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**Awe and Wonder - Science, mathematics and the outdoors**

**Task 1: Photograph**

(Source: Robertson, 2019)

**Task 2: Learning story**

This photograph gives scope for open-ended play due to the different gradients within the grassy areas, mud and trees where conversations can be had about wildlife, creatures and life cycles, aswell as the varying sizes and shapes in logs. Within my learning story I have decided it is raining whilst the children play outside, and I also add a variety of loose parts, mid-way, for the children to include in their play.

At 9am the children arrive at nursery. They are all 4 years old. I have been delegated to play with and observe eight of these five-year-old children, a mixture of boys and girls.
“Boys and girls, look, it is raining outside”, I point with excitement. The children all run to the window to have a look. “Can you see the rain falling on the grass?” I asked. “Yes” the children shouted enthusiastically.
“I wonder if the grass will be wet or dry now?” I asked.

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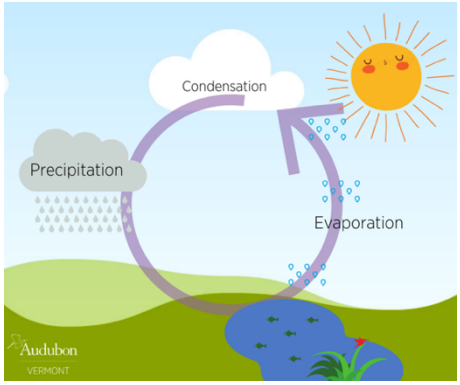
"WET! It's going to be wet because the rain is wet", one five-year-old boy shouted.
One girl thought aloud, "Why is rain wet?"
"Hmmm, I'm not sure why the rain is wet. Shall we read some books on rain later to see if we can find some answers, because that is an interesting question. For now, we can get our rainsuits and wellies on and go outside to play. Maybe we could touch the grass to find out of it is wet or dry?"

(Source: Mueller, 2019)

The children find their own wellies located on a low shelf in the nursery room, whilst I fetched their rainsuits. With some help from another staff member, we get the children suited and booted for some outdoor, rainy play. The play area is fully fenced in, no children can get out and no strangers can get in, so I tell the children they can play anywhere. The wide-eyed, excited children ran off to play. Just as I was closing the nursery door I heard, "Miss, come here quickly", whilst gesturing with her hands. "The grass is wet. I can feel the cold on my fingers". Three more children joined us. Whilst feeling the grass myself, I explained simply to the children about the water cycle, that when the clouds get too full of water it starts to rain. I gave them the illustration of a sponge being full of water and that when it gets too heavy to hold any more water it would start to leak.

(Source: Archer, 2020)




(Source: Image Professionals GmbH, 2022)

On this topic of rain, another boy asked if the rain was a drink for the trees. "Does the rain help them to grow?"

I replied, “What a brilliant question. Yes, just like we eat food and drink water and it makes us grow big and strong, so the rain feeds the trees, flowers and grass and makes them grow.” As I continued talking, I guided the children to the trees. In getting down low and touching the soil I explained to the children that trees have roots deep down in the mud and that the roots are like straws. “Just as we suck up water through a straw and drink it, so the roots of the trees suck up rain and drink it.”
Another boy said, “the rain is the tree’s drink?”
“Exactly”, I replied pointing at him with a big smile on my face.

(Source: Jon, 2020)

The children then scattered around the play area. Some were jumping off the tree stumps, two girls were sitting on the wooden bench with their hoods up having a conversation, a couple were walking a “tight rope” balancing on the horizontal, lined up wooden trunks on the grass, and others were running playing tag.

I decided to place some objects in certain areas. I placed 5 different coloured balls and five wooden blocks in the sloped grass area, kitchen utensils and bowls in the mud area by the trees, and some coloured bean bags by the tree stumps. I intentionally stood back to observe what the children might do. Three children immediately went over to the mud/tree area. One child noticed the raindrops falling into a bowl. She was inquisitive about whether the rain could fill the whole bowl up entirely of water. They decided amongst themselves to place the bowl on the grass away from the trees and watch to see if the bowl would fill up. Whilst waiting, the children played mud kitchens by spooning mud into the bowls and stirring. They quickly realised that the utensils were all different shapes and sizes and that some had prongs. They figured out they could make patterns in the mud. They created zig-zag patterns, straight lines and spirals, which led them onto shapes, such as squares, circles and triangles.

