How would you use an outdoor environment to promote and support children's scientific and mathematical thinking?

Section 1

Hurrell (2016).

Section 2

The environment in the photo could be used in various ways by children to develop many different concepts but particularly their scientific and mathematical concepts, children can explore and develop these concepts by interacting with the environment around them and the natural resources found there. This outdoor environment could allow a child to take their learning in their own way and give them independence when developing their scientific and mathematical skills. The environment could be used by the children to further their scientific and mathematical development in an enjoyable way, they may use the free space to race and see who can build a den in the fastest time or who is the first person to find several bugs. For this activity a class would be visiting the site with correct ratio of staff to children. The practitioners

involved in observing the children in this activity will be there to observe, supervise and to encourage the children to use their curiosity.

The children could be asked to gather materials for dens and then proceed in making them or they could go on a bug hunt. Mathematical concepts such as counting and measuring could be developed during these activities as children may count how many different bugs they can find or how there are of one species. Children could also do addition when doing this. For example, if one child counts 10 ladybugs on one stick and another child counts 5 ladybugs on another stick, they will have found 15 ladybugs in total. Challenges could also be set for the children, such as who can find the most bugs. Teams could be created and the children in the teams could count how many bugs are in different places. The children could then come together and compare how many bugs they were able to find and see what area had the most. Paper and pencils could be given to the children to aid the children in counting accurately. Some children may find it easier to write the numbers down rather than count in their head. In relation to the four purposes in the Curriculum for Wales, the Welsh Government (2020b) states that mathematical skills encourage children to be critical of data and findings and this encourages them to be ethically informed citizens. The children may also measure trees, sticks, or branches when sourcing the materials needed for their den building. Practitioners could encourage the children's curiosity here by asking why certain materials may be better for their dens or why they have decided to use longer or shorter sticks and branches. Children may use their measuring skills to ensure that their dens are strong and stable. They may want to go inside their dens and therefore will have to ensure that their dens are tall enough for them to go inside. They may also create their own competitions by comparing who can build the tallest den. The Welsh Government (2020b) states that mathematical concepts should be taught in exciting ways and these competitions may encourage the children to work harder in a more enjoyable way.

Exploring weight could also be explored by children participating in this activity. For example, if they use heavier sticks to build dens then they may be stronger but also may be too heavy and destroy any structure the children may have already made. The Welsh Government (2020b) explains that mathematical concepts are vital for children to learn as it helps them critical thinking skills in day-to-day life. The children will be able to learn from their mistakes when exploring weight as a concept. If they

see that thicker sticks are more supportive, the children may be able to experiment with how much weight they can hold before they break. If a child uses something that is too heavy for their structure, they may find a lighter alternative. By giving children the opportunity to explore these concepts freely then they can ask themselves questions (Should I use this? What can make this better?) this then encourages them to use their critical thinking skills.

There is also a slightly sloped area which may encourage the children to roll or slide down. The children could be asked if this slope would be a good area to build a den? Concepts such as gravity could then be explored here. The children could experiment with trying to build on different gradients and explore how flat surfaces may be more stable area than a sloped one. This may encourage the children to use metacognitive talk and question why certain things may happen. For example: Why should I not build a den here? Where would be better? The adults observing this activity could just encourage this talk by prompting children to ask these questions.

Scientific concepts such as classification, life cycles or weather cycles could also be explored during this activity. The Welsh Government (2020) places an emphasis on the importance science and technology has on a child and how it ultimately makes them more independent individuals. Children could explore the environment and see what bugs they can find. Magnifying glasses or bug pots could be given for children to examine the different insects or bugs that they find. Children could then investigate classifying the different bugs by raising questions such as: can it fly? How many legs does this have? What colour is it? Where does it live? These questions encourage a child's metacognitive talk which Education Endowment Foundation (2023) describe as highly beneficial for a child's development. If artificial loose parts were added here, children could be given identification sheets that they could refer to if they were unsure of the name of something. The Welsh Government (2022) explains that a child's progression takes places when they gain knowledge and information over a period. Identification sheets would allow the children to build on their existing knowledge of bugs that they can identity, furthering their scientific development. The Welsh Government (2022b) state that to encourage a child's development, their learning experiences must be meaningful. In this activity, children could investigate the different bugs life cycles and expand their own learning

independently by being able to identify the different bugs found and then find information regarding their life cycle.

