

Awe and Wonder: Science, Mathematics and the Outdoors

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Part 1 -



RISK BENEFIT ASSESSMENT- Part 3

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 precaution RATING: L
Walk from school to beach -	Children will have an opportunity to learn about road safety. Looking both ways, careful listening and awareness of judging how fast/slow vehicles move.	Walking on pavement – Uneven or broken pavement resulting in a potential fall. Crossing the road -Children may step off the pavement too soon.	Adults and children.	Maintain adult to child ratio to minimise all risks. Reinforce safety rules to the children before the visit – • How to cross safely- look right, look left and right again. • Remind children to walk slowly, no running. • Listen to staff • Use of buddy system, holding hands. This can be done through story books.	M

		Weather conditions - could make visibility difficult impairing on judgement of traffic on road.	Staff to walk the route prior to the visit to take note of potential hazards. Discuss with the children that the pavement may have loose areas and the importance of looking whilst walking and concentrating. Ensure that there is always a first aid kit available and a trained first aider to administer first aid should there be any falls or accidents. Leader to carry a mobile phone and contact details of children. Regularly monitoring of weather conditions via the Met Office to become more aware of risks as fog and rain could impact visibility, and to take extra time for judgement when crossing roads. Children and staff to wear high visibility vests to ensure they are visible to all adults,	
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				traffic and members of the public. – Risk level M	
The Weather -being outdoors in different weather conditions.	Children will have learning opportunities to understand what appropriate clothing is needed for different aspects of the weather. Sun hat, extra water and sun cream for hot days, wellies and waterproofs for rainy days. This can support children's independence to select the correct clothing, dressing themselves and catering for their	Too much sun exposure could cause sun burn and cause heat stroke. High winds could cause children to lose balance and fall, causing injury. Weather that is too cold or hot in extreme cases could cause hyperthermia or hypothermia. Extreme wet weather could mean children could become uncomfortable and distressed.	Adults and children.	Weather conditions will be closely monitored using the Met Office forecast and checked before leaving the school. The visit will be cancelled if needed. A letter will be sent to parents/carers in advance, explaining the importance of appropriate clothing for all weather conditions.	L

	own needs depending on the weather.	Wet weather will result in slippery surfaces, e.g stones, rocks, causing potential falls and injury		Avoid areas that are slippery, supervise children closely when exploring or walking near wet stones and rocks. Explain to the children the potential risks with slippery surfaces and to be cautious in wet, rainy conditions.	
Tide	Children will have opportunities to learn about how the tide moves further in and out bringing awareness to safety concerns during the visit. Children will become aware of their role in keeping themselves safe by following safety instructions to manage the risk.	Areas of the beach could potentially become cut off if tide times are unknown making the visit unsafe, with risk of drowning, and limited area for the children to explore.	Adults and children.	Check tide times in advance and plan visits around low tide. Clearly mark safe boundaries for children to explore and play using cones. Avoid areas known to be cut off by the tide. Have additional adults to increase the adult to child ratio to ensure children's safety, to supervise the high-risk areas where there is water.	L

