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ECEY5005; Awe and Wonder – Science, Mathematics and the Outdoors (4,000 words)

I confirm that I have not used any Artificial Intelligence tools in the research and creation of this assignment. I confirm that I have not presented any AI generated materials as my own work. I confirm I have copies of my drafts, notes, and other resources I used, which I may be asked to provide in evidence.

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Part 1



(Source: Katie Cornelius-Davies, 2024).

Part 2

I and four other staff members took 20 children, aged 4-5 years old to Swansea beach. During our journey, the children showed positive attitudes as metacognition began. Metacognition enables and evokes children to build conversations with others, this helps develop language and literacy skills, thoughts and vocabulary. Jiao, Zhang, and Bu (2023) and NCFE (no date) agree by saying metacognition has an important role in the development of children. Metacognitive performance can promote holistic develop as the functions can predict early mathematical skills. Children begin to speak their thoughts and develop an enriching understanding of themselves as a learner. To do this, children tend to become aware of their own thoughts as they “think about thinking”. During our journey, rain began to fall down the window, Child A asked, “why does it rain?”, to build upon the child’s knowledge I replied by suggesting “when we get back to school, let’s find out by researching this question!”. The children started to communicate with their friends on what they could see as the bus drove past animals in fields, different coloured cars and shapes of clouds in the sky. Before getting to our destination curiosity and discovery had already started to blossom as the children quickly realised after pressing their heads against the window that the window vibrates, during the realisation, Child B was making a noise as he leant on the window, his voice began to shake with the vibration which the children around him found highly amusing!



(Source: depositphotos, 2024).

Activity 1 – Repeated Patterns



(Source: shutterstock, 2007).



(Source: WESTEND61, no date).



(Source: APHOTOMARINE, no date).

Practitioners and I conducted a repeated patterns activity. This activity helps aid the children's learning of mathematical thinking while being able to collaboratively work with loose parts.

Loose parts play provides children an environment that encourages curiosity and discovery when experimenting the use of scrap materials, water, sand and open-ended objects. Encouraging children to use and discover the benefits of loose parts enables the children to use their creative and imaginative skills, develop socialisation skills and improves physical coordination as well as psychological wellbeing of being outdoors. (Casey, Robertson, Inspiring Scotland, 2017).

Department for Education (2024) suggests that patterns are vital for children. Seeing, and create patterns tends to form the basics of mathematical thinking. Children start to understand how patterns change and notice irregularities. Learning about patterns supports the foundations of making their own predications, form logical connections and develops mathematical thinking and reasoning as they grow.

The children started to collect two or more of each item (depending on the individual abilities of each child). During this, it became apparent that the children started to investigate the shells and pebbles with their friends. The children started to notice patterns on the items that they had found. Conversations started to develop between the groups of children as Child D shouted to Child Y "Wow! My shell is shiny and sparkly", as Child Y responded by saying "This seaweed is slimy", while pulling a funny face. After these interactions had been made, I provided

magnifying glasses to each child for them to have a closer look as they build upon their discovery and explorations of the different patterns around them.

This was child-led, as they began to demonstrate and develop teamwork, this helped the children's social skills as they built upon forming positive relationships with both practitioners and children. As patterns formed it became familiar to the children that patterns occur naturally within an outdoor environment. During this activity, practitioners initiated open-ended questions to provide an understanding of the activity given, such as "I wonder what comes after the pebble in your sequence?". However, we did not overly interrupt the children during this time.

Metacognition was shown when Child A mistakenly put a pebble in the incorrect place within their sequence, Child A was able to spot the error independently while saying to themselves, "oops! You do not go there, pebble".

As the activity came to an end, it became apparent that this activity demonstrated many developmental skills and personal development as the children showed communication, critical thinking, confidence and adaptability. This activity benefited the children's academic development by creating their own patterns as they use their mathematical thinking to ensure the correct item goes in the correct place. Whereas this activity could also be interconnected with a scientific background as the children discovery the items found on the beach, and their uses within the water.