Children could experiment with loose parts without a set activity. They may combine the tyres with wood to create cars or spaceships. The opportunities could be endless, and children would have the opportunity to explore and learn through self-directed play. If they are building a car, they may want it to look symmetrical so find the similar materials for both sides. If they were building their own playground, they may want to build a slide and therefore could experiment with using different gradients and gravity.

If this activity was repeated during different weather conditions the children may be able to may comparisons to further their learning. They may be able to identify how the weather can impact on the activities given to them. The children may question whether they find more animals in the wet than in the dry? or can they build a den better with dry materials rather than wet? This contributes to their holistic learning. The Welsh Government (2022b) explain that cross curricular experiences are vital, this activity therefore would be highly beneficial as it could help further a child's mathematical and scientific development.

Section 3

RISK BENEFIT ASSESSMENT

Location / Activity:	Woodland area	**Date:**	26th September 2023.
Assessor:	Megann Hopkins	**Review date:**	

The boxes in the table below will expand as you type into them; pre-entered text is simply for illustration. You should delete irrelevant items and replace with text relevant to your circumstances.

Your overall risk rating – Low, medium, or high – is based on your judgement about whether the BENEFITS of the activity or opportunity outweigh the RISKS.

Experience exploring outdoor space in photograph	How will young people BENEFIT from this activity?	Hazards and associated risks	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk after precautions RATING: L/M/H
Walking on uneven ground	Children can use their awareness of their body to understand what they can and cannot do. Promotes children's understanding of scientific concepts such as gradient, slopes and forces. Supports children physical development through their balance and strength.	Trip hazard. Children may fall due resulting in bruising, cuts, or other injury.	Children and adults.	A yoga or balance game for children to experience and assess their own ability to balance. Ensure appropriate clothing is worn- Shoes, coats, and long trousers. Discuss gradients and slopes with the children, what may be dangerous and hazardous. Demonstration of what happens when you walk on different uneven or sloped ground.	L

Experience exploring outdoor space in photograph	**How will young people BENEFIT from this activity?**	**Hazards and associated risks**	**Who is at risk?**	**PRECAUTIONS in place to reduce the risk of injury**	**Overall risk after precautions RATING: L/M/H**
Children picking up material to make dens.	Children can examine properties of different materials. Encourages critical thinking through by questioning what may work best etc... Gross motor development- lifting material. Children can develop teamwork skills by working together to carry materials.	Children may collect hazardous material such as rubbish. Splinters or cuts from sharp materials. Poisonous plants or flowers.	Children and adults.	Educate children that nothing is to go in their mouth, and they must wash their hands at the end of the activity. Give information regarding what children should not pick up. Quiz children on what they can and cannot touch.	L

Experience exploring outdoor space in photograph	**How will young people BENEFIT from this activity?**	**Hazards and associated risks**	**Who is at risk?**	**PRECAUTIONS in place to reduce the risk of injury**	**Overall risk after precautions RATING: L/M/H**
Children exploring the insects and bugs living in the environment.	Children can investigate the relationships that living things have with the environment. Children can investigate life cycles, habitat and how living things travel. Children can be ethically informed citizens by looking into living things in a considerate way. Children can learn about how insects and bugs have a role in nature.	Bites, stings, or allergies to bites/insects.	Children and adults.	Teach children to identify poisonous insects or bugs. Bring identification sheets to show which insects and bugs not to touch. Explain that there may be other insects or bugs to explore which can be exciting. Children do not touch unidentifiable bugs or insects without an adult's permission. Ensure first aid and any medication is readily available.	L

Experience exploring outdoor space in photograph	How will young people BENEFIT from this activity?	Hazards and associated risks	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk after precautions RATING: L/M/H
Children explore and select the best area to build a den.	Physical development. Gross motor skills- jumping, walking, and running in the environment.	Children may become lost. Branches at low high may cause eye or head injury.	Children and adults.	Ensure children are aware of where they can explore without and adult and where they cannot. Explain what areas may or may not be suitable. Explore the area and explain that the children should be cautious around anything that is sticking out and to always look where they are walking.	L