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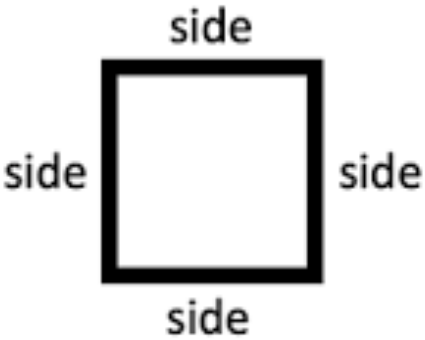
(Source: Housing a Forest, 2013)

I decided to ask the child drawing a square in the mud how many sides there are to a square. He didn't understand the question, so I knelt, and with my finger drew a square in the mud. Once completed, I explained that each line of the square is a side, counting each side as I re-traced the square with my finger. He then wanted a turn, imitating what I had just done. He drew the square and counted each side. "1-2-3-4. A square has 4 sides, Miss", he squealed. I applauded and encouraged him. I then asked him, "I wonder how many sides a triangle has?" I smiled and stepped away to observe from a distance. He copied the exact steps previously done by drawing the shape and counting the sides.




(Source: McFarlane, no date)

As he continued, one of the little girls went back to her bowl and noticed it was nearly full. She called me over to have a look. With great excitement she said, "Miss, the rain has filled my bowl up. It wasn't full before!"
I asked, "If it wasn't full before, does that mean it was empty?"
She replied, "Yes, there was no water in it before".

(Source: Pxfuel, no date)

I suggested, “Why don’t we use this bowl of water to find out what things in the garden sink and float?” More children came to join us. “Boys and girls, this could be our garden experiment! Shall we pretend to be scientists?” They were all very excited. I explained to them the concepts of sinking and floating. How something that’s heavy will sink to the bottom of the bowl, under the water, and something that floats will stay above the water. Whilst I sat by the bowl of water, I asked all the children to go and find an object. “Boys and girls, I’ll give you 10 seconds to find an object in the garden. When I shout 10 you need to come back to me and then we’ll test what sinks and floats. Ready? Steady? GO, GO, GO!”

All eight children were involved at this point and hurriedly wondered around the garden. By the time I reached 10 everyone was circling the bowl of water with objects at hand. “For us to be real scientist’s boys and girls, we need to make a prediction of what each object is going to do. That means we must guess if the items are going to sink or float”. This was such a fun-filled game, full of mathematical and scientific opportunities. The items chosen were a ball, stick, stone, fork, beanbag, leaf, wood chipping, and somebody’s hair clip. We all made our predictions and waited with such anticipation to find out the results. We discussed weight, heavy and light objects. And we cheered every time somebody got a prediction correct. On finishing the experiment, I took a step back to observe and the children continued to find objects and discuss which items would float and sink.

(Source: Davis, 2014)

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**RISK BENEFIT ASSESSMENT**

| | | | |
|---|---|---|---|
| **Location / Activity:** | Natural playground environment | **Date:** | 15th September, 2022 |
| **Assessor:** | Shauna Hawker | **Review date:** | 15th January, 2023 |

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.**

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| ACTIVITY | How will young people BENEFIT from this activity? | Hazards and risks | Who is at risk? | PRECAUTIONS in place to reduce the risk of injury | Overall risk RATING: L/M/H |
|---|---|---|---|---|---|
| Rainy Weather | - Stimulating children's immune systems<br>- Stimulating the 5 senses with new sights, smells, textures and sounds which encourage brain development<br>- Supports creative thinking and fine motor skills<br>- Basic understanding of Scientific concepts such as the water cycle | - Slips, trips and falls as ground may be wet<br>- Chafing or rubbing from wet clothes causing soreness or redness<br>- risk of developing a cold if out in this weather too long | Children and adults | - First Aid kit accessible when outdoors and fully trained First Aider outside with children or available if needed<br>- Appropriate clothing to be worn by both children and staff such as waterproof rainsuits and wellies, with a change of clothes available<br>- Sheltered areas available for children as and when needed<br>- Outdoor play to be restricted to shorter periods of time if and when necessary | Low |

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| ACTIVITY | How will young people BENEFIT from this activity? | Hazards and risks | Who is at risk? | PRECAUTIONS in place to reduce the risk of injury | Overall risk RATING: L/M/H |
|---|---|---|---|---|---|
| Sloped ground | - Enhances awareness of surrounding area and encourages children to consider the uneven levels of ground, adapting physical walk when necessary<br>- Requires children to shift their centre of gravity causing improved range of motion and building muscular strength, preventing potential injury<br>- Builds balance and coordination | - Slips, trips and falls | Children and adults | - First Aid kit accessible when outdoors and fully trained First Aider outside with children or available if needed<br>- Variety of grounds available for children to play on, including flat surfaces<br>- Appropriate footwear to be worn, such as wellies or trainers | Low |