Activity 2 – Measuring Size of Footprints

As we touched the sand the children's mental health suddenly heightened as the curiosity began to build within each child. Due to the anticipation and the development of pace, the children's feet started to slightly slide into the dry sand, footprints began to grow in every step as their electrified feet moved faster. During the children's play at the beach, a couple of the children started to count the footsteps they could see around them. As the challenge began to flow towards the other children the "game" started to become a favourite, and the challenge elevated to see who could count the most. As more footprints started to embed in the sand with the motion of children and staff.

As a new task, I set the question of, “I wonder who can get the deepest footprint?”. As the children started to jump, run, and push into the sand with force the children started to measure the depth of their own footprints visually, and using stones and shells. As a result of this active activity the children started to develop upon their gross motor skills. During this activity the children began to show a positive understanding as counting footprints became a positive challenge. Within the early years, play forms an important part in the development of mathematics and numeracy. This activity was formed from play by the children, as well as enabling them to explore ideas, establish connections and collaborate with others. The children developed resilience as well as a sense of achievement and enjoyment. This activity was shown as play; however, a huge amount of learning was surrounded around them. As a result of this, the children became ambitious, capable learners and creative contributors (HWB, 2020a).

As this activity started to flow, children began to communicate with friends to help each other make the deepest footprint. A pair of children started using their hands to push on each other’s feet to embed the pattern of soles, whereas other children were running to watch their footprint follow or jump to create the overflow of sand around the embedded area. Again, the magnifying glasses were in use, as the children started to notice sole prints embedded into the sand. Children started to investigate and make predications of whose shoe made that footprint. The children started to compare their footprint to their friends’, and staff members around them.

This activity was a successful challenge through play as mathematical thinking occurred throughout as the children built upon their counting skills, as well as noticing patterns on shoes. This suggests that this activity aids learning through play, fun, curiosity and challenge. Due to the children being forceful within the sand as they pressed their feet using their body, the development of scientific thinking also shone through. The children found it highly motivating as they count the footsteps around them, notice the different pattern of sole and see the different size of prints between their own footstep, compared to a practitioner. Whereas scientific thinking was discovered as the force within their body came together to push down onto the sand but lifted the sand around the embedded area, as the sand lifted water from the tide started to fill their deep prints, this was again, a huge success as the children discovered when wet sand is

pressed on, the texture of sand changes and the water seeps around the weighted area which causes the wet sand to turn to drier. During this activity the children met their scientific thinking milestones as they showed exploration and experimenting, and began to understand and discover the different textures, movements and change of shape in forces when pressing into wet and dry sand.

As the knowledge of the world around them begins to grow, their friendships began to blossom too. The children came together during this activity as they built upon teamwork as they support each other with all aspects of learning. According to Curriculum for Wales (2015), the children met their milestones within the mathematical area as they use ordinal numbers to 10 and 20 in daily play and practical situations.

Activity 3 – Building Sandcastles

When announcing to the children that we were going to take a trip to the beach, the excitement of the idea of building sandcastles rocketed, there was a huge amount of metacognition that began to fill the room. One child shouted, “I love building sandcastles!”, whereas another child said, “we could see sharks”.

As the children started to rush over to their own area within a close proximity, the children started to independently fill their buckets up with sand. Most of the children found an area with dry sand to build their sandcastles, whereas four children unintentionally found a wet patch of sand from where the tide had come in and gone out. During this, the children began counting each scoop of sand that they are putting inside their buckets. As the buckets began to flip, some of the dry sandcastles crumbled, and others did not stand at all. As a response to their disappointment, I encouraged the children to try again, but this time using the different textured sand. However, the children using wet sand, successfully built their sandcastle. In response to these children I asked, “I wonder if your sandcastle will look like this with dry sand, shall we try?”. The children became resilient and tried to build as many castles as they could. After this the children started to see that the sandcastles stand stronger when the sand is wet. As this

activity was occurring, I was giving suggestions to the children why the sand may be standing stronger with wet sand. I explained to the children that, “sandcastles stand tall when using wet sand because the water works like glue, this means the water forms between the grains of sand to hold it together”.

