it structures the shape. On the other hand also understanding that while all have a similar structure everything is slightly different making each living thing unique.

During the different seasons of the year the forest is a fascinating place to be. During this time the forest shows the different seasons really well, from winter where children can see the cold crisps floor or to feel the cold air through the trees.

Children can then see how the spring starts to show through with visual representation of buds growing up from the trees and the wildlife starts to come out of the ground and start to explore and find food. While looking at the bark, bringing scientific concepts into the outdoors and how habitats form, asking how might the bark become a home for an insect? What makes bark a good home? What animals may live here? All these questions start to form an understanding of how life around us grows and how insects live, learning that some hibernate during the winter months while others only come out at night. During the summer time the children can see the shadows from the trees because the sun is shining and the trees have all their leaves on so they see the way the sun shines through these trees. The seasons of the year come from the way the sun orbits the planet. Therefore starting to bring more scientific concepts in the form of the planets and space, understanding what the sun is and how it makes shadows and what shadows are.

During a session in the forest the children had a blue circle and a picture of the planet from space and had to re-create the earth using green leaves and brown bits. The children found this fun and exciting because they learned about the different parts of earth before and why when looking at earth there were different colours. With looking at different shapes within earth, and why each country has formed into different shapes.

According to the curriculum for funded non-maintained nursery settings 2022 early education provision that is high-quality is essential for children's development, these experiences, skills and knowledge of the natural environment and outdoors help children feel a sense of belonging and pride in what they do and the environment around them while celebrating the diverse culture of modern Cymru. The outdoor environment The glossary of education reform 2013 states that the learning environment is where pupils learn in a diverse physical location, context and culture. Virtual college 2022 also states that a learning environment is a term that can also be known by a physical location in which education and work go hand in hand, as

well as culture. The outdoor environment is significant for the pupils' learning because the children do not always think they are learning, they get to be creative and enjoy the outdoors interacting with their peers, working as a team to complete a task, teaching their peers something new while learning and managing risks in a safe way. Doing all these fun activities and being able to learn crucial scientific and mathematical concepts that can be done in a fun hands-on way. According to Froebel no date suggests that children are creative, curious and active learners who learn best through play, talk, activity and self-reflection, Froebel also says that children learn best when they are in good relationships with family and the wider community, and emotionally secure and feel part of the environment they are in.

Part 3 - please find attached separately.

Part 4

When it comes to the outdoors it is such a versatile place where a number of different activities can go on in one place this allows for creativity when it comes to learning outdoors. According to Hazareesingh, Simms and Anderson 1989 fundamental to good practice is having a serviceable area for play where the indoors and outdoors combine to support an united school learning environment providing warmth, safety, secure and clean place to play. The outdoors offers a number of different experiences, although there are different types of risks when outdoors to indoors, risks in a safe environment can be healthy risks, Lindon 1999 suggests that allowing children to experience risk in the outdoors safely can be an essential for the pupils physical and emotional development. Hazareesingh, Simms and Anderson state that the outside world allows children a unique volume of different materials, movements and colour all of which play a big part in the creativity process for children.

Science affects all lives at all stages from birth to adulthood, Bower 1977 states that babies have an amazing potential to recognise distance, direction, size and to

recognise how to relate sense to. Science guides the materials used to construct homes, how electricity is made and the way food is grown. When looking at science Brunton and Thornton 2010 states that science is made up of a body of knowledge which explains circumstances and the system for gathering this knowledge through experimentation and observation.

When looking at mathematical concepts Devlin 2002 from the teaching mathematics creativity suggests mathematics is the abstract key to which turns the lock on the whole physical universe. For many mathematics is challenging because although pupils have an ability to use mathematics, understanding how mathematics can be used in the real world can be tricky and develops over time. Ofsted 2012 (teaching maths creatively pg 2) agrees with this because they state that the responsibility of mathematics is to enable pupils to develop a good understanding of mathematics by learning to structure, different relationships and fluent recall of concepts of the mathematics before they are able to put those skills into problem solving with tackling more complex ones as they become more confident.