Children independently exploring and engaging with the natural environment- Playing with the sand, stones, water and natural materials.	Children will have opportunities to explore the environment and learn through their senses about the world around them. Children will have opportunities to learn holistically through play, curiosity, discovery and investigation over all areas of learning. Children will have opportunities to observe and describe how materials change when mixed together. Children will have learning opportunities to learn about water danger and the potential hazards of living things. Children will have opportunities to learn about different surfaces and how best to approach slippery surfaces, and how balance can be beneficial on uneven surfaces. Children will learn about litter in the environment and its effect on living things.	Possible litter on beach and harmful objects (broken glass, metal) which could be dangerous, for children to incorporate into their play. Sharp objects could cause injuries. Wood, stones and driftwood could be a tripping hazard and contain splinters. Possible dog fouling, causing potential infection, illness and blindness if ingested. The pebbled/rocky area could be slip and uneven where children could fall causing injury.	Children and adults.	Conduct an investigation of the area before children begin exploring. This will reduce the risk of potential harmful materials, dog feaces, tripping hazards and pooled water. Explain to the children what familiar natural materials we may come across and not to pick up unknown or dangerous items. This could be done through a story book prior to the visit. Make children aware of the areas where there is water in and around the rocks and ensure children are closely supervised near these areas. First aid kit is needed for potential injuries. Take gloves and bin bags to dispose safely of any litter or dangerous materials which could cause injuries.	L
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		Water in rock pools and from the sea. This could cause drowning, slipping and falling hazard.		Explain to the children before the visit that there could be uneven areas on the rocks and sand at the beach where it could be wobbly, potential water pools and slippery surfaces. Emphasise to take care when walking on these surfaces and to walk slowly. Identify and avoid hazardous rocky areas. Supervise children closely when walking or exploring near rocks. Closely supervise children near water. Set clear boundaries around rock pools and water access. Encourage suitable footwear to support the children walking over the uneven surfaces. Adult supervision is needed when children are walking on uneven ground to help when needed.	
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Members of the public-strangers walking dogs.	Children will have opportunities to learn about stranger danger and how to deal with situations where unfamiliar adults and animals	Insects or stings (jelly fish) could cause allergic reaction, bites and stings. Members of the public walking the beach may raise safeguarding concerns, with children going missing. Dogs can be lively and aggressive at times, causing children to be anxious.	Adults and children.	Practice balancing activities with the children prior to the visit to better prepare them to manage the risk and bring awareness to the different surfaces on the visit. Brief children not to touch unfamiliar creatures or insects. Be aware of children with known allergies and carry necessary medication. Choose locations where jellyfish sightings are minimal, if possible. Ensure adult to child ratio with an increased ratio, if possible, to supervise the children closely so that they don't	
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	approach them. To stay calm and close to adults.	This could potentially result in bites and allergies.		wonder off and interact with strangers. Ensure the children wear high visibility vests to ensure all children can be seen to improve supervision. Explain to the children about stranger danger prior to the visit. Brief children on how to behave around unfamiliar dogs (e.g. don't approach or run). Keep the group together in a designated area. Supervise closely, especially when members of the public or dogs are nearby. Risk level - M	
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Learning Stories – Part 2

A group of eight children from a reception class and 4 adults went for three sessions of outdoor play-based learning to the local beach. Each session had a primary focus but as children learn holistically numerous mathematical and science learning opportunities arose through hands on experiences.

Equipment

Buckets

Spades

Rakes

Baskets

Magnifying glass

Sensory collecting tray

Living things information sheet

Following clear guidance from the teacher about safe areas to explore, the children enthusiastically explored and investigated the beach environment. They used a wide variety of natural materials including shells, stones, driftwood, seaweed, and sticks through their play-based learning and became aware of the living things around them. The adults observed from a distance allowing for child led exploration and opportunities to scaffold the children's learning with appropriate questioning.

Learning Story - Session 1: Exploring Loose Parts at the Beach- with a focus on creativity.

Learning Opportunity

Child A had begun placing the loose parts he had collected including driftwood, seaweed, and shells around the sandcastles he had made. He then returned to the pebbled area to explore further and kneeled down to select a large stone. He attempted to move it but appeared to be struggling. As he grunted and pulled at the stone, I approached the child and began questioning his thinking.

I approached and said,

"I can see that that's a difficult job for you. Why is it so tricky?"

Child A responded,

"I can't move it. I need it for my castle to put in the middle, but it's too big for me to carry!"

I replied,

"Why do you think it's such a hard job to carry?"

Child A,

"Because it's hard and stuck in the sand"

I answered with,

"Good answer, it is hard, big and a little stuck in the sand, we can say things are heavy when they are difficult to carry."

I assisted Child A by helping to carry the large stone over to his creation, where he experienced firsthand the concept of heavy. The learning was then extended through appropriate adult questioning -

I asked,

"I wonder if you could think of something that is not so heavy?"

