

Awe and Wonder – Science, Mathematics, and the Outdoors



(Waters, 2024)

Part 2 –

Our Visit to The Gnoll Country Park

Wednesday 1st May 2024 – Preparations for our trip

As highlighted within The Curriculum for Wales (2024) educators should allow children the opportunity to investigate in mathematical and scientific-rich environments both indoors and outdoors. Reinforcing this, my colleagues and I decided it would be a great first-hand learning opportunity to take eight children from our childcare setting on a trip to our local country park.

In preparation for our trip, as a setting, we ensured that permission slips were issued to the children's parents a week before our trip. These slips entailed details such as where and when we would be going, our plan for a picnic with food specifications, and our means of transport.

Further supporting The Curriculum for Wales (2024) before embarking on our trip, my colleagues and I discussed various types of materials we thought would enhance and benefit the children's play throughout our time at the park. After many suggestions, we decided to take some string, Magnifying glasses, Binoculars, and little Buckets for the children to collect different types of leaves, stones and sticks, so we could create a collage when we got back to the setting.

Wednesday 8th May 2024

When first approaching the wonderful grounds of the Gnoll Country Park, it was evident that there were many opportunities for sensory experiences to be had there. The plethora of textures, noises, and smells meant for great conversations with the children along with first-hand experiences, such as allowing the children to feel the different textures surrounding them and hearing all the wildlife residing in the park.

Upon arriving we asked the children if they would like to go on a nature walk, to which they all reacted positively. Whilst walking through the beautiful woodlands we spotted some wonderful carvings created by local carvers. The children had a lot of questions regarding what they were and how they got there. One child asked if people had chopped the trees down just to make the sculptures. I responded by telling the child

that some trees can get poorly and that cutting them down can prevent the surrounding trees from getting sick, and other trees get so old and withstand lots of different weather conditions they can sometimes fall over by themselves. We further discussed the animals depicted in the carvings and how they lived in the very same woodland we were walking through. The children asked where these animals were, eager to see them. I began teaching them the concept of Nocturnal animals, and explaining that these types of animals usually sleep during the daytime and come out at night.



Figure 1 Waters, L. (2024) Owl Carving.

After walking around the grounds, visiting the ducks, and having a picnic, the children seemed incredibly interested in one specific area. This area, as seen in the image provided, had a plethora of natural resources for the children to enjoy, such as fallen logs, branches, pebbles, and water. Considering the importance of safety as stated within ... my colleagues and I first ensured a risk assessment was carried out on this specific area, ensuring that safety measures were put in place to keep the children and ourselves safe. Following this, we reminded the children of our golden rules,

ensuring that all children are always visible to a member of staff, as well as reminding them not to eat anything from the surrounding floor or bushes as this could give them potential allergic reactions or general sickness.

After all safety measures were taken, we allowed the children to explore the area without adult intervention, being cautious to observe but not interfere with their desired way of play.

Whilst observing I overheard three children discussing the nearby stream of water. “Where is that water coming from?” Child A asked. “It came from the big pond over there” Child B said as they pointed at the large pond. “No! It comes from the sky!” Child C responded. They quickly ran towards me, “Where does this water come from, Miss?” Child B asks me. Thinking swiftly, I realise that this is the perfect opportunity to teach children A, B and C about the water cycle, as seen below.