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| ACTIVITY | How will young people BENEFIT from this activity? | Hazards and risks | Who is at risk? | PRECAUTIONS in place to reduce the risk of injury | Overall risk RATING: L/M/H |
|---|---|---|---|---|---|
| Muddy/ trees area | - Healthier immune systems due to germ exposure<br>- Boosts creativity, imagination, independent learning, and teamwork<br>- Develops construction and problem-solving skills<br>- Develops emotional health through sensory play | - Infection through scrapes and cuts caused by digging in the mud<br>- Trees falling or branches breaking causing injury to children | Children and adults | - Staff to be vigilant at all times<br>- Staff to assess area for debris prior to children playing<br>- Golden rules to be explained to children, such as 'no eating mud, stones, and other earth fragments<br>- Appropriate clothing to be worn with a change of clothes available if necessary | Low |

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| ACTIVITY | How will young people BENEFIT from this activity? | Hazards and risks | Who is at risk? | PRECAUTIONS in place to reduce the risk of injury | Overall risk RATING: L/M/H |
|---|---|---|---|---|---|
| Utensils | - Exploration of different materials, shapes and sizes<br>- Open-ended objects developing children's open-ended play<br>- Basic understanding of mathematical concepts due to pattern formation | - Injuries due to prongs on utensils<br>- Injury, bruising and cuts due to children hitting each other with heavy metal utensils | Children | - Staff to be vigilant at all times and intervene when necessary<br>- Remove objects if risk is heightened<br>- First Aid kit accessible at all times | Low |

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| ACTIVITY | How will young people BENEFIT from this activity? | Hazards and risks | Who is at risk? | PRECAUTIONS in place to reduce the risk of injury | Overall risk RATING: L/M/H |
|---|---|---|---|---|---|
| Bowls and water play | - Basic understanding of scientifical concepts, such as volume and weight<br>- Develops hand-eye coordination<br>- Enhances concentration and focus<br>- Builds social and communication skills<br>- Develops creativity, imagination and exploration<br>- Develops gross and fine motor skills through lifting, pouring, carrying | - Water spillages<br>- Slips, trips and falls due to slippery surfaces<br>- Heavy water containers | Children and adults | - First Aid Kit accessible at all times<br>- Reiterate the need to be careful when walking on wet, slippery ground<br>- Appropriate clothing to be worn with a change of clothes available if necessary | Low |

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| ACTIVITY | How will young people BENEFIT from this activity? | Hazards and risks | Who is at risk? | PRECAUTIONS in place to reduce the risk of injury | Overall risk RATING: L/M/H |
|---|---|---|---|---|---|
| Benches | - The bench area could encourage a variety of role play opportunities; occupational, fantasy, and mimicking real-life situations. Role play will encourage imagination, social and emotional development, whilst improving language and communication skills<br>- Develop emotional traits such as empathy and compassion as children communicate with one another | - Splinters (If there are any rough egdes)<br>- Potential bone breakages if children jump off the beck awkwardly | Children | - First Aid Kit accessible at all times<br>- Assess and feel for any splinters prior to children playing outside<br>- Staff to be vigilant at all times | Low |

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| ACTIVITY | How will young people BENEFIT from this activity? | Hazards and risks | Who is at risk? | PRECAUTIONS in place to reduce the risk of injury | Overall risk RATING: L/M/H |
|---|---|---|---|---|---|
| Horizontal and vertical tree stumps | - Gives them a natural place and material to climb and jump whilst developing gross motor functions<br>- Balancing, coordination and decision-making skills are enhanced as children take one step from one log to another<br>- They learn to manage depth, distance and risk<br>- Develops creativity and imagination with made up games, such as 'the floor is lava' | - Potential slips, trips and falls<br>- Potential bone breakages, scratches, cuts and splinters | Children | - Assess the wood before children play on it for any areas that could cause splinters<br>- First Aid Kit available at all times<br>- Staff to be vigilant at all times<br>- Appropriate shoes to be worn, such as trainers or wellies | Low |

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| ACTIVITY | How will young people BENEFIT from this activity? | Hazards and risks | Who is at risk? | PRECAUTIONS in place to reduce the risk of injury | Overall risk RATING: L/M/H |
|---|---|---|---|---|---|
| Climbing fences | - Understanding safety<br>- Having conversations surrounding 'stranger danger'<br>- Self risk-assessing and understanding their capabilities | - Children climbing the high fences to get out causing children to get lost or hurt | Children | - Staff to be vigilant and watchful of all children<br>- If children are seen to be climbing fences to reiterate safety<br>- If children continue to climb fences, they will need to be removed from play area<br>- Staff to continually walk around the entire play environment for safety measures | Low |

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**Task 4: Academic evaluation**

According to Little, Sandseter and Wyver (2012) and Brussoni (2019) outdoor play is paramount for children's holistic mental health, wellbeing and physical development. Positive risk-taking and experimentation within the outdoors are contributing factors to this holistic health (Brussoni et al, 2018). Infact, Murray and Williams (2019) believe outdoor, risky play within the Early Years, through experiencing new thrills, challenges and discoveries (Duglan, 2015), can develop autonomy, initiative and independence in children. An equally important aspect is that children prefer playing outdoors more than indoors, reports Raymund (1995) and White (2019).