Practitioners were there to support the children with the weight of the buckets and the turnover of the bucket of sand. However, practitioners did not overly interrupt but helped when asked. After the creations came together, I responded to the children’s resilience by saying “wow! Not only are you an artist today, but you are also a scientist!”.

As an evaluation to this activity, the children started to understand the cause and effect of the different textures of sand, as they discovered the wet sand works better when constructing a sandcastle. HWB (2020b) suggests that sand play invites children to explore and engage with their senses and build upon their scientific thinking. A child’s scientific thinking is at the heart of progression steps 1 and 2. This provides a foundation of curiosity, exploration and the knowledge of the world around us.

Activity 4 – Sink or Float

After using the buckets for sandcastles, some of the children started filling their buckets with water. Independently, the children began to drop loose parts into their buckets of water, these included sand, shells and stones. After observing the children from a distance for some time, I went over to initiate and build a conversations and challenge to further their holistic development.

As I walked over to the small group of children, Child O said, “Miss Davies, Look! My shell is sinking”, as Child P responded by adding, “so is my stone”. After this, a few more children became interested in the activity being presented to me. The whole group then took on the question of, “how many objects can we find that float?”.

The children ran off, some independently and others in pairs, to find as many natural materials as possible to see which of the items float, or sink.

During this, there was an immense amount of discussion between the children and metacognition filled the atmosphere. A small group of children started comparing the sizes of shells and pebbles to see if the size of the object would determine the result. During this experiment, the children became shocked when realising small shells were also sinking! One child asked, “why do shells sink?”, however, the shell was sinking due to the way the child was placing the shell into the water. I demonstrated to the children another way to slowly put the shell into the water, and this time the shell began to float! This was an excellent way to show different ways and understandings of a float and sink activity. After this process, I began explaining to the children that because the shell is light and does not weigh much, means the weight of the water surrounding the singular shell will cause the object to float. Whereas the density of a pebble weighs more than the water itself, which causes the pebble to instantly sink. Force also determines whether the objects sinks or floats, as force pushes the object up, or down.

There was a many scientific words used throughout this activity, for example, the word density, and the meaning, force, and energy were becoming a regular occurrence in discussions.

At the end, the children started to count how many items floated and sunk. As a challenge, the children were adding their items, and their partners items together to use their mathematical thinking, as well as scientific.

Floating and sinking activities promote problem solving, creativity and positive wellbeing, while also enhancing on social skills. A float and sink activity are visual which helps children make more accurate predictions of the outcome.

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Part 3 - Risk-Benefit Assessments

Name of activity:	Activity 1
Description of activity	Children collect a range of loose parts that they can find at the beach. For example, seaweed, pebbles, and shells. After this, children are to make a sequenced pattern.
Appropriate for which ages and abilities	This activity will be appropriate for any age, at any ability with and without support from an adult, this activity is adaptable to suit the individual needs of each child. For example, only using two objects, or making a shorter pattern. Children with Additional Learning Needs may need 1:1 support to get around the beach safely. Relevant staff will be in attendance to ensure all needs and abilities are met.
Equipment or resources needed	Magnifying glasses. Loose parts on the beach will also be needed, these may include: • Shells • Pebbles • Rocks • Seaweed
Any special adaptations for different needs	Depending on the individual needs of the child, soft materials may be a more suitable object to compile. Such as: • Seaweed • Leaves • Sand

Benefits	Children will start to compile patterns using natural materials. The children will physically move items to ensure understanding is developing in the pattern created. Child to identify what object should go next in their pattern. Child will show an understanding of mathematical thinking when completing the pattern independently or with help. Children will start to show understanding of what loose parts are and how they can be used outside of the classroom. Scientific thinking will be shown as they discover items from the sea and see how they are washed up with the tide coming in. Independence. Communication skills. Social skills. Children build upon their cognitive skills. Children develop gross motor skills. Children to explore the area using a magnifying glass.
Hazards/Risks and who may be harmed	Sand may go into a child's eye/mouth/ear. Children or staff may slip on the sand if sand is dry or sloped. Children could walk on shells or sharp items bare foot. Drowning may occur if a child is too close to the shore.