Therefore bringing mathematical and scientific concepts to the outdoors is a great fun way to follow the national curriculum with a hands on approach to not only sitting and listening however to child lead learning. According to Braund and Reiss 2004 from the learning science outside the classroom book there are many positive influences that context for learning which occurs outside the normal classroom not only for the pupils but the practitioners as well.

The role of the adult is to encourage children to engage in mathematical and scientific concepts in an outdoor environment. Bruner 2016 suggests that the role of the adult is to design lessons that help the individual to discover and not give information in a remote way. In order to be able to achieve this the environment needs to provide a stimulating, discovery, curious and experimental area, allowing children to freely explore and use the pupils' imagination. Froebel no date suggested that children learn best through self-activity, rich first hand experiences and problem solving. In addition Wilson 1994 suggests that a child's creativity, sense of wonder and appreciation of beauty is nurtured by an educational environment outdoors. Nicholson 1971 agrees with this theory through his theory of loose parts saying in any environment both creativity and the ability to invent along with the possibility to

discover are all linked to the number and different kinds of variables within the environment. Loose parts are open-ended materials that are designed, redesigned, moved around and transformed in many different ways. Nicholson no date states the degree of inventiveness and creativity as well as the possibility of discovery in any environment are directly related to the number and types of loose parts. Loose parts are effective tool when it comes to play because they are so versatile and can be used to make so many different items, they are portable which allows for pupils to have their own ownership on what they need to create something not dependent on teacher to collect items for them, loose parts encourages imagination and creativity by allowing the pupils to use the items as they feel fit for example a cardboard box may turn into an engine for a car, they are developmentally appropriate for the age of the child and as the child grow the imagination changes and grows. According to Daly and Beloglovsky 2015 when pupils interact with loose parts, children move into a world of 'what if' that advances into the type of thinking that allows children to problem solve. Bruner 2004 suggests that children are scientists and artists. The role of the adult is crucial, an adult plays many roles while supporting, challenging and engaging pupils during the school day. To deliver high quality teaching, adults need to want to expand experiences and enhance learning. Froebel states that while children communicate what they are learning not just by the outcomes of the activity however by action and speech, to do this children will plan, construct, extend, discuss, invent, question, explore and explore with the opportunities that present for pupils. In order for pupils to have the opportunity that Froebel states above it is necessary that adults stand back, work alongside the pupils allowing them to lead the activity and try to extend or scaffold the pupils' learning. Vygotsky 1934 scaffolding theory focuses on learners' ability to grow through guidance from the practitioner followed by peer group work to achieve independent learning. Rinaldi 1997 believes that children are promoters in the learning of the building process, then instead of talking to pupils it is more knowledgeable to listen, listening means understanding the differences and values of different points of view and how others interpret those ideas to create. For adults to achieve this it is important adults offer challenges to the pupils' thinking as well as activities because as Carlina Rinaldi states pupils can only see what they know. (science in the early years) also states that when developing young children's mathematical skills, habits and attitudes modelling is a very powerful and effective tool.

Practitioners have a vital role to play in how children learn by interacting, supporting, encouraging, motivating young children, giving guidance resources and information to allow children's play and learning to be as effective as possible. Sustained shared thinking helps children to explore ideas and make links (early education 2012).

Sustained shared thinking is where two or more individuals are working together to solve a problem whether that being how full is the bucket or how much more water is needed to fill the bucket (sylva et al 2004). Vygotsky 1934 and Piaget 1980 believed that through social interactions with peers, family, friends and teachers knowledge and thought are constructed. Steiner 1925 expands on this by stating that imagination and roleplay learning is essential for developing creative and analytical thinking. Sustained shared thinking is important because according to Laever 2005 is supporting the child's level of learning in a deeper manner.