Consistent, regular time outdoors is vital as it gives children time and space to notice and reflect on their ever-changing surroundings, such as, seasons, plant growth, leaves falling, birds flying, and weather changing, to name a few (National Literacy Trust, 2022). It also gives opportunities for sensory play and exploration of the natural world (Waters-Davies, 2022) by feeling mud, discovering varied minibeasts and wildlife, experiencing the thrill of tree-climbing and puddle jumping, collaborating with peers in den-making, whilst discovering and understanding scientific and mathematical concepts such as gravity, gradients, weight, height, balance, texture, shape, colour and patterns through play (White, 2015).

This is reiterated by Crein et al (2015) in that she believes that outdoor play environments should undoubtedly encourage play and exploration, understanding of cause and effect, development within dialogue, collaboration and problem-solving, whilst increasing their autonomy, questioning, curiosity, and reflection alongside adult scaffolding and involvement.

Bilton (2020) understands the vitality of the role of the adult playing a major part in positive outdoor play for children by showing enthusiasm and interest, role-modelling curiosity, and imagination, whilst having good, explanatory conversations throughout play times, thus becoming sustained-shared thinkers (Maynard and Waters, 2007). Tovey (2020) agrees with Froebel, a German Early Years educator, that children grow, develop, learn and think cognitively, socially, physically and emotionally within the outdoors through being nurtured by knowledgeable and supportive adults (Mechler, 2015).

However, in a study done by Duglan (2015) it seems that some early year's practitioners were afraid of providing riskier, child-led, open-ended play opportunities for children due to their own personal preferences, lack of interest and comfort levels. It is crucial to learn from this article by keeping children's preferences and interests at the forefront when planning play opportunities by observing the children during child-led play times says Jan White in Muddy Faces (2022). This is done by responding to and providing opportunities for investigation and play within their current interests whilst sowing seeds of new ideas, offering wider experiences and presenting new concepts within outdoor environments (Gov Wales, 2008).

According to Greenfield (2009) many professionals have concerns of lacking in scientific and mathematical concepts and knowledge, however Worth and Grollman (2003) and Gomes and Fleer (2020) argue that it's the responsibility of the adult to educate themselves, spending extra time preparing for such discussions. The adult's role in outdoors play is to observe what the child already knows and understands based on what they convey verbally and behaviourally, and to then help fill in any gaps with curiosity (Department of education and training, 2017). Questions such as, "I wonder why the rain falls from the sky?" or "What makes objects sink or float?" could spark awe and wonder within children's thinking, questioning and development.

Mechler (2015) believes applying mathematical and scientific concepts throughout daily activities is straightforward because maths and science are, in essence, everywhere (STEM learning, 2020). Baroody and Dowker (2003) believe infants learn fundamental mathematical concepts such as, more than, less than, behind and in front of, inside and outside, near and far before they even enter nursery or school. The terms adding and subtracting, weighing, measuring, and graphing are also deemed foundational (Clemson and Clemson, 2006). According to Piasta, Pelatti and Miller (2014) providing young children with the knowledge and understanding of basic mathematical concepts produce in them the drive to master in new, developing skills as well as fine-tune existing ones.

Similarly, science is in nature, life cycles, cooking, weather, and the environment (Department of Education, 2013). When children are aware of such elements, scientific skills such as observation, comparison, prediction, measurement and documentation can be used regularly says Greenfield and Colleagues (2009). These mathematical and Scientific discoveries give children opportunities to become problem-solvers and abstract-thinkers (Mechler, 2015).

Vygotsky's Model of Social Learning suggests that the prevalence, timing, and standard of verbal and non-verbal interactions between the facilitating adult and child are crucial for the holistic development of children (Holzman, no date). His pattern for scaffolding children during activities will begin with the child being unable to complete tasks alone, to achieving with assistance and verbal support, to achieving with verbal support, and to finally achieving alone (First Discoveries, 2022). By using this theory, we are supporting child independence as well as encouraging bravery, risk-taking and curiosity.

