

Awe and Wonder: Science, Mathematics, and the Outdoors.Portfolio of five parts:

1. Photograph
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Photograph



Personal Collection : 2025

Discussion of photograph

Another adult (Adult B) and I took eight children, aged six and seven on an afternoon trip to Swansea Bay, to allow the children to explore the beach, in windy, cold, and overcast weather conditions. Before the children were allowed to enter the beach, Adult B went onto the beach where we would allow the children to explore to assess the learning area and ensure that it was a safe environment. I stayed on the bus with the children while this was done.

12:00pm

Once it was confirmed that the learning area was safe, we got the children off of the bus. The children's faces were beaming with excitement; they all then ran through the sand dunes and down onto the beach. Once we were on the beach I placed an empty tray on the ground, I then encouraged the children to place anything they find interesting on it, for us to go through it later on.

The tide was out when we arrived at the beach. I overheard Child A asking Child B "why is the sea so far away? I did not think the sea was meant to be that far from us." Child B then added that the tide looked closer the last time he had been down onto the beach. Following this discussion, I gathered the children together and asked everyone if they knew any information about the tide and why it was far away today but closer to us on other days. Once I had asked this it was clear that none of the children were aware of the different tide times and why the sea was so far away. I then went on to explain to the children that the tide is controlled mainly by the moon, by the sun and the gravitational forces. I went on to explain that the tide would eventually come in to where we were exploring but it takes hours to do so. I noticed that Child C was interested in how long it would take for the tide to be completely in. This led me to suggest that the children could record the tide at various times of the afternoon to see if they noticed a difference in the tide. Child A said that they could use sticks that they have found on the beach or even shells. They discussed how long they wanted to wait until they observed the distance the sea had travelled, and they decided to check the tide every half an hour. After

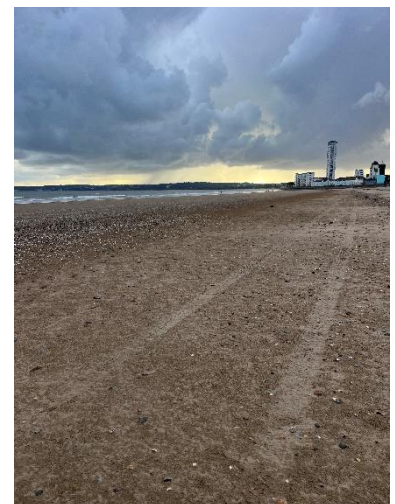


observing the distance the tide had travelled after half an hour, the children were able to see the sea had travelled a small distance and were shocked. Child D repeatedly said, "I cannot believe the sea moves that quickly." Child B agreed. Once the children had made this observation, they then went on to predict what time they thought high tide would be. In a group, Child A, Child B, Child C and Child E produced various times. I suggested that once we got back to the classroom, we would check the official high tide time online together, to check for accuracy.

Following this exploration and activity, the children were aware of why the tide moves and the speed and distance it travels. This allowed the children to expand their knowledge of science. From measuring the distance of which the tide travelled, the children were able to use and develop their mathematics knowledge.

1:00pm

After an hour of exploring on the beach and tracking the tide, the children seemed to notice a number of different shadows on the beach. Child A asked Child B why some shadows were bigger than the others and why had some changed since we had got there. Child B answered saying "when we go into the sun, our bodies create shadows behind us." I then asked the eight other children to gather around Child D who had a shadow behind him. The children's attention immediately turned to the big shadow behind Child D. Child C asked straight away, "why is there



a massive black spot behind Child D?" I followed on from this question and others which were raised during this discussion, and I explained the movement of the sun and how this causes there to be shadows behind things. I added that due to sun constantly moving in the sky, shadows of different things can start off as very small but can turn large. Child D suggested that the other children drew around their shadow with a stick and in an hour, he could stand in the exact same position and then the children could draw around the new shadow and compare the difference in size. The children were very excited to do this, they all ran away to find the longest stick to draw with. Child A also added that they could measure the shadows of other objects too in order to see the size difference in other shadows. Child B suggested

that they gather larger stones, sticks and seaweed. The other children followed their instructions and gathered two objects each and started drawing around the shadows that their objects had made. Child D asked me to set a timer for the children, so that in one hour they would be able to see the difference in size. After one hour, the children were all measuring out their new shadows with sticks that they had found and could not believe the difference in the sizes of the shadows.

From these activities, the children were able to use their mathematic skills to measure out the shadows and compare the difference in sizes between from when they started to an hour later. The children were also able to learn about solar movement as part of this activity which develops their science understanding.