Experience exploring outdoor space in photograph	How will young people BENEFIT from this activity?	Hazards and associated risks	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk after precautions RATING: L/M/H
Exploring the outdoors in different weather conditions.	Expand vocabulary in relation to temperature- wet, dry, warm, cold. Children can become more aware of how the weather can pose a risk to their own safety. Children can understand how the weather affects things in the environment- rain makes things slippery etc.	Wet and cold weather may lead to hypothermia. Hot weather may lead to sunburn or sun stroke and dehydration. Pollen allergies/hay fever. High wind may lead to falling branches or trees to fall which may result in injury or death.	Children and adults.	Consider conditions on the day the activity is planned. Check met office conditions for the day – do not do activity if there are stormy or high-speed winds. Ensure everyone wears appropriate clothing – wellingtons or walking shoes, coats, and waterproofs. Ensure appropriate essentials are taken – sunscreen, water, hats and that some shelter is available. Educate children that rain can make the ground slippery. Ensure first aid and any medication is readily available.	L

Experience exploring outdoor space in photograph	**How will young people BENEFIT from this activity?**	**Hazards and associated risks**	**Who is at risk?**	**PRECAUTIONS in place to reduce the risk of injury**	**Overall risk after precautions RATING: L/M/H**
Playing with varied materials such as soil and water.	Encourages sensory development by exploring properties of soil and water. Children can experiment what happens when they are combined. Develops fine motor skills.	Drowning. Ingesting bacteria.	Children and adults.	Consult environmental health to ensure soil is suitable and safe to use. Ensure children wash their hands thoroughly after use. Ensure only small quantities of water are handed out in watering cans. Demonstrate and educate on how to use water safely.	L

Experience exploring outdoor space in photograph	How will young people BENEFIT from this activity?	Hazards and associated risks	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk after precautions RATING: L/M/H
Managing small insects and bugs.	Develops fine motor skills through handling insects and bugs gently. Children can learn how in nature things work collaboratively. Develop patience and concentration skills.	Animals removed from their natural habitat. Bites or stings or allergies to bites and stings.	Children and adults.	Teach children to identify poisonous insects or bugs. Bring identification sheets to show which insects and bugs not to touch. Ensure there is some adult provision available for this. Remind children to put all living things back where they found them and explain why this is essential. Ensure first aid and any medication is readily available.	L

Experience exploring outdoor space in photograph	How will young people BENEFIT from this activity?	Hazards and associated risks	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk after precautions RATING: L/M/H
Children exploring the environment independently.	Allows children to be creative- children can plan and build what they visualise.	There may be animal faeces which could be tread on. Trip hazard from hazardous objects within the environment such as tins or pieces of metal.	Children and adults.	Adults to inspect area before allowing children to explore. Set up a perimeter and show the children what area they need to stay in. Ensure children are aware of what to do if they see a stranger. Ask the children to tell an adult immediately if they do find any animal faeces. Ensure there is the correct ratio of adults to children to overlook the children.	L

Experience exploring outdoor space in photograph	How will young people BENEFIT from this activity?	Hazards and associated risks	Who is at risk?	PRECAUTIONS in place to reduce the risk of injury	Overall risk after precautions RATING: L/M/H
Combining or joining material to build a den.	Cognitive thinking through cause and effect- what has the best outcome. Development of fine motor skills – tying things together. Critical thinking skills improved through learning from mistakes.	Strangulation from string. Stab hazard from pegs.	Children and adults.	Demonstrate how to use string and get each child to repeat to ensure understanding. Count all strings at the beginning and end of the activity. Use plastic pegs. Count all pegs at the beginning and end of the activity.	L

Section 4

Vygotsky (1986, cited in Campbell and Speldewinde, 2020) states that day to day learning is all a part of scientific development. Therefore, it is suggested that opportunities for children to explore concepts in an outdoor environment will contribute to their development of these concepts. Richardson (2013) and Play Scotland (2023) place an emphasis on outdoor learning and discuss that children have the right to access an outdoor environment. The main role of the adult is to share a child's discovery, if this role is not fulfilled then children will not develop. Richardson (2013) supports this view and states that children require adults who understand the importance of the outdoors for a child's development. However, as Knight (2011) noted, there are some practitioners who are anxious with the idea of

outdoor learning. The impact the outdoor environment has on a child's holistic learning should also be considered.