A scientific and mathematical visual of this outworked in an outdoors environment might be a child wanting to walk along vertical wooden logs but is unable to balance alone. The child recognises their inability and asks for adult help. The adult helps the child by holding their hand as they walk along the log, explaining simply the concept of balance and counting their steps whilst verbally encouraging their efforts. On practicing this balancing activity a few times, the practitioner can let go of the child's hand, when they feel it is safe to do so, whilst standing back and verbally encouraging them. Once this element is completed the child will be able to accomplish this task alone with no physical or verbal help needed. The adult 'showing' and 'telling' is in essence what a supportive, scaffolding, enabling adult is (First Discoveries, 2022).

According to MA Education Ltd (2022) it is crucial that adults provide Early Years children with sensory-rich environments, with varied opportunities for play. Malaguzzi (Pound, 2014) believed by allowing children to become fully absorbed in their play areas, allowing them to investigate sensorily, children would be more engaged in play, encouraging them to become multi-dimensional thinkers.

Children's play environments within school or nursery settings are usually fenced areas with a type of play equipment, such as slides, playhouses, tents, and climbing frames, with little greenery (Lerstrup and Konijnendijk van den Bosch, 2017). Because of this, there has been a want to enhance outdoor environments (McKendrick, 2005), giving children better educational opportunities (Department for Education and Skills, 2006), through larger, open landscapes with multiple gradients and levels, natural affordances such as trees, mud, and water, with open-ended variables to play with (Acar, 2014).

Gibson's Affordance Theory (Waters-Davies, 2022) argues for an environment to be most effective for play and development it must have a variety of affordances available to children. Refshauge et al (2013) believes affordances should be an object that children can climb on, run on, balance on, swing on, move on, be imaginative with, construct and build with, be touchable and mouldable, whilst sparking opportunities for dramatic play, construction, creative play and role play. This aligns with Gov Wales (2020) in that settings and practitioners should allow for authentic learning opportunities within play times which extend and apply to cross-curricular skills, such as numeracy, literacy, mathematics and science. For example, the different sized, vertical tree stumps in the above photograph might be a submarine one day, whilst on another day they might represent their 'Islands of safety' from the creatures in the water beneath them. Another example might be a stick being used as a wand in a game of witches and wizards, and on another day, it is a spoon for mixing mud food. These affordances, the tree stumps and sticks, can be used across the breadth of the curriculum.

Affordances are versatile objects, allowing for meaningful possibilities within the outdoors environment (Gibson, 1979), whilst promoting children's exploration of new scientific and mathematical concepts (Edwards et al (2017). Fjortoft and Sageie (2000) research showed that landscapes such as forests, open fields, and urban areas promoted resilience, independence, cognitive strength, creativity, imagination and motor skills over that of children who played in more traditional playgrounds. However, the way in which outdoor spaces are used and managed by adults is as important as the play environment itself (Malone and Tranter, 2003).

Like affordances, another way to enhance children's learning and curiosity is to allow time to play with loose parts, this is referred to as Nicholson's Theory of Loose Parts (1971). These are materials which can be used in an open-ended fashion, and can be both natural such as acorns, sticks and water, or man-made, such as wooden pallets, tyres, and tarpaulin (Department of Education, 2022). These variables can be used by children in imaginative ways to become something that they are not (Daly and Beloglovsky, 2015), manipulated and transformed through child-led play (Houser et al, 2016). Loose parts can be used to stimulate the senses too, by listening to sounds such as tyres rolling and tarpaulin being rustled, by

feeling the ridges of the tyre marks, noticing the different textures and patterns of each of the materials; for example, rubber, plastic and wood, and even the different scents the objects carry (Play Scotland, no date).

An example of a scientific and mathematical child-led activity could be the constructing of a den made from loose parts, such as tyres, pallets and tarpaulin (Hobson, 2020). This type of activity will inevitably spark imagination and creativity, encouraging problem-solving, good communication and collaboration with peers, whilst experimenting with trial and error, thus demonstrating understanding of varied, holistic skills (Ginsberg, 2007 and Nicholson, 1971).

Elements such as gravity when pushing tyres up and down gradients whilst noticing the pace of the tyre going slower up the hill and quicker down the hill (Creative Star Ltd, 2022). Children understanding their capabilities as they assess the heaviness or lightness of the pallets and using their core strength to lift variables, producing stability, coordination, and balance (Department of Education: EYFS, 2021), and stretching out the tarpaulin to see how far it goes whilst recalling measurements of the den structure (Skinner, 2022). It provides scientific opportunities for construction and engineering which follows Piaget's theory in that children can become 'little scientists' as they discover new concepts and ideas, experimenting and inventing with different variables (Kitchener, 1986 and Hobson, 2020). A scientific and mathematical activity such as this one encourages children to become ambitious in their thinking, enterprising by showing initiative and resourcefulness, and creative contributors in their building (Gov Wales, 2022).