Child A responded with,

"Well, I think the twigs I've collected for my sandcastle flags are not heavy to carry."



(Burton, 2025)



I questioned him further asking "How do you know they are not heavy?"

Child A replied with "Because it's easy to pick up, look!"

He then picked up a stick and threw it in the air.

Child A,

"Easy!"

I answered with,

"Well done, we can say that's light"

Child B, who was playing nearby, joined the conversation.

(Burton, 2025)

Child B added,

"The shells are the lightest, though!"

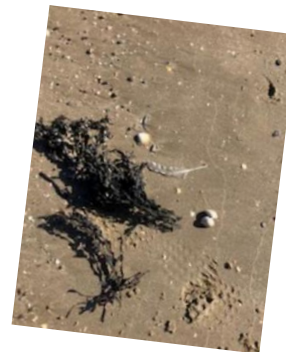
I replied with,

"I wonder how you can find out"

Child A answered with,

"We'll put the light things here to see what is the lightest, to test them out, and the heavy things there to see what's the heaviest"

Both children then worked together to collect more materials, discussing and comparing them. They created two piles, one for light objects and one for heavy, engaging in discussion and early exploration of weight, comparison, and classification. With further questioning the children began to order the items from the lightest to the heaviest. This aligns with the Curriculum for Wales, within the Mathematics and Numeracy Area of Learning and Experience at Progression Step 1, which includes a focus on making comparisons and estimates related to measure, developing an early understanding of the concepts of heavier and lighter (Welsh Government, 2020).



(Burton, 2025)



(Burton, 2025)

Learning Story - Session 2: Exploring Living Things

Learning Opportunity

Child A was walking across the sand, carefully looking at the wet sand, with several peers nearby. He shouted with excitement, "Miss! Look at this, it's moving!" The other children quickly gathered around as I approached.

I responded,

"I wonder what this could be?"

Child B answered with,

"It looks like a crab."

I replied with,

"What makes you think it's a crab?"

Child C replied,

"It's got lots of legs and pincers"

I continued with,

"What do you know about crabs? Are they alive?"

Child E answered,

"I think it's alive because it's moving."

I agreed and used this as an opportunity to reinforce the idea that movement is one thing living things do. To extend their thinking further, I asked, "What else do you think living things do?"

From this observation, and by using effective questioning, the children clearly recognised that the crab was a living thing. They identified movement as a sign of life and made links to their prior knowledge and experiences. This aligns with the

Curriculum for Wales, within the Science and Technology Area of Learning and Experience, Progression Step 1, under the focus of living things in the world around us, (Welsh Government, 2019).

The children watched closely as the crab moved slowly sideways, crouching down to the sand, fully engaged.

Child A made an observation,

“He has lots of legs.”

I responded,

“Good noticing! Why do you think legs are important to the crab?”

Child C answered, “So he can move and get back home.”

I praised the response and extended the learning by asking,

“I wonder how many legs he has?”

Child E began pointing from a distance to count and successfully identified eight legs. I praised Child E for accurate counting and encouraged everyone to join in, suggesting we all count aloud together using our fingers to count to eight, or by pointing and counting without help.

From this observation and through effective questioning, the children demonstrated their understanding of one-to-one correspondence by reliably counting a set of objects both those they could touch and those they counted from a distance. This aligns with the Curriculum for Wales, within the Mathematics and Numeracy Area of Learning and Experience, Progression Step 1, under the focus of using a number system to compare and represent relationships between quantities and numbers (Welsh Government, 2020).

Learning Story - Session 3: Learning Properties Through Senses

Learning Opportunity



(Burton, 2025)

A circle time activity on the beach allowed the children to experience different materials, properties and learn new vocabulary to describe the loose parts surrounding them. The children were then given the freedom to explore the area to investigate further using their senses, to promote their curiosity.

Child A picked up a stone, sharing his thoughts with a friend.

“This is really rough.”