UNICEF (no date) and Scot Public Health (2017) explain that all children have the right to an education and a right to play. Maslow's hierarchy of needs demonstrates that children need to have all basic needs met before they can reach self-actualisation where they can fully develop (McLeod, 2023). Practitioners, therefore, should ensure that all children have their needs met so they can develop their understanding of concepts such as maths and science. The outdoor environment is beneficial to a child's development and health (Welsh Government, 2009). A child need's to be in good health so they can develop fully (McLeod, 2023). Berkshire National Health Service (2023) describes how a child's vestibular system is vital in regulating behaviour. The outdoor environment gives children the space to experiment and use their vestibular sense which aids in developing a child's sense of balance, which is essential for physical movement. It could be beneficial therefore for adults to allow children to use the outdoor environment so they can teach concepts in an open space. Peterson (2022) suggests that math activities which require movement as successful as they are repetitive which makes them easier for children to remember. Similarly, Bruner (1960 cited in McLeod, 2023b) suggested that a spiral curriculum would be beneficial for children to develop concepts, they would be able to revisit and build on previous concepts to develop a deeper understanding. McLeod (2023b) states that Bruner's spiral curriculum theory in relation to mathematical concepts would ensure children have a comprehensive understanding. Children learn better through direct learning (McLeod, 2023b). It would be valuable then for practitioners to use a direct learning approach when introducing a scientific or mathematical concept to children as they will then be able to build upon their existing knowledge each time.

Like Maslow, Early Childhood Education (2008) describe Steiner's approach of children developing who they are as a person. Steiner's approach focuses on children reaching their spiritual and emotional potential as well as their academic potential (Early Childhood Education, 2008). Cardiff Steiner School (2022) states how outdoor play promotes the use of emotional and social skills and notes how practitioners can work solely as observers so children can work independently to solve problems. The Welsh Government (2020b) discusses that play is vital for

children to develop their mathematical concepts. Early Years Careers (2015) states that when practitioners set mathematical activities in the outdoors, children build on their mathematical knowledge, and they build on skills such as teamwork and resilience. The outdoor environment also contributes towards a child's holistic development. McIlroy (2023) explained that activities that are play based and open ended promote a child's holistic development. Froebel (no date, cited in Lilley, 1967) declared that all children need the opportunity to explore the natural environment. Wardle (2021) discusses Frobel's approach and noted that Froebel found the outdoors as useful for children's learning as it gives them the opportunity to explore freely through direct learning, thus contributing to their holistic development. Bruner (1960, cited in Wardle, 2021) also placed an emphasis on adults giving children a direct learning experience as it allows children to develop a thorough understanding. Piaget placed an emphasis on hands on learning as it gives children the opportunity to find revelations for themselves (Murphy, 2018). In addition to this, Tunnicliffe (2015) states that children develop their scientific concepts of the world around through natural experiences of their environment. Therefore, practitioners should allow children to use the outdoor environment, so they are able to develop an in-depth understanding of their scientific and mathematical concepts. McIlroy (2023) suggests that practitioners should use holistic learning, so children are able to develop in all areas.

Professional Association for Childcare and Early Years (2023) explain that enabling environments consider the emotional and physical environment and they are significant for a child's development. The Welsh Government (2022b) share this view and note that early year's practitioners should also work as enabling adults by providing safe and supportive environment to ensure children's development. Therefore, it may be beneficial for practitioners to be these enabling adults and provide the children with an enabling environment so the children can further their scientific and mathematical concepts. Wilson (2018) identified that children do develop academically without direct intervention from adults. Therefore, it is suggested by Wilson (2018) for adults to allow children to be independent in their learning but through adult planned activities rather than adult led activities. Education Wales (2022) also state that the new curriculum will assist in educating children to live independently. Practitioners therefore may want to provide children

with these ‘enabling environments’ so that children can further their scientific and mathematical concepts in an outdoor environment. Nevertheless, Keith (2017) states that not many have access to the outdoor environment and as a result are confined to developing these concepts in an indoor environment instead. Despite this, Keith (2017) and Louv (2009) notes that the outdoor environment is crucial in developing a child’s mathematical concepts. The Welsh Curriculum (2015, cited in Keith, 2017) places significance on cross curricular learning and explains that maths should be explored through play and life experiences.