2:00pm

After the children had started shadow tracking and were in between waiting to track the tide distance and the distance that the shadows had travelled, I noticed that the children had collected a number of shells, of different sizes and colour. They had added them to the tray that was placed in the sand at the start of the learning session. The children had all gathered around a particular patch of sand where there were big and small and light colour and dark coloured shells. Adult B and myself took 4 children each into a little group and discussed what we could see. Child A was curious about what animal could have lived in the smaller shells. They were discussing with the other three children and were listing possible marine life.



Once the children had finished listing the marine life like; shrimps, crabs and lobsters, I discussed that the other shells could be from things like clams, snails, muscles, barnacles and sea urchins. Whereas Child C was particularly interested in the bigger shells and where they had come from. Whilst this discussion was taking place, the children were naturally sorting the shells into their own individual groups. I noticed there were a pile of small white shells, a pile of medium sized multicoloured shells, and a pile of larger multicoloured shells. The children had also made a separate pile for rocks and stones that were amongst all of the shells. Once the children had sorted the shells into their own piles, I discussed with the children why

separating objects into their own piles based on their characteristics can help with every day life. I discussed how it helps scientists when investigating the difference in shells and where they come from. The children discussed the roughness of the bigger shells and noticed how they were a lot firmer than the shells. The children naturally made their own assumptions about why they could be a lot harder than the little ones. During this discussion, I could see Child A lifting a small shell to their ear and then lifting a large shell to their ear and noticing the difference of sound that was produced from each shell. The other children copied Child A once they understood what Child A was doing. After the children had finished their discussions and observations about the sizes, shapes, sounds and colours of the shells, I noticed that they began to count the individual shells in each pile.

When I was observing the children counting and analysing the difference in size, shape, colour, patterns and density of the shells, I could see that this activity and area of learning was supporting the children when developing their mathematics and science skills and knowledge.

3:00pm

We returned the children back to school. Following our day out, as a group we gathered the accurate high and low tide times.



Risk-benefit assessment

RISK BENEFIT ASSESSMENT

Location / Activity:	Swansea Bay Beach	Date:	14.09.25
Assessor:	Meg Evans	Review date:	14.03.25

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: Low/Medium/High
Tide Observations	Observing tides helps young people understand Earth science concepts, like gravitational forces from the sun and moon, oceanography, and climate systems. Tide observations are linked to sea-level rises. Learning about this will help young people to become informed about global environmental challenges. Also, learning about how tide cycles impact marine life builds an ecological awareness and a sense of responsibility for nature. When there is a low tide, tide pools and marine life are revealed which allows young people a chance to explore, encouraging curiosity and a connection to the real world.	Being caught by the incoming tide, which could cause drowning.	All attendees.	In order to prevent the risk of harm to individuals, there will be an elevated level of understanding of the local tide patterns. An adult member of staff will be responsible for finding out this information from local marine specialists (websites). This will prevent anyone becoming stranded on the beach and in the worst case, drowning.	Low

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: Low/Medium/High
Shell Sorting and Counting	Sorting and counting shells helps to build foundational maths skills, such as grouping, patterns and estimation. This introduces basic scientific classification. By observing different shells, it encourages the development of curiosity and observational skills which can lead to children asking questions like “why are some shells different?” or “what kind of creature lived in this?” This activity can help young people learn to collect data, analyse it, and draw conclusions, which are all important steps in scientific investigations. Shells are the remains of marine life, thereby from studying them, children are able to learn about biodiversity, ecosystems, and the life cycles of ocean species. The shells can also reveal signs of pollution or habitat loss. Picking up, handling and sorting shells supports hand-eye coordination, and sorting by shape, colour, size or type, builds classification skills that are foundational for later science or maths learning.	When sorting and counting shells, children might come across shells which are broken or jagged. They can be sharp and cause cuts or scrapes. Shells may also carry bacteria, parasites, or faeces from animals. This could cause skin irritation or illness, if touched or accidentally ingested.	All attendees	To avoid cuts and scrapes from broken or jagged sharp shells, children will be wearing protective gloves and be reminded to handle shells gently and with care. They will also be told to avoid handling broken shells. In order to avoid skin irritation or illness, children will be told to wash their hands after the activity has taken place, especially before eating. Also they will be told to avoid touching their face during the sorting and counting of the shells.	Low