I responded with,

“What can u tell me about rough materials? How do they feel?”

Child A,

“They are bumpy and scratchy, this one is really scratchy!”

I answered,

“Well done, good answer they are bumpy and scratchy”



(Burton, 2025)

This aligns with the Curriculum for Wales, within the Science and Technology Area of Learning, Progression Step 1, where the child demonstrated that he/she could make observations whilst exploring the environment and communicate his/her ideas (Welsh Government, 2020).

Further questioning led to developing the learning,

I asked,

“I wonder if you could find other materials that are rough?”



(Burton, 2025)

The children proceeded to search and came across shells which were rough and wood. Child B commented on a pebble he picked up, explaining that not all stones are rough as his was smooth. I agreed with him, praising him for his observation and asked the children if there were more smooth materials they could find. This led the children to begin to group the items they found based on their properties.



(Burton, 2025)

This aligns with the Curriculum for Wales, within the Mathematics and Numeracy Area of Learning and Experience at Progression Step 1, which includes a focus on grouping sets into a certain category with the ability to communicate why (Welsh Government, 2020).

Part 4 –

This assignment explores how adults support young children's mathematical and scientific learning outdoors, with reference to theory. The Curriculum for funded non-maintained nursery settings (2024), emphasises how outdoor environments are vital for fostering children's curiosity, creativity, and independence. Through hands-on experiences, risk-taking, opportunities for open ended play and ongoing adult observations, children develop problem-solving and critical thinking skills, considered key aspects of understanding mathematical and scientific concepts, with adults guiding and encouraging children's curiosity and exploration through play-based learning. This is supported by the United Nations Convention on the Rights of the child (article 31) which states that children need opportunities to play within a safe, nurturing, and engaging environment (UNICEF, n.d.)

The Welsh Government's curriculum for Wales (2024) explains how an enabling, engaging outdoor environment promotes children's curiosity, through freedom to lead their own learning (Welsh Government, 2024). Suardi, Kurniawati and Rachmawati, (2021) highlight how curiosity is a fundamental aspect of cognition and a powerful motivator for learning and plays a significant role in cognitive development. This aligns with the learning theories of Piaget, Bruner, and Dewey, who emphasise the importance of hands-on learning where children lead their own discoveries through being curious (Grigg and Lewis, 2016). Moreover, Sisson and Lash (2017) highlight that natural environments and materials in outdoor settings offer rich opportunities for children to become curious and actively construct mathematical and scientific knowledge through play, where children naturally incorporate challenge and risk, enhancing their engagement and enjoyment whilst learning. Building on this, Wilson (2018) explains that adults play a vital role in nurturing children's curiosity by providing outdoor spaces high in affordance, with environments rich in possibilities for action, interaction and opportunities that allow for risk and challenge where children are free to explore and investigate a variety of learning opportunities.

Bilton (2017) explains that children need outdoor environments with high play affordance, which include trees to climb, plants and wildlife to explore, wood and planks to exercise their creativity and balance, hills to experiment with, and materials

such as tyres, plastic crates and ropes. These open-ended materials within outdoor environments provide rich learning opportunities for children to incorporate risk and challenge into their play to develop their mathematical and scientific development. Moreover, Froebel described nature as an educator, and how engaging in real-life outdoor experiences encourages deeper environmental exploration enhancing children's knowledge and understanding through observation and inquiry (Froebel Trust, 2022). This aligns with the Science and Technology area of learning within the Curriculum for Wales explaining how children need to explore the world around them, as part of their development and learning (Welsh Government, 2019). Therefore, Watts (2020) emphasises how adults need to support children in outdoor environments to experience activities such as climbing trees, creating log stepping stones and access to wildlife ponds which offers opportunities for children to experience risk and challenge.