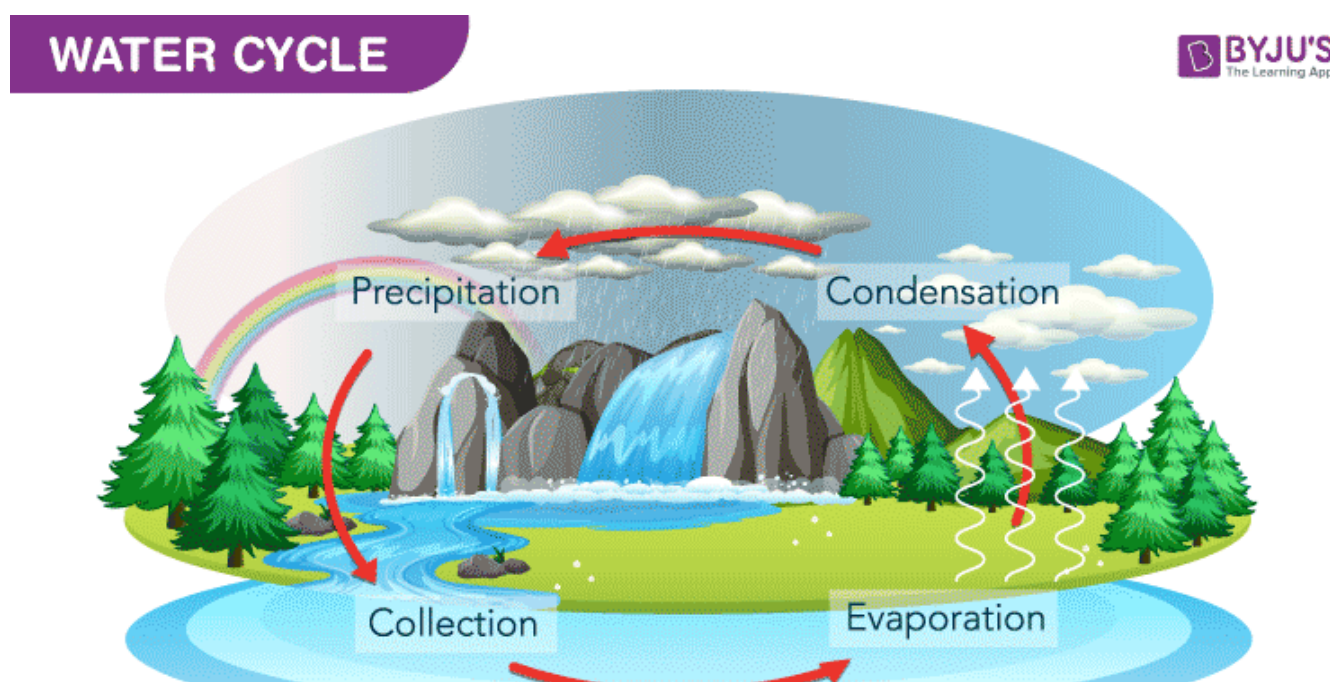


Figure 2 BYJU'S Biology (No date) The Water Cycle

“On days that are very sunny and hot, the sun’s rays’ warms up rivers, streams and ponds, evaporating the water. Evaporation is the change from liquid into gas. For example, when you have a warm bubble bath, can you usually see steam rising in the air?”. “Yes Miss! It gets very foggy in my bathroom!” Child C explains. “That is the water in your bath evaporating into gas!” I respond. “This evaporated gas rises up into

the sky, where it's collected into clouds. This is called Condensation. Once the clouds become heavy with water, it begins to rain! This is called Precipitation. As the rain falls to the ground, it fills the streams, rivers and ponds again! This is called Collection. Together, Evaporation, Condensation, Precipitation, and Collection form the Water Cycle. Does anyone know why water is so important? Do we need water?" I ask. "YES!" They exclaim. "Flowers need water too" says Child A. "You're absolutely right. Flowers drink water through their roots in the soil. So do you all understand where the water comes from?" I ask. "Yeah! The Water Cycle!" The children shout.

After allowing the children time to explore the new environment, my colleagues and I decided to introduce the loose parts materials we brought along with us, with the hope that they would enable the children to further their curiosity. I placed a few pairs of children's binoculars, magnifying glasses, string, and little buckets.



Figure 3 Early Years Resources (No date) Children's Magnifying Glasses

Further observing the children playing, I was able to notice their interaction of combining both natural resources with our synthetic materials such as tying some string to long sticks and creating a handmade fishing pole, which they later used to pretend to catch fish in the nearby stream.

I am approached by a child who seems excited to show me something they had found with a magnifying glass. "Look Miss!" they exclaim, pointing to a little gap in a hollow

tree log. "What could it be?" I respond. "It's a Spider!" they say, jumping up and down with excitement. "How many legs does it have, I wonder?" I ask. This seems to spark the child's interest as they begin to use the magnifying glass to count how many legs the Spider has. "Eight legs!" Shouts the child. "Eight legs and it has a red head!". "Oh wow, well done! Shall we have a look if there are any other bugs nearby?". The child begins to scour the floor for tiny lifeforms. "I've found something!" The child shouts to me. After inspection, I realise the child has discovered a Ladybug. "A Ladybug! How many legs does it have?" I ask the child. The child begins to count, "One, two, three..". "Six! It has six legs! Two less than the spider we found" They explain. "That's amazing! You're very good at counting" I respond.