Shadow Tracking	From shadow tracking, children begin to understand earth rotation, time, and space, which are key earth science concepts. Children can also begin to grasp how the sun appears to move across the sky and how this affects and causes shadows. By shadow tracking, children are encouraged to carefully watch, measure and record, which can lead to questions like: “why is the shadow longer now?” and “where did it go?” Measuring shadows with rulers or string introduces basic maths skills like length comparison, estimation, and graphing. By tracking shadows over a period of time, for example every hour, children are able to develop their time-telling and sequencing skills. When tracking shadows, children are able to move their bodies to explore how they create shadows, which supports gross motor skills, spatial awareness, and kinaesthetic learning.	Sunburn. Sharp objects in the sand. Tripping and/ or disorientation. Disturbing habitats.	All attendees and wildlife.	In order to minimise the risk of sunburn, children will be encouraged to wear suncream, sunhats and stay hydrated. Before the children are allowed to explore, an adult will check the learning area to make sure it is free from sharp objects and to ensure the environment is safe. Children will be told to keep their shoes on whilst at the beach, to avoid standing on sharp objects. An adult will ensure that the learning area is safe and flat. The children will be encouraged to keep their movement gentle to avoid tripping and disorientation. Beforehand, the children will be taught about environmental respect and to only play in the safe learning area.	Low
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Academic Writing

Outdoor learning refers to educational practices that use natural or outdoor settings such as school grounds, parks, and woodlands as sites for teaching and learning. It involves curriculum-linked or exploratory activities outside the formal classroom for example, nature walks, outdoor experiments, and environmental projects and often encourages senses, interaction, risk, and autonomy. Recent pedagogical literature increasingly treats outdoor learning not as an “extra” but as a central, evidence-based mode of education (Bangor University, 2023). The benefits of outdoor learning are well documented. First, in terms of health and wellbeing, children who learn outdoors tend to engage in more moderate-to-vigorous physical activity and less sedentary behaviour, resulting in better physical fitness and mental health (e.g. reduced stress, better mood) (Waite and Aronsson, 2022). Secondly, there are academic and cognitive benefits including improved engagement, concentration, motivation, and retention of learning. Outdoor settings often support multi-sensory, real-world contexts which aid understanding and make learning more memorable (Bangor University, 2023). Lastly, outdoor learning enhances social, emotional, and personal development, and it has been seen that confidence, resilience, teamwork, communication, risk assessment, and pro-environmental attitudes tend to increase (Bangor University, 2023).

A useful theoretical framework to understand how outdoor learning supports development is Vygotsky’s sociocultural theory, especially the notions of social interaction, scaffolding, and the Zone of Proximal Development (ZPD). While much of Vygotsky’s work predates recent outdoor learning research, his emphasis that learners grow cognitively via interaction with more knowledgeable others, maps well onto outdoor learning practices. It is suggested that teachers or peers guiding children exploring nature, gradually reduce the support as competence increases. Recent UK studies adopt Vygotskian ideas to analyse teacher perceptions of outdoor learning, showing that it is seen to foster collaborative learning and support learners beyond what they might do alone (Williams and Scott, 2019). It is clear that outdoor learning offers multidimensional gains which are physical, cognitive, social, and emotional. Understanding it through Vygotsky’s lens helps us see how these gains happen. In Wales, The Curriculum for Wales offers a broad and adaptable educational structure for learners aged 3 to 16. It promotes hands-on, outdoor

learning across all Areas of Learning and Experience (AoLE), with a particular emphasis on Science and Technology, Health and Well-being, and Humanities. Outdoor learning is integrated into the curriculum's four core purposes, which focus on nurturing learners who are ambitious, creative, ethical, and confident (Welsh Government, 2025).

As discussed above, outdoor learning is a valuable pedagogical approach that promotes children's holistic development. However, the effectiveness of outdoor learning for children significantly depends on the active role of adults who might be the teachers, facilitators and caregivers who enable these experiences. Adults play a pivotal role in scaffolding children's learning by structuring experiences, encouraging exploration, and fostering reflection (Waite, 2017). According to Vygotsky's sociocultural theory, learning is a socially mediated process where adults guide children through the ZPD, supporting them to achieve skills and understanding that they could not attain these skills independently (Vygotsky, 1978). In outdoor learning contexts, adults not only facilitate safe interaction with the environment but also stimulate curiosity, questioning, and critical thinking, enabling deeper engagement and learning. Moreover, adults' attitudes and confidence towards outdoor learning can either enable or obstruct children's access to enriching outdoor experiences (Beames & Brown, 2020).