White (2020) suggests that children's ability to identify risks and adapt to challenges, are crucial life skills. Moreover, Bilton (2017) explains that risky play encourages children to assess challenges, experience fear, and reflect on outcomes, building resilience for future decision making, through their mathematical and scientific learning. Condly (2006), states that resilience is important for children to develop problem-solving skills, time management, and social competence to help them overcome challenges. This is supported by Schafer (2022), suggesting how the capacity to cope with challenges, adapt to change, and recover from setbacks are crucial skills in building resilience, essential for long term development. Therefore, the role of the adult is to encourage children to take risks, find solutions and evaluate their actions to build resilience to encourage lifelong learners, by providing effective outdoor learning environments high in affordance (Welsh Government, 2020).

However, as Johnson (2018) explains, how an overprotective culture may limit children's risk and challenge opportunities, compared to European countries, where the outdoor learning is richer and more varied. Quvry and Furtado (2019) highlight that some practitioners view outdoor play as too risky, often due to parental pressure and a lack of confidence in managing potential hazards.

On the other hand, with appropriate training and planning, outdoor environments can offer safe yet challenging experiences that support children's maths and science development. This is supported by Carmarthenshire County Council's professional development guidance with information provided for teachers and practitioners regarding courses across all areas within their profession to improve confidence and standards of teaching and learning opportunities for children (Carmarthenshire County Council, n.d.). Moreover, training opportunities, offered by the Council for Learning Outside the Classroom, along with clear outdoor learning policies, can help build staff confidence and ensure consistent, purposeful outdoor practice (Grigg & Lewis, 2016).

Nicholson (1971) believed that loose parts in the outdoor environment are highly beneficial for sparking children's creativity and innovation through freedom to explore, experiment, and engage deeply with various open-ended materials. Morgan and Kneebone (2023) supports this explaining how creativity is essential in understanding scientific concepts because it drives curiosity, innovation, and the ability to explore ideas, ask questions, and find new solutions. Similarly Basic *et al* (2022) explains how creativity supports mathematical thinking by helping children identify problems, explore patterns, and generate original solutions, through freedom to explore their creativity children will develop richer reasoning and problem-solving skills.

Moreover, Play Wales (2023) describes how loose parts offer endless opportunities for exploration and creativity facilitating engagement with mathematical and scientific concepts, through a wide range of materials, including natural items, building tools, recycled objects and bark. Casey and Robertson (2016) emphasise how children need environments where they can invent, construct, manipulate, and adapt their ideas through play, engaging in scientific and mathematical thinking such as pushing, pulling, rolling, balancing, measuring, and problem solving. The Welsh Government's curriculum for funded non-maintained nursery settings supports this stating that children learn best and should naturally develop creativity leading to better mathematical and scientific understanding through hands-on, multi-sensory

play through daily outdoor experiences, with open-ended natural resources which encourages exploration (Welsh Government 2024). Therefore, Burner's theory that learning occurs in response to stimuli underpins the adult's role in enriching the outdoor environment by incorporating loose parts into children's play (Grigg and Lewis, 2016).

However, a National Education Union survey found that 85% of teachers believed their schools could not provide sufficient learning resources (National Education Union, 2023). This suggests that outdoor learning environments which lack affordance, natural materials and loose parts for pupils could suffer, due to insufficient government funding to enrich these areas. This could potentially impact children's mathematical and scientific learning and development, limiting settings abilities to provide and sustain an adequate outdoor learning environment, inclusive of loose part to support creativity, exploration and investigation. This is supported by Spencer *et al's* (2019) findings during a study regarding educator views on the advantages and limitations of loose parts play in outdoor environments, where sustainability of incorporating loose parts into children's play was highlighted as a challenge.

On the other hand, Wallis (2023) states how loose parts could include recycled materials, such as cardboard boxes, plastic containers, bottle caps, or fabric scraps. Children can also be taken off site for nature walks and to woodlands to experience a wider range of natural loose parts and better play affordance to enhance their learning. The Department of Education (2022) state how leaders should follow the settings policies, safety procedures and conduct risk assessments to do this safely.