Precautions, or other comments	To ensure all risks are minimal, we have ensured that staff in attendance will be trained to meet the needs of every individual child. Staff in attendance will have up to date First Aid training with appropriate resources, kits, and medication for any child that may need assistance. Lifeguards will be at the beach at a proximity is help, if needed. Staff will be in close proximity at all times. A member of Senior Management will be in attendance of all trips.
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Name of activity:	Activity 2
Description of activity	Children are to count and measure the footsteps embedded within the sand around them. Child can use a range of lose parts as a measuring block. For example, stones, shells, sticks or visually. Children are to embed their own footprints within the sand as they see the difference in depth and size in the prints around them, compare their own to an adult.
Appropriate for which ages and abilities	This activity is appropriate for any age of child. This activity can be differentiated to suit the individual need of support, such as, help and guidance may be needed to a child that struggles to walk or to use added pressure within their legs/feet. This activity would not be suitable for a child persistently using a wheelchair unless support can be given successfully in a safe way.
Equipment or resources needed	Loose parts. Magnifying glasses.
Any special adaptations for different needs	Support may be needed for a child with Additional Learning Needs. 1:1 help will be provided for children who are in wheelchairs or may find it hard to complete this activity. Trained staff will be assigned to attend this trip.
Benefits	Children can develop upon their gross motor skills. Children can use their mathematical thinking. Children can start to develop an understanding of forces.

	Children begin to measure depth visually. Children begin to measure depth using loose part resources. Independence. Communication skills. Social skills. Children develop and build upon their gross motor skills as they use the whole body within this activity.
Hazards/Risks and who may be harmed	Children may slip on the sand. Sharp items may be buried within the sand, such as shells or stones. Drowning can be a hazard when being close to the shore.
Precautions, or other comments	Children will be supervised at all times. Staff will have a First Aid kit that will have all relevant resources they may need. First Aid training will be given to the staff in attendance. Lifeguards will be present during this trip to ensure help is given, if needed.

Name of activity:	Activity 3
Description of activity	Children are to build two or more different sandcastles with dry and wet sand. Children start to develop their mathematical and scientific thinking as they see the difference in their creations when using different textures of sand. After children have built their sandcastles, a discussion as a group will occur to discuss the different mathematical thinking and scientific features that have occurred throughout the activity. Children begin to understand that building sandcastles is a form of learning through play and that water can act as a glue motion when mixed with sand.
Appropriate for which ages and abilities	This activity is appropriate for any age of children. Support may be needed for younger children to help turn over the bucket to form the castle. Adaptions to this activity can be suggested to meet the abilities of each individual child. For example, smaller equipment may be used, with a 1:1 adult to support.
Equipment or resources needed	Buckets. Spade.
Any special adaptations for different needs	1:1 support, if needed.
Benefits	Children develop a scientific thinking when learning through play.

	Children are to start to show an independence during through play and activity. Children use mathematical concept throughout this activity, such as counting each scoop of sand that goes into the bucket. Children build upon their gross motor skills. Children develop their cognitive skills.
Hazards/Risks and who may be harmed	Sand may go into ears/eyes/mouth. Drowning. Sharp objects may be embedded within the sand, this may hurt the children.
Precautions, or other comments	First Aid boxes, resources, equipment and medication will be taken with the staff in attendance to ensure any injuries or illness are minimal. Lifeguards will be present on the beach to provide help, if needed. The correct ratio of staff to children will be in attendance. This means at least 4 members of staff will be present. Staff will always be alert and active to ensure all children are at a close proximity.