Research highlights that many educators feel underprepared or have a lack of confidence to teach outdoors due to a limited amount of training, perceived risks, or curriculum pressures (Smith & Waite, 2021). Therefore, professional development and institutional support is essential to empower adults with the knowledge, skills, and positive mindset needed to confidently deliver high quality outdoor learning. Enabling adults also involves addressing practical barriers such as health and safety concerns, accessibility, and resource availability (Knight, 2016). When these challenges are acknowledged and managed effectively, adults can create inclusive outdoor learning environments that cater to diverse learners. Additionally, when adults model positive environmental attitudes and respect for nature, children are more likely to develop pro-environmental behaviours and lifelong connections to the natural world (Chawla & Derr, 2012). It is clear to see that enabling adults is vital to the success of children's outdoor learning, by fully equipping adults with appropriate

training, resources and support educational settings can ensure that outdoor learning is delivered safely.

Loose parts are open-ended materials that can be moved, manipulated, combined, and redesigned in a variety of ways during play. Originally defined by architect Simon Nicholson (1971), loose parts can include natural items like sticks, stones and leaves or manufactured items like tyres, fabric, and crates. They are typically accessible in outdoor and indoor play environments. Nicholson argued that the more variables or 'loose parts' in the environment, the more creative and inventive children's play becomes. Loose parts play is widely acknowledged for promoting creativity, problem-solving, and cognitive development. Due to loose parts having no defined purpose, they invite imagination and exploration. Children actively construct the meaning by interacting with the materials in their own different ways, which aligns with Piaget's constructivist theory that learning occurs through active engagement with the environment (Piaget, 1951). Furthermore, loose parts support divergent thinking, allowing multiple outcomes and fostering resilience through experimentation (Daly & Beloglovsky, 2015). Socially, loose parts play encourages collaboration, communication, and negotiation as children work together to build, share, and create. This supports Vygotsky's (1978) sociocultural theory, which emphasises the role of social interaction and language in cognitive development. Physically, manipulating varied textures and weights develops fine and gross motor skills, particularly in outdoor settings where natural materials offer rich sensory experiences (Maxwell, Mitchell & Evans, 2008). As discussed in part 2 of this essay, the learning activity which took place on the beach, offered an opportunity for a group of children to explore the area they were in and to discover the loose parts that could be found all around the beach. The children found sticks, stones, shells, seaweed, and rocks.

However, loose parts also present some challenges. One concern surrounding loose play parts is safety. This is because without predefined uses, some materials may pose physical risks if not properly supervised or maintained (Tovey, 2017). For example sharp sticks can cause physical harm if the child is not being supervised closely. Additionally, in formal educational settings, the unstructured nature of loose parts may be undervalued or misunderstood by practitioners focused on standardised outcomes (McClintic & Petty, 2015). Storage, cost, and weather considerations also affect implementation, especially in under-resourced settings. In

conclusion, loose parts play offers significant benefits to children's holistic development by encouraging autonomy, creativity, and collaboration. Grounded in constructivist and sociocultural theories, it positions children as active agents in their learning. However, successful integration requires thoughtful planning, appropriate adult support, and recognition of its value within early years pedagogy.

In conclusion, this assignment has explored the critical role of outdoor learning, the enabling of adults, and the use of loose parts in supporting children's holistic development. Outdoor learning, as highlighted, is a powerful pedagogical approach that extends education beyond the classroom, offering benefits that are physical, cognitive, emotional, and social. When embedded within frameworks such as the Curriculum for Wales, and understood through Vygotsky's sociocultural theory, outdoor learning becomes not only a curricular enhancement but a transformative educational experience. The success of outdoor learning experiences is heavily dependent on the enabling of adults. Teachers and caregivers are central to facilitating meaningful engagement with the environment by scaffolding learning, fostering inquiry, and modelling positive attitudes. Adult confidence, training, and institutional support were shown to be essential in overcoming barriers such as health and safety concerns, resource limitations, and a lack of professional development. Only when adults are empowered can children fully access and benefit from high-quality outdoor learning opportunities. Additionally, the inclusion of loose parts play within outdoor learning environments enhances children's creativity, problem-solving, and collaborative skills. Aligned with Piaget's constructivist theory and Vygotsky's emphasis on social learning, loose parts allow children to function as autonomous, imaginative learners. While safety and practical implementation issues exist, the educational value of loose parts is significant and should not be underestimated.

Overall, this assignment has demonstrated that outdoor learning, when combined with well-supported adults and open-ended materials such as loose parts, has the potential to provide rich, child-centred experiences. These approaches collectively foster confident, creative, and capable learners, echoing the four core purposes of the Curriculum for Wales. With thoughtful planning, inclusive practices, and a clear understanding of theoretical foundations, educators can ensure that outdoor learning remains a vital and impactful part of children's education.

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