Adults can assist in extending a child’s learning journey through adding loose parts to an outdoor environment to further their development of their mathematical and scientific concepts. Flannigan and Dietze (2018, cited in Rahardjo, 2019) explain that the outdoor environment provides not only a space for children to play but also provides loose parts with endless uses. Nicolson (1971) suggests that adults play a role in preventing a child form being imaginative. He explains this by stating that adults take away the enjoyment for learning by placing structured objects in the learning environment. This then doesn’t give the child to be creative with their learning. Wilson (2018) states that practitioners must understand the significance of play when it comes to a child’s development of maths and science. Tunnicliffe (2015) notes the importance of play for a child’s scientific development as it allows children to observe their own learning and begin to raise questions. Nicolson (1971) suggested that placing loose parts in a child’s learning environment, allow children to develop their critical thinking skills and further their development through experimentation of different materials which have endless uses. Gibson’s ‘affordance theory’ describes this and states that parts like these have different meanings to different children in the environment (MA Education, 2016). Duglan (2015) and Nicolson (1971) conclude that open-ended materials and opportunity promote a child’s curiosity and development. However, Campbell and Speldewinde (2020) concluded that the natural environment already provides children with both loose and fixed parts which assist in their scientific development. Similarly, Wilson (2020) found that children were more engaged with their learning if they gathered resources independently rather than being given resources by an adult. Consequently, it could be argued then that loose parts may not be required in an outdoor environment if the environment already contains these naturally. This is similar to the Reggio Emilia

approach which considers the environment as the lecturer of a child (Reggio Emilia approach, 2022). Despite this, Rahardjo (2019) concludes that practitioners can use loose parts can be used as a tool to support learning or to help children express their emotions in their reflections.

Frobel (1967 cited in Tovey, 2012) suggested that children face more challenges are safer than those who are sheltered and protected from risk. Despite this, Steiner, Karabon and Litz (2023) identify that there is a decline in outdoor play and an increase in indoor play. Laird and McFarland (2014) explain that children learn risk when no adult is supervising them, but adults are now too protective. Therefore, it can be viewed that adults within the early years do not let children self-assess risk and consequently children will be less independence due to their inability to assess risk. Knight (2011) explains the role of the adult and states that the adult should allow the child to take rational risks. Similarly, Froebel (1967 as cited in Tovey, 2012) concluded that children benefitted from the freedom of figuring out things for themselves within the environment and it encouraged independence, the adult should consider the benefits rather than the risks. Piaget stated that adults should encourage children to make mistakes as this shows they are interacting with the environment around them (Murphy, 2018). Louv (2009) settled on the idea that the outdoor environment is key for a child's development of their senses which, consequently, benefits their academic learning and innovation. The Welsh Government (2020) in relation to the four purposes, states that children who are enterprising, creative contributors find solutions to problems and are prompted to take risks. Education Wales (2022) describes healthy confident individuals who can overcome problems. For that reason, it suggested that for children to develop their scientific and mathematical concepts, practitioners must allow them to take their own risks.

It is important to consider how a child with additional learning needs may react to an environment like this. Some children may flourish in an environment where they can move freely without too much structure and explore these concepts by themselves. Tissler (2011) discusses how outdoor environments promote engaging learning for children with special educational needs through sensory incentives. Outdoor environments, therefore, may be more suitable environments for children with

special educational needs to develop their mathematical and scientific skills by providing environments.

It can be concluded that the outdoor environment is beneficial for children's scientific and mathematical development. The role of the adult is to ensure children have access to enabling environments to ensure they can fully develop their mathematical and scientific concepts. Adults should also consider their role and provide children with the opportunity to safely self-assess risks. Practitioners should also consider whether loose parts should be added and what value would be added to a child's learning by doing this. In addition to this, practitioners must consider a child's holistic development and provide children with the opportunity to engage in this by giving them opportunity to explore and play freely.