Name of activity:	Activity 4
Description of activity	Children will fill a bucket half full of water. Children will experiment using loose parts, as they drop/place the items into the bucket. They will continue to investigate whether the items sink, or float. During this, practitioners will show their wonder of why items sink or float. This will initiate discussions between small groups as they develop their curiosity, discovery and development of the scientific features and thinking of this activity. Mathematical thinking will also be shown in this activity.
Appropriate for which ages and abilities	This activity is appropriate for children aged 3+ with support in the weight of the bucket, depending on the amount of water inside. 1:1 support may be needed depending on age, or ability depending on the individual needs of each child.
Equipment or resources needed	Buckets. Loose parts.
Any special adaptations for different needs	This activity can be adapted to suit any different need, for example smaller buckets can be used.
Benefits	Mathematical thinking will be shown during this activity. Scientific thinking will be shown during this activity. Development of curiosity will be developed upon. Children build upon cognitive skills.

	Children develop gross motor skills.
Hazards/Risks and who may be harmed	Drowning. Sand getting in a child's ear/mouth/eye Children stepping on sharp objects
Precautions, or other comments	First Aid equipment will be provided and taken to the beach with the staff attending. Up to date First Aid training will be given before the trip. A senior member of staff will be there to support. Lifeguards will be present, if help is needed.

Part 4

"To move, to run, to find things out by new movement, to feel one's life in every limb, that is the life of early childhood." (Margaret McMillan, 1930, p.23). Movement is significant for young children as it underpins mental health, develops physical health, aids learning and lays the foundations for attitudes and interests for life. Movement helps by building the brain and the body at a young age, and learning through doing with your whole body, which helps develop an understanding of cause and effect.

Within an early years setting the role of the practitioner plays a vital role of helping children develop and grow. As the role of the practitioner, you should be observing, supporting and extending play and learning within all activities to ensure you are meeting all individual needs and pushing each child to their full potential. Practitioners should be encouraging children's curiosity, helping them extend their thinking and discovery within all aspects of learning. (White, J., 2014)

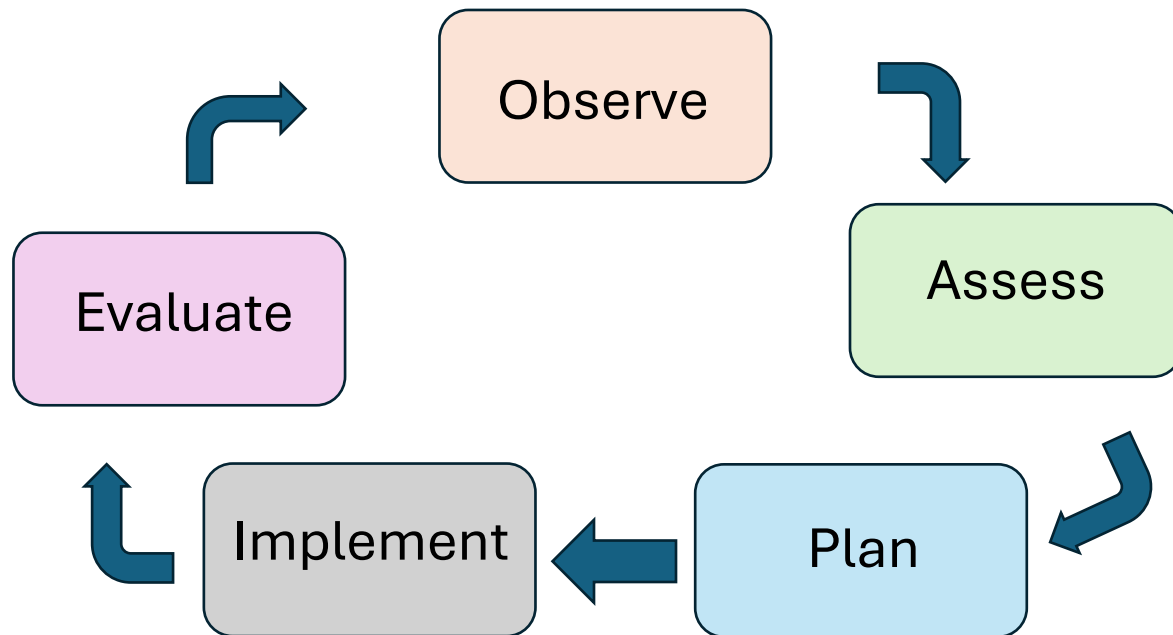
Mathematical thinking within the outdoors occurs as children seek patterns, make connections and recognise relationships through finding out and working with numbers. Children use their knowledge and skills within these areas of development to solve problems, generate questions and make connections across all areas of learning (Palaologou, I.,2010). According to Project Learning Tree (2019) there are many challenges when using and developing upon a child's mathematical thinking. These include, motivation, invites problem solving, supports diversity and enhancing the child's development. However, there may be disadvantages of using mathematical thinking within the outdoors. For example, the setting may have a lack of outdoor space and clothing, and fear of managing behaviour outdoors. Behaviour in children can often differ when being in the outdoors this may be because the children feel freer and more spacious to be more active. (Learning through Landscapes, no date)