Adults' role to support sustained shared thinking by having interesting in-depth conversation about anything and everything, the shared element of it is where practitioners learn from the children by information flowing both ways in a two way exchange (brodie 2022). The thinking process of this is provided by the process that goes into the conversation, helping pupils to problem solve, adults support this by asking questions following the how, why, what, where, when and who system to enable open-ended questions allowing for advancement of the question not just yes or no. the sustained part of this is deep level of learning and being able to extend the and solve the problem in a more complex way. Deep level learning encourages pupils not only to learn facts however, think critically and support a positive learning placement (Brodie 2022). Adults can support and encourage this by thinking aloud allowing pupils to have a framework or structure as to how to critically think while all practitioners are critically thinking all will do this process slightly differently and therefore allows the child to grow their own way of critically thinking and problem solving. According to Hale 1988 adults support sustained shared thinking by the process of guided observation to allow children to make the learning connections.

Although there are a lot of reasons why the outdoors should be used for mathematical and scientific concepts, there are naturally challenges when using the outdoors as a learning space. Wells and Lekies 2006 suggests Early childhood nature experiences seem to be related to adult attitudes and behaviours relating to the environment; early experiences in nature have the potential to shape subsequent

environmental paths. Staff working with children using an outdoor area needs to have the confidence and ability to take part and get involved in these activities. Allowing children and staff time to explore the area around and space to play without an adult led activity, can be a challenge within a school environment because there are so many other things that need to be taught, and the school day is such a short time. Tizard and Hughes 1984 states that children have natural enthusiasm for learning however could be suppressed by the teaching priorities. Another challenge when bringing the learning outdoor is having the correct outdoor space for the pupils some issues with the correct outdoor space is budget in order to start the outdoor process, Rickson et al, 2004: Edwards-Jones et al, 2018 states teacher are not given the time, resources or budget to make the changes need for school to have access to an outside suitable environment.

However with all the challenges that are faced when bringing the learning outside it is important to remember to think of the whole body in a holistic way. The holistic way is to think of the child's mind, body and spirit. Harmony 2021 states that the holistic approach is giving pupils a chance at a rich life, because practitioners are considering the whole body physically, socially, emotionally, cognitively, behaviour and personal journeys. Adults can support this by recognising, identifying, counselling, teaching, supporting, challenging, encouraging and including children in the planning and development of their own learning. The holistic approach brings together both the school environment and the home environment Hazareesingh, Simms and Anderson 1989 state that a holistic approach implies relating the learning environment of the school to the home environment, this should happen on a regular basis and on going not just once. Piaget 1980 believes that children experienced four developmental stages and children go through these stages at different points in their developmental journey, the progress of each child depends on the ability and the mutual interaction between people and the environment, this follows the holistic approach because his views are to explore experiment using all their senses, children should have the opportunity to discuss and debate with each other, they should be able to make mistakes and learn from them with all this works towards using body mind and soul to help with development. Piaget believed in the holistic approach because he saw children as individuals, building their understanding and knowledge in their own way. Vygotsky 1934 agrees with the holistic approach because play and imagination were vehicles for learning and help develop the holistic development of the child.

To conclude When it comes to the outdoors it is such a versatile place where a number of different activities can go on in one place this allows for creativity when it comes to learning outdoors. Bringing mathematics and science to the outdoors sounds tricky however when looking at it in more detail the outdoors is science and science is mathematics therefore linking all together allowing children to explore the outdoors and combine the curriculum. The outdoors offers a number of different experiences, although there are different types of risks when outdoors to indoors, risks in a safe environment can be healthy risks. The role of the adult is crucial, an adult plays many roles while supporting, challenging and engaging pupils during the school day. To deliver high quality teaching, adults need to want to expand experiences and enhance learning. Practitioners help children learn by interacting, supporting, encouraging, motivating young children, giving guidance resources and information to allow children's play and learning to be as effective as possible. Therefore bringing mathematical and scientific concepts to the outdoors is a great fun way to follow the national curriculum with a hands on approach to not only sitting and listening however to child lead learning.

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