Reference list

Berkshire Healthcare National Health Service (2023) *Vestibular (movement) system*. Available at: https://cypf.berkshirehealthcare.nhs.uk/support-and-advice/sensory-processing/vestibular-movement-system/ (Accessed: 29 September 2023)

Campbell, C. and Speldewinde, C. (2020) 'Affordances for Science Learning in "Bush Kinders"', International *Journal of Innovation in Science and Mathematics Education.*, 28(3), pp. 1-13.

Cardiff Steiner School (2022*) Building Social and Emotional skills in nature*. Available at: https://www.cardiffsteiner.org.uk/2022/05/01/frontpage-article/social-nature/ (Accessed: 29 September 2023)

Duglan, S. (2015) 'Enabling Environments: Outdoors - In full swing', *Nursery world* Available at: https://www.nurseryworld.co.uk/features/article/enabling-environments-outdoors-in-full-swing (Accessed: 26 September 2023)

Early Childhood Education (2008) *The Steiner Education Approach*. Available at: https://earlychildhoodeducation.co.uk/steiner-education-approach/ (Accessed: 29 September 2023)

Early Years Careers (2015) *The importance of taking maths outdoors*. Available at: https://www.earlyyearscareers.com/eyc/early-years-practice/the-importance-of-taking-maths-outdoors/#google_vignette (Accessed: 29 September 2023)

Education Endowment Foundation (2023) *Metacognition and self-regulation.* Available at: https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit/metacognition-and-self-regulation (Accessed: 21 September 2023)

Education Wales (2022) *2022- A new curriculum for Wales has arrived*. 14 January. Available at: https://www.youtube.com/watch?v=SCMLnc8IMxE (Accessed: 29 September 2023)

Hurrell, S. (2016) *Green.* Available at: https://www.flickr.com/photos/solarbob99/26879571842/ (Accessed: 20 September 2023)

Keith, L. (2017) *Developing Young Children's Mathematical Learning Outdoors: Linking Pedagogy and practice*. New York: Routledge.

Knight, S. (2011) *Risk and Adventure in Early Years Outdoor Play: Learning from Forest Schools.* London: Sage Publications.

Laird, S. and McFarland, L. (2014) *Children need to play outdoors, but we're not letting them*. Available at: https://theconversation.com/children-need-to-play-outdoors-but-were-not-letting-them-31295#:~:text=Research%20has%20shown%20that%20children%20learn%20self-control%20over,to%20judge%20and%20manage%20risk%20on%20their%20own. (Accessed: 22 September 2023)

Lilley, I. (1967) *Friedrich Froebel: A Selection from his Writings*. Cambridge: Cambridge University Press.

Louv, R. (2011) *Last child in the woods: Saving our children from nature-deficit disorder*. London: Atlantic Books.

MA Education (2016) *Possibilities on offer*. Available at: https://www.earlyyearseducator.co.uk/features/article/possibilities-on-offer (Accessed: 30 September 2023)

McLeod, S. (2023) *Maslow's hierarchy of needs*. Available at: https://www.simplypsychology.org/maslow.html (Accessed: 29 September 2023)

McLeod, S. (2023b) *Jerome Bruner's Theory of Learning and Cognitive Development*. Available at: https://www.simplypsychology.org/bruner.html#The-Spiral-Curriculum (Accessed: 29 September 2023)

McIlroy, T. (2023) 'What is holistic development in Early Childhood?'. *Empowered parents*, Available at: https://empoweredparents.co/what-is-holistic-development/ (Accessed: 30 September 2023)

Murphy, S. (2018) ‘How to Apply Piaget's Theory in the Classroom’, *The Classroom*. Available at: https://www.theclassroom.com/use-observational-learning-classroom-7897401.html (Accessed: 29 September 2023).

Nicolson, S. (1971) ‘The Theory of loose parts: how not to cheat children’, *Landscape Architecture*, 62, pp. 30-34.