For children to develop holistically, which includes learning about and understanding both mathematic and scientific concepts within the outdoors, it is vital we become pro-active, enabling adults for them, creating space for engaging experiences through play, whilst providing effective outdoor environments (Gov Wales, 2021). By applying these we will inevitably see children grow to become ambitious, capable learners; enterprising, creative contributors; ethically informed citizens; and heathy confident individuals (Welsh Parliament, 2022).

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**Reference list:**


Acar, H (2014) 'Learning environments for children in outdoor spaces', *Department of landscape architecture,* 141, pp. 846-853. DOI: https://doi.org/10.1016/j.sbspro.2014.05.147

Archer, D (2020) *The water cycle revisited.* [image] Available at: https://vt.audubon.org/news/water-cycle-revisited (Accessed: 12th September, 2022).

Baroody, A. J. and Dowker, A (2003) *The development of arithmetic concepts and skills: Constructing adaptive expertise.* Available at: https://books.google.co.uk/books?hl=en&lr=&id=5IaZofpAurQC&oi=fnd&pg=PR3&ots=6Db3ZKmrc-&sig=GiZoe_Lfllc04F30I1PEMa6dgHc&redir_esc=y#v=onepage&q&f=false (Accessed: 23rd September, 2022).

Bilton, H. (2020) 'Values stop play? Teachers' attitudes to the early years outdoor environment', *Early Child Development and Care,* 190 (1). pp. 12-20. ISSN 1476-8275 doi: https://doi.org/10.1080/03004430.2019.1653548 Available at https://centaur.reading.ac.uk/86411/

Brussoni, M (2019) *Outdoor play*. Available at: https://www.child-encyclopedia.com/outdoor-play (Accessed: 23rd September, 2022).

Brussoni, M. et al (2018) **'**Go Play Outside! Effects of a risk-reframing tool on mothers' tolerance for, and parenting practices associated with, children's risky play: study protocol for a randomized controlled trial**',** *Trials,* 19, pp. 173. DOI: https://doi.org/10.1186/s13063-018-2552-4

Clemson, D. and Clemson, W (2006) *Mathematics in the Early years*. London: Routledge.

Creative Star Ltd (2022) *Tyres in school grounds*. Available at: https://creativestarlearning.co.uk/developing-school-grounds-outdoor-spaces/tyres/ (Accessed: 26th September, 2022).

Cremin, T *et al* (2015) 'Creative Little Scientists: exploring pedagogical synergies between inquiry- based and creative approaches in Early Years science', *Education* 3-13, 43:4, 404-419, DOI: 10.1080/03004279.2015.1020655

Daly, L. and Beloglovsky, M (2015) *Loose parts: Inspiring play in young people*. Available at: https://www.communityplaythings.com/resources/articles/2015/Loose-Parts (Accessed: 26th September, 2022).

Davis, J (2014) *Floating and Sinking Science activity*. [image] Available at: https://www.learning4kids.net/2014/04/15/floating-and-sinking-science-activity/ (Accessed: 12th September, 2022).

Department for Education and Skills (DfES) (2006) *Learning outside the classroom: manifesto. HMSO DfES.* Available at: http://www.outdoor-learning.org/external (http://www.outdoor-learning.org/external)affairs_policy/lotc_manifesto.pdf (Accessed: 26th September, 2022).

Department of Education (2013) *Science programmes of study: Key stages 1 and 2.* Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/425618/PRIMARY_national_curriculum_-_Science.pdf (Accessed: 23rd September, 2022).

Department of Education (2021) *Statutory framework for the early years foundation stage.* Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/974907/EYFS_framework_-_March_2021.pdf (Accessed: 26th September, 2022).

Department of Education (no date) *The power of loose parts play.* Available at: https://www.education.sa.gov.au/sites/default/files/npsa-familyday-care-loose-parts.pdf (Accessed: 26th September, 2022).

Department of Education and Training (2017) *Practice Principle Guide – Integrated Teaching and Learning Approaches*. East Melbourne.

Duglan, S (2015) *Enabling Environments: Outdoors in full swing*. Available at: https://www.nurseryworld.co.uk/features/article/enabling-environments-outdoors-in-full-swing (Accessed: 19th September, 2022).

Edwards, S., Cutter-Mackenzie, A., Moore, D., & Boyd, W (2017) 'Finding the balance: A play-framework for play-based learning and intentional teaching in early childhood education', *Every Child*, 23(1), 14–15.