These were just two of many conversations I had with the children. Observing them in a large outdoor environment participating in child-led play allowed me to see the myriad of diverse personalities we had within the group. All of which had different interests, questions, and opinions. It later dawned on me how even a small interaction with a little insect created a great mathematical connection for certain children, or how seeing a stream of water ignited further cognitive questioning, linking it back to science.

Part 3

RISK-BENEFIT ASSESSMENT

Location / Activity:	The Gnoll Country Park – Outdoor Learning	Date:	8 th May 2024
Assessor:	Leah Waters	Review date:	8 th November 2024

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
Jumping on large stones in the water. Playing hopscotch	-Increasing gross motor skills -Practising balancing skills -Learning about distances	-Slipping and falling into a stream of water -Risk of drowning -Hitting head on surfaces	Children	-Ensuring large stones are dry and void of moss. -Children always wearing hi-vis jackets. -Appropriate clothing and footwear are worn e.g. wellies and waterproofs. -Ensuring an adult is always present.	Low
Skipping stones in water	-Increasing fine motor skills -Learning about gravity -Learning about distances	-Cutting hands or fingers on sharp stones -Slipping into the Lake, risk of drowning	Children	-Wash children's hands before and after activity. -Ensure an adult checks the area for any sharp objects. -Remind the children to be cautious about what they are picking up.	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: L/M/H
Climbing on and jumping off tree logs	-Learning about different heights -Learning about personal capabilities	-Falling off Tree logs, causing injuries such as fractures/ sprains or open wounds.	Children	-Ensure the flooring is clear of uneven textures such as large branches -Ensure children are wearing appropriate footwear -Have a first aid kit available -Have a plan in place for potential injuries	Medium
Utilising natural loose parts and foraging for items that may include: -Leaves -Stones -Sticks and Twigs -Plants -Mud or Soil	-Learning about insects and flowers. -Understanding outdoor environments. -Discovering new patterns. -Further develops their imagination and creativity -Builds upon problem-solving skills	-Potential cuts, stings, splinters, or skin irritation. -Damage or irritation to eyes from throwing, blowing or rubbing of substances such as mud, sand or gravel. -Potential infection from animal faeces. -Ingestion of dangerous toxins from foraged plants or berries.	Children and Adults	-Ensure an adult thoroughly checks the area for any animal mess or sharp, unsafe objects such as glass, plastic or metal shards. -Thoroughly wash children's hands and face before and after handling natural resources. -Ensure to inform children of our Golden Rules for this activity: -Do not eat anything that they find. -Do not touch any faeces.	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: L/M/H
Running around the outdoor space	-Learning about different speeds and timings. -Learning about distances. -Encourages healthy, physical lifestyles.	-Trip over debris such as logs, or large stones. -Slipping on wet surfaces. -Collisions with other children.	Children	-Ensure all children are wearing appropriate footwear e.g, wellies, trainers or walking boots. -Remind children to take their time and not to run on wet surfaces. -Ensure an adult checks the area for any large or sharp objects. -Ensure resources brought with are kept out of the way.	Low
Exploring the outdoor space	-Learning about lifecycles of plants, animals, and insects -Independence Skills -Investigating their own interests	-Putting small objects in mouth such as pebbles or wild berries. -Getting lost. - Approaching strangers and their dogs.	Children	-Remind the children prior to embarking on the trip of these golden rules: - O Do not approach strangers or any dogs. - O Do not eat anything they have found. - O Always stay in the allocated area where an adult is able to see all children. -Have access to a register. -Do regular headcounts. -Always have an adult present and aware. -Ensure children are wearing hi-vis jackets.	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: L/M/H
Any Outdoor activity	-Gross and Fine Motor Skills -Knowledge of the outdoors and nature -Understanding personal capabilities such as how high they can jump or how fast they can run	-Low blood glucose. -Fainting, resulting in potential head injury	Diabetic Children	-Have medical records and plan on hand. -Have personal medicines such as insulin pen and blood glucose monitor available. -Have snacks available for those effected, advised by parents. -Have a communication device on hand to contact emergency contact/services if necessary.	Low
Any Outdoor activity	-Gross and Fine Motor Skills -Knowledge of the outdoors and nature -Understanding personal capabilities such as how high they can jump or how fast they can run	-Asthma attack	Children with Asthma	-Have medical records and plan on hand -Have personal medicines such as Asthma pump available. -Advise and monitor at risk children in avoiding potential triggers, such as strenuous activity. -Have a communication device on hand to contact emergency contact/services if necessary.	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: L/M/H
Any Outdoor Activity	-Promotes wellbeing -Gross and Fine Motor Skills -Knowledge and understand of the outdoors and surrounding nature. -Discovering and strengthening personal capabilities such as balancing, jumping, and throwing.	-Severe allergic reactions. -Risk of Seizure.	Children at risk of seizure (e.g, epilepsy) or allergic reaction	-Have medical records and plan on hand. -Have personal medicines such as an epi-pen or anti-allergen medication available. -Advise and monitor at risk children in avoiding potential triggers. -Have a communication device on hand to contact emergency contact/services if necessary.	Low