Observing children is essential for identifying and supporting their mathematical and scientific thinking and progression and plays a vital role in how adults nurture children's conceptual understanding (Welsh Government, 2024). Francisco (2019) highlights that effective observation involves watching, listening, asking purposeful questions, and assessing children's language and actions. Kochanowski and Carr (2014), suggest how self-directed play in natural environments offers rich, unpredictable, and sensory experiences that foster creativity and exploration, with

natural materials encouraging hands-on learning. Therefore, conducting observations during self-directed play can be highly beneficial as children naturally expose their mathematical and scientific conceptual understanding by performing various skills holistically through their play.

Estyn (2024) states that responding to observations creates meaningful opportunities to deepen children's understanding of concepts and further their learning. Wragg and George, (2001) note how appropriate questioning involves using clear, purposeful questions, which include what, where, and why questions to clarify understanding, guide learning, and deepen thinking. Effective questioning helps identify misconceptions, encourages exploration, and supports children in making connections, while offering timely support but also knowing when to step back (Wragg and George, 2001). This is supported by Vygotsky's sociocultural theory, which explains how adults play a key role in supporting children's learning by observing children and asking purposeful questions within the child's zone of proximal development (Rapanta, 2023).

In addition to this, Rapanta, (2023) explains that through guided dialogue and peer interaction, children are encouraged to reason, reflect, and develop deeper understanding, particularly when exploring mathematical or scientific ideas. Therefore, the Welsh Government's curriculum for Wales underpins the role of the adult in supporting children to engage with mathematical and scientific concepts through thoughtful questioning, and meaningful discussion whilst observing young children through play (Welsh Government, 2020).

However, according to Brenneman (2011) many practitioners feel unsure about their own science knowledge and ability to teach it confidently, affecting their ability to support children through appropriate questioning and conducting valuable observations which leads to assessment and future planning. The Welsh Government's curriculum for Wales states that the role of the practitioner is to assess learning through observation, purposeful questioning, and reflective discussion (Welsh Government, 2020). Moreover, Cremin *et al.*, (2015) explains that some teachers struggle to allow open scientific exploration due to a lack of confidence or

fear of losing control, limiting children's opportunities for independent inquiry and problem solving. Therefore, Smidt (2015) emphasises the importance of practitioners receiving adequate training to build confidence, knowledge, and skills when observing and questioning children to support their mathematical and scientific development.

On the other hand, according to a study by the Teacher Development Trust, 20,000 teachers in schools throughout England have no allocated budget for staff training within their settings to improve their confidence in delivering a curriculum enriched with opportunities to support young children's mathematical and scientific development (Coughlan, 2017).

Children's mathematical and scientific understanding flourishes best through rich, hands on outdoor experiences that engage their natural curiosity and a sense of wonder. These experiences are most effective when supported by skilled adults who carefully observe children's play, ask appropriate questions, and guide their learning without limiting their independence. Natural materials and loose parts in outdoor environments provide endless opportunities for exploration, creativity, and problem-solving, allowing children to experiment, take risks, build resilience, face challenges and develop critical thinking skills. However, to ensure that practitioners can confidently develop meaningful, learning experiences, ongoing professional training and adequate resources are essential in providing rich outdoor mathematical and scientific learning experiences.

Reference List

Basic, A., Arsic, B., Gajic, A., Zdravkovic Parezanovic, R., Macesic Petrovic, D. and Lazovic, T. (2022) 'Creativity in teaching mathematics', *Journal Human Research in Rehabilitation*, 12(2), pp.127–137. doi:<https://doi.org/10.21554/hrr.092203>

Bilton, H. (2017) *Taking the first steps outside: under threes learning and developing in the natural environment*. Oxon: Routledge.

Brenneman, K. (2011) 'Assessment for preschool science learning and learning environments', *Early Childhood Research & Practice*, 13(1). Available at: <https://files.eric.ed.gov/fulltext/EJ931225.pdf> (Accessed: 27 September 2025).

Burton, G (2025) *Own collection of beach images*. Ferryside beach.