First Discoveries (2022) *Playworker: The adult role in outdoor play and learning.* Available at: https://www.firstdiscoverers.co.uk/playworker-outdoor-learning/ (Accessed: 23rd September, 2022).

Fjortoft, I. and Sageie, J (2000) The natural environment as a playground for children. *Landscape and Urban Planning*, 48(1), pp. 83–97. DOI: http://dx.doi.org/10.1016/S0169-2046(00)00045-1

Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston: Houghton Mifflin.

Ginsburg, K. R.(2007) The importance of play in promoting healthy child development and maintaining strong parent-child bonds, *Paediatrics*, *119*, pp. 182-191. DOI:http://pediatrics.aappublications.org/content/119/1/182

Gomes, J. and Fleer, M (2020) 'Is Science really everywhere? Teacher's perspective on science learning possibilities in the preschool environment', *Research in Science education*, 50, pp. 1961-1989. DOI: https://doi.org/10.1007/s11165-018-9760-5

Gov Wales (2008) *Play/Active learning*. Available at: https://hwb.gov.wales/storage/52aae98d-65ed-4065-9222-1a7876e150de/play-active-learning-overview-for-3-to-7-year-olds.pdf (Accessed: 26th September, 2022).

Gov Wales (2020) *Developing a vision for curriculum design*. Available at: https://hwb.gov.wales/curriculum-for-wales/designing-your-curriculum/developing-a-vision-for-curriculum-design/#cross-curricular-skills (Accessed: 28th September, 2022).

Gov Wales (2021) *Enabling Pathways*. Available at: https://gov.wales/sites/default/files/consultations/2021-05/enabling-pathways-consultation-document_0.pdf (Accessed: 23rd September, 2022).

Gov Wales (2022) *Developing a vision for curriculum design*. Available at: https://hwb.gov.wales/curriculum-for-wales/designing-your-curriculum/developing-a-vision-for-curriculum-design/#curriculum-design-and-the-four-purposes. (Accessed: 26th Septemebr, 2022.)

Greenfield et al (2009) 'Science in the preschool classroom: A pragmatic research agenda to improve science readiness', *Early education and development*, 20(2), pp. 238-264. DOI: https://doi.org/10.1080/10409280802595441

Hobson, T (2020) *Integrating loose parts play in a pre-school program.* Available at: https://www.edutopia.org/article/integrating-loose-parts-play-preschool-program (Accessed: 26th September, 2022).

Holzman, L (no date) *Vygotsky's zone of proximal development: The human activity zone*. Available at: https://www.researchgate.net/profile/Lois-Holzman/publication/254992019_Vygostsky's_Zone_of_Proximal_Development_The_Human_Activity_Zone/links/53ee0e3a0cf23733e80b24ca/Vygostskys-Zone-of-Proximal-Development-The-Human-Activity-Zone.pdf (Accessed: 23rd September, 2022).

Houser, N. E. *et al* (2016) 'Let the Children Play: Scoping Review on the Implementation and Use of Loose Parts for Promoting Physical Activity Participation', *AIMS Public Health*, 3(4), pp. 781-799. DOI: https://doi.org/10.3934%2Fpublichealth.2016.4.781

Housing a forest (2013) *Mud, mud, glorious mud*. [image] Available at: http://www.housingaforest.com/mud-mud-glorious-mud/ (Accessed: 12th September, 2022).

Image Professionals GmbH (2022) *Hands squeezing out wet sponge* [image] Available at: https://www.imageprofessionals.com/en/images/00964673-Hands-squeezing-out-wet-sponge (Accessed: 12th September, 2022).

Jon (2020) *How to prevent tree roots in sewer pipes* [image] Available at: https://www.crackedslab.com/blog/how-to-prevent-tree-roots-in-sewer-pipes (Accessed: 12th September, 2022).

Kitchener, R. F (1986) *Piaget's theory of knowledge*. Yale University Press.

Lerstrup, I. and Konijnendijk Van Den Bosch, C (2017) 'Affordances of outdoor settings for children in preschool: revisiting heft's functional taxonomy', *Landscape research*, 42(1), pp. 47–62. Available at: https://doi.org/10.1080/01426397.2016.1252039.

Little, H., Sandseter, E.B.H. and Wyver, S. (2012) 'Early childhood teachers' beliefs about children's risky play in Australia and Norway', *Contemporary issues in early childhood*, 13(4), pp. 300–316. Available at: https://doi.org/10.2304/ciec.2012.13.4.300.