Peterson, S. (2022) *Reinforcing Elementary Math Lessons with Movement*. Available at: https://www.edutopia.org/article/reinforcing-elementary-math-lessons-movement (Accessed: 29 September 2023)

Play Scotland (2023) *Outdoor Play and Learning: guidance for creating outdoor play experiences in early learning and childcare*. Available at: https://www.playscotland.org/get-involved/schools/outdoor-play-and-learning/ (Accessed: 22 September 2023)

Professional Association for Childcare and Early Years (2023) *Creating enabling environments.* Available at: https://www.pacey.org.uk/working-in-childcare/spotlight-on/creating-enabling-environments/ (Accessed: 23 September 2023)

Rahardjo, M. (2019) ‘How to use Loose-Parts in STEAM? Early Childhood Educators Focus Group Discussion in Indonesia, *Jurnal Pendidikan Usia Dini*. Available at: https://doi.org/10.21009/JPUD.132.08 (Accessed: 28 September 2023)

Reggio Emilia Approach (2022) *Reggio Emilia Approach*. Available at: https://www.reggiochildren.it/en/reggio-emilia-approach (Accessed: 30 September 2023)

Richardson, G. (2013) *Creating a space to grow: Developing your enabling environment outdoors.* 2nd Edition. New York: Routledge.

Scotland Public Health (2017) *Maslow’s hierarchy of needs, rights of the child, and the joy of learning to play music*. Available at: https://scotpublichealth.com/2017/10/23/maslows-hierarchy-of-needs-rights-of-the-child-and-the-joy-of-learning-to-play-music/ (Accessed: 30 September 2023)

Steiner, A., Karabon, A., and Litz, L. (2023) ‘Eliminate Barriers to Risk Taking in Outdoor Play’*, NAEYC.* 16 (3). Available at:

https://www.naeyc.org/resources/pubs/tyc/spring2023/risk-taking-outdoor-play (Accessed: 28 September 2023)

Tissler, A. (2011) 'Outdoor learning for children with SEN', *SEN Magazine*. Available at: https://senmagazine.co.uk/content/activities/learning-outside/193/outdoor-learning-for-children-with-sen/ (Accessed: 30 September 2023)

Tovey, H. (2012) *Bringing the Froebel approach to your early years practice*. London: Routledge.

Tunnicliffe, S. (2015) *Starting Inquiry-based Science in the Early Years: Look, talk, think and do.* London: Routledge.

Wardle, F. (2021) 'Learning from Froebel's Kindergarten', *Community Playthings*. Available at: https://www.communityplaythings.co.uk/learning-library/articles/what-we-can-learn-from-froebels-kindergarten (Accessed: 30 September 2023)

Welsh Government (2009) *Foundation Phase Outdoor Learning Handbook*. Available at: https://hwb.gov.wales/storage/fcb8539c-9be7-4883-8542-35d7b54b56f2/foundation-phase-outdoor-learning-handbook.pdf (Accessed: 29 September 2023)

Welsh Government (2020) *Curriculum for Wales: Science and Technology*. Available at: https://hwb.gov.wales/curriculum-for-wales/science-and-technology/ (Accessed: 22 September 2023)

Welsh Government (2020b) *Curriculum for Wales: Mathematics and Numeracy*. Available at: https://hwb.gov.wales/curriculum-for-wales/mathematics-and-numeracy/ (Accessed: 22 September 2023)

Welsh Government (2020c) *Curriculum for funded non-maintained nursery settings*. Available at: https://hwb.gov.wales/api/storage/b1801d78-38c3-4320-9818-d9996c21aef8/220914-a-curriculum-for-funded-non-maintained-nursery-settings.pdf (Accessed: 26 September 2023)

Welsh Government (2022) *Supporting materials for curriculum, assessment, and evaluating learner progress*. Available at: https://hwb.gov.wales/curriculum-for-

wales/supporting-materials-for-curriculum-assessment-and-evaluating-learner-progress/ (Accessed: 23 September 2023)

Welsh Government (2022b) *A curriculum for funded non-maintained nursery settings.* Available at: https://hwb.gov.wales/api/storage/b1801d78-38c3-4320-9818-d9996c21aef8/220914-a-curriculum-for-funded-non-maintained-nursery-settings.pdf (Accessed: 23 September 2023).

Wilson, R. (2018) *Nature and Young Children: Encouraging creative play and learning in natural environments.* 3rd Edition. London: Routledge.

UNICEF (no date) *How we protect children's rights with the un convention on the rights of the child*. Available at: https://www.unicef.org.uk/what-we-do/un-convention-child-rights/ (Accessed: 30 September 2023)