Casey, T. and Robertson, J. (2016) *Loose parts play a toolkit*. Available at: <https://inspiringscotland.org.uk/wp-content/uploads/2017/03/Loose-Parts-Play-web.pdf> (Accessed: 17 September 2025).

Condly, S.J. (2006) 'Resilience in children', *Urban Education*, 41(3), pp.211–236. doi:<https://doi.org/10.1177/0042085906287902>

Coughlan, S. (2017) 'Schools have no funds to train teachers, says study.' *BBC News*. Available at: <https://www.bbc.co.uk/news/education-38827188> (Accessed: 27 September 2025).

Cremin, T., Glauert, E., Craft, A., Compton, A. and Stylianidou, F. (2015) 'Creative little scientists: exploring pedagogical synergies between inquiry-based and creative

approaches in early years science', *Education 3-13*, 43(4), pp.404–419.
doi:<https://doi.org/10.1080/03004279.2015.1020655>

Department for Education (2022) *Health and safety: Responsibilities and Duties for Schools*. Available at: <https://www.gov.uk/government/publications/health-and-safety-advice-for-schools/responsibilities-and-duties-for-schools>. (Accessed: 16 September 2025).

Estyn. (2024) *Using effective observations to inform planning to improve the impact on children's learning and development - Estyn*. Available at: <https://estyn.gov.wales/improvement-resources/using-effective-observations-to-inform-planning-to-improve-the-impact-on-childrens-learning-and-development/> (Accessed: 18 September 2025).

Francisco, E.B. (2019) 'Child observation: purpose & observation methods in childcare', *Safety Culture*. Available at: <https://safetyculture.com/topics/child-observation/> (Accessed: 4 February 2025).

Froebel Trust (2022) *Froebelian principles*. Available at: <https://www.froebel.org.uk/about-us/froebelian-principles> (Accessed: 17 September 2025).

Grigg, R. and Lewis, H. (2016) *A-Z of learning outside the classroom*. London: Bloomsbury Education. Available at: <https://research-ebSCO-com.ezproxy.uwtsd.ac.uk/linkprocessor/plink?id=6c3601cd-f04e-3f43-820b-3256f908aeef> (Accessed: 6 September 2025).

Johnson, J. (2018) *Developing creativity and curiosity outdoors: how to extend creative learning in the early years*. 1st edn. Florida: Routledge.

Kochanowski, L. and Carr, V. (2014) 'Nature playscapes as contexts for fostering self-determination', *Children, Youth and Environments*, 24(2), p.146.
doi:<https://doi.org/10.7721/chilyoutenvi.24.2.0146>

Morgan, R. and Kneebone, R. (2023) 'Why creativity in science matters and three ways to achieve it', *World Economic Forum*. Available at:
<https://www.weforum.org/stories/2023/07/creativity-science-matters-ways-to-achieve-it/>

National Education Union (2023) 'Current school funding levels are inadequate | National Education Union', *National Education Union*. Available at:
<https://neu.org.uk/latest/press-releases/current-school-funding-levels-are-inadequate>
(Accessed: 16 September 2025).

Nicholson, S. (1971). 'How not to cheat children: The theory of loose parts', *Landscape Architecture*, 62(1), 30–35.

Ouvry, M. and Furtado, A. 2019 'Exercising muscles and minds', 2nd edn *Outdoor Play and the Early Years Curriculum*. London: Jessica Kingsley Publishers.

Play Wales. (2023) *Home - play Wales*. Available at: <https://play.wales/> (Accessed: 6 September 2025).

Professional learning for practitioners: Carmarthenshire County Council (CCC). (n.d.) Available at: <https://hwb.gov.wales/api/storage/5a90f598-8ddf-4554-ba5c-e407a83b6331/professional-learning-for-practitioners-carmarthenshire-county-council.pdf> (Accessed: 23 September 2025).