MA Education Ltd (2022) *Possibilities on offer.* Available at: https://www.earlyyearseducator.co.uk/features/article/possibilities-on-offer (Accessed: 26th September, 2022).

McFarlane, T (no date) *Does a square have 4 or 8 sides as each side has an inside and an outside?* [image] Available at: https://www.quora.com/Does-a-square-have-4-or-8-sides-as-each-side-has-an-inside-and-an-outside (Accessed: 12th September, 2022).

McKendrick, J.H (2005. *School grounds in Scotland: research report. Scottish Poverty Information Unit*. Available at: http://www.sportscotland.org.uk (Accessed: 26th September, 2022).

Mechler (2015) *Applying maths and science concepts in Preschool classrooms*. Available at: https://www.childcarequarterly.com/pdf/fall15_math-science.pdf (Accessed: 23rd September, 2022).

Muddy Faces (2022) *Child led play*. Available at: https://muddyfaces.co.uk/outdoor-hub/outdoor-play/child-led-play (Accessed: 23rd September, 2022).

Mueller, L (2019) *Moving in the Rain: 10 Tips for Staying Dry and Protecting Your Stuff.* [image] Available at: https://www.moving.com/tips/moving-in-the-rain-10-tips-for-staying-dry-and-protecting-your-stuff/ (Accessed: 12th September, 2022).

Murray, E. J. and Williams, P. H (2019) 'Risk-tasking and Assessment in Toddlers During Nature Play:The Role of Family and Play Context', *Journal of adventure education and*

*outdoor learning*, 20(3), pp. 259-273. DOI: https://doi-org.ezproxy.uwtsd.ac.uk/10.1080/14729679.2019.1660193

National Literacy Trust (2022) *The benefits of outdoor learning in the early years.* Available at: https://literacytrust.org.uk/blog/the-benefits-of-outdoor-learning-in-the-early-years/ (Accessed: 23rd September, 2022).

Nicholson, S (1971) 'How not to cheat children – The theory of loose parts', *Landscape Architecture, 62*, 30-34.

Piasta, S. B, and Pelatti, C. Y, and Miller, H. L (2014) 'Mathematica and Science learning opportunities in preschool classrooms', *Early Education Department*. 25(4), pp. 445-468. DOI: https://doi.org/10.1080%2F10409289.2013.817753.

Play Scotland (no date) *Loose parts*. Available at: https://www.playscotland.org/wp-content/uploads/Play-Scotland-Loose-Parts-Leaflet.pdf (Accessed: 26th September, 2022).

Pound, L. (2014) *How children learn: educational theories and approaches - from Comenius the father of modern education to giants such as Piaget, Vygotsky and Malaguzzi. New and improved edition.* London: Practical Pre-School Books.

Pxfuel (no date) *PXFUEL.* [Image] Available at: https://www.pxfuel.com/en/free-photo-orneu (Accessed: 12th September, 2022).

Raymund, J. F (1995) 'From barnyards to backyards: An exploration through adult memories and children's narratives in search of an ideal playscape', Children's environments, 12(3), pp. 162-380. Available at: https://www.jstor.org/stable/41514982?seq=1#metadata_info_tab_contents(Accessed:23rd September, 2022).

Refshauge, A. D *et al* (2013). 'Evidence-based playground design: Lessons learned from theory to practice', *Landscape Research, 40*, 226–246. DOI:10.1080/01426397.2013.824073

Robertson, J (2019) *Why natural playgrounds are better than structured playgrounds* [image] Available at: https://www.ecoparent.ca/eco-parenting/why-natural-playgrounds-are-better-structured-playgrounds (Accessed: 8th September, 2022).

Skinner, C (2022) *Getting constructive with maths*. Available at: https://www.teachearlyyears.com/learning-and-development/view/getting-constructive-with-maths (Accessed: 26th September, 2022).

STEM Learning (2020) *Maths is everywhere*. Available at: https://www.stem.org.uk/news-and-views/opinions/maths-everywhere (Accessed: 26th September, 2022).

Tovey (2020) *Froebel's principles and practice today*. Available at: https://www.froebel.org.uk/uploads/documents/FT-Froebels-principles-and-practice-today.pdf (Accessed: 19th September, 2022).

Waters-Davies, J (2022) *Introduction to play*. SAGE Publications Ltd.

Welsh Parliament (2022) *Donaldson review: The purposes and content of a curriculum for wales*. Available at: https://research.senedd.wales/research-articles/donaldson-review-the-purposes-and-content-of-a-curriculum-for-wales/ (Accessed: 27th September, 2022).

White, J (2015) Every child a mover: A practical guide to providing young children with the physical opportunities they need. British Association for Early Childhood Education.

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