According to Michigan State University (2017) scientific thinking in the outdoors supports children share their wonder for their discovery play. It enables children to use their senses to have feel, listen, smell and taste of all that nature has to offer. Scientific thinking within the outdoors gives the children and adults the opportunities to ask open-ended questions while building positive relationships with the people and the world around them. However, the barriers to this are the lack of outdoor environments, and some children may struggle with a sensory overload.

When observing children's interests and features, practitioners can get a good idea on what the children like to work with, and do not like to work with. When providing child-led play it is important to provide a meaningful scaffold that interests the children and builds upon their previous knowledge. Children tend to learn more than the concepts and skills but show exploration through play when the subject is math or science (Community Playthings, 2016). Learning through play when the developmental area is math should always be shown using manipulatives, for example cubes, pattern blocks, rods or natural, outdoor materials. This can be beneficial as the children can use these skills to build, play and move to show their understanding (Edutopia, 2019).

Whereas, Play Matters: the heart & science of play (2024) suggests that child-led play for scientific learning within the outdoors is giving the children an opportunity to learn about the world around them, this can be done through gardening, painting outdoors, building with loose parts, or just playing outside as they follow their natural curiosity to explore and uncover the environment around them, such as observing plants and insects. Vygotsky supports this as according to Vygotsky (1978), children learn through interacting with the environment and through social interaction with others. This helps children's holistic development using imagination through play and learning, which sets up the children for the future. (Bartlebay, no date)

As children are completing ongoing activities regarding the chosen subjects it is important that adults observe as this can help practitioners assess the children's progress. There are many things you can find out when observing children, it is important the practitioner documents the details accurately and appropriately. Documenting observations can be written, recorded or by audio. This will help the practitioner have a better understanding of the individual children within their care. After this process, practitioners should assess by analysing and reviewing what they know and what they have found out about the child's development. This can help future activities, whether the activities are at the correct level for the children. According to West Sussex Government (2021a) the vital process, that should be done frequently is as follows:



According to West Sussex Government (2021b) observation, assessment and planning all support a child's development and learning. Planning must start with observing children to understand and consider their current interests and learning. Observation skills must be considered before undertaken the observation, the practitioner must decide on the documentation they are going to use for each child before looking, listening and recording the data needed. Effective practitioners pull together to form the information as they gather all information. This is when practitioners can start to plan the next set of activities for the abilities of children within their care.

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