Rapanta, C. (2023) 'Piaget, Vygotsky and young people's argumentation: Sociocognitive aspects and challenges of reasoning "together" and "alone"', *Learning, Culture and Social Interaction*, 39. Available at: <https://doi.org/10.1016/j.lcsi.2023.100698> (Accessed:18 September 2025).

Schafer, E.S. (2022) 'Recognizing resilience in children: A review', *Trauma Care*, 2(3), pp.469–480. doi:<https://doi.org/10.3390/traumacare2030039>

Sisson, J.H. and Lash, M., 2017 'Outdoor learning experiences connecting children to nature', *YC Young Children*, 72(4), pp. 8-16. Available at:<https://Outdoor Learning Experiences Connecting Children to Nature - ProQuest> (Accessed: 26 September 2025).

Smidt, S. (2015) *Observing young children: the role of observation and assessment in early childhood settings*. Available at:<https://ebookcentral.proquest.com/lib/trinity/detail.action?docID=3569303> (Accessed: 16 September 2025).

Spencer, R., Joshi, N., Branje, K., Lee Mclsaac, J., Cawley, J., Rehman, L., FL Kirk, S. and Stone, M. (2019) 'Educator perceptions on the benefits and challenges of loose parts play in the outdoor environments of childcare centres', *Aims Public Health*, 6(4), pp.461–476. doi:<https://doi.org/10.3934/publichealth.2019.4.461>

Suardi, M., Kurniawati, L. and Rachmawati, Y. (2021). 'Curiosity in young children. *Proceedings of the 5th International Conference on Early Childhood Education (ICECE 2020)*, 538. doi:<https://doi.org/10.2991/assehr.k.210322.048>

UNICEF (n.d.). UN convention on the rights of the child (UNCRC). Available at: <https://www.unicef.org.uk/what-we-do/un-convention-child-rights/> (Accessed: 16 September 2025).

Wallis, A. (2023) *The humble cardboard box. Play Scotland*. Available at: <https://www.playscotland.org/the-humble-cardboard-box/> (Accessed: 16 September 2025).

Watts, A. (2020) *Outdoor learning through the seasons: an essential guide for the early years*. London: Routledge.

Welsh Government (2019) *Curriculum for Wales: information for parents, carers and learners - Hwb*. Available at: <https://hwb.gov.wales/curriculum-for-wales/curriculum-for-wales-information-for-parents-carers-and-learners/> (Accessed 23 September 2025).

Welsh Government (2019) *Descriptions of learning - Hwb*. Available at: <https://hwb.gov.wales/curriculum-for-wales/science-and-technology/descriptions-of-learning/> (Accessed: 16 September 2025).

Welsh Government (2019). *Descriptions of learning - Hwb*. Available at: <https://hwb.gov.wales/curriculum-for-wales/mathematics-and-numeracy/descriptions-of-learning/> (Accessed: 16 September 2025).

Welsh Government (2020) *Supporting learner progression assessment guidance - Hwb*. Available at: <https://hwb.gov.wales/curriculum-for-wales/assessment-arrangements/supporting-learner-progression-assessment-guidance/> (Accessed: 16 September 2025).

Welsh Government (2020) *Supporting learner progression assessment guidance - Hwb*. Available at: <https://hwb.gov.wales/curriculum-for-wales/assessment-arrangements/supporting-learner-progression-assessment-guidance/> (Accessed: 16 September 2025).

Welsh Government (2024) *A curriculum for funded non-maintained nursery settings*. Available at: <https://hwb.gov.wales/api/storage/1f581142-6b91-41e4-845d-3d6c7765df20/a-curriculum-for-funded-non-maintained-nursery-settings.pdf> (Accessed: 16 September 2025).

White, J. (2020) *Playing and learning outdoors: the practical guide and sourcebook for excellence in outdoor provision and practice with young children*. 3rd edn. London: Routledge.

Wilson, R. (2018) *Nature and young children*. 3rd edn. New York: Routledge.

Wragg, E.C. and George A. (2001) *Questioning in the primary school*. London: Routledge.

Appendix

I have not used AI.