Part 4 –

As written by Piaget (1957) children can be considered as little scientists, as they observe, experiment with and discover novel aspects of the world around them, akin to the scientific method. Clements and Sarama (2016), support this notion by adding that young children are thought to instinctively obtain scientific curiosity throughout their development. This concept can be demonstrated by typical scientific queries asked by children, such as “*why?*”, “*what?*”, and “*how?*” questions. They further explain that children in the early years of life frequently use methods of mathematics during play. For example, by acknowledging and exploring different patterns, shapes, object size, and measurements, children are subconsciously utilising and strengthening their mathematical understanding.

Supporting this, as theorised by Froebel (1837), play can be considered a fundamental part of acquiring novel knowledge throughout childhood. He further states that children are able to create deep connections and understandings with the world around them through outdoor enriching play experiences. Moreover, Froebel also mentions that children should have the freedom to experience outdoor environments in every aspect such as, colour, sound, and substance. Additionally, he recommends that adults undertake regular observation of children in outdoor environments in order to better support and facilitate enriching play. This can be done by artificially introducing favoured materials, resources, and activities. Additionally, Hunter, *et al.* (2020), suggest that adults do not just have to observe children but also the environment in which the children engage. This can allow practitioners to identify opportunities and natural resources that could support Mathematic and Scientific encounters.

KÖÇER (2021), explains that as babies explore using their senses, they begin to recognise paradigms of the natural world, such as the foundations of gravity by understanding that something will fall if dropped, sparking curiosity. As children continue to age, they are able to better define and comprehend these systems surrounding them. This could lead to more intricate learning prompts and two-way engagement between children and adults, promoting enriched open-ended questioning. In addition to this, Fler (2021), suggests that as children’s imaginations develop and their comprehension of the natural world improves, they are better able

to understand what type of play they wish to take part in, thus allowing adults to further implement child-led play.

As suggested by Orr (2016), discovery learning can be linked to positive learning outcomes for children as it can allow them to develop and investigate their own interests through curiosity. In addition to this, Article 29 of the United Nations Convention on the Rights of the Child (2019) highlights that children obtain the right to an education which develops and strengthens their understanding, abilities and traits through diverse environments and cultures. Furthermore, Acar (2014) suggests that exploring outdoors can further enhance children's skills such as problem-solving, independence and cognitive abilities. Linking to this, as seen within the Curriculum for Wales' (2024), four purposes' it is considered to be an educator's duty to nurture and support children into becoming ambitious, enterprising, ethical, and healthy contributors to society. However, as supported by Chantrelle (2015), adults are often met with a multitude of challenges when it comes to teaching children outdoors. This can vary from rational issues such as the inability to gain access to an outdoor space, to more insubstantial issues such as a lack of knowledge on the impact that outdoor learning can have on children's holistic development. Oberle, *et al.* (2021) explain that often personal preference and lack of motivation can deter educators from practicing outdoor teaching. For example, some adults often dislike the idea of outdoor activities during days which are wet, windy, or cold as they themselves may not want to go out during wet weather.

As suggested by Sandseter, *et al.* (2017), like many barriers, the fear for the children's health and safety can often hinder adults' perception of outdoor experiences. Although this may stem from a place of concern, this can limit the opportunities that adults provide for children. As supported by Little (2020), outdoor learning can often be associated with taking too many safety risks, potentially resulting in harm to the child. Conversely, Solly (2014), describes risk-taking as beneficial to children's futures as it can allow them to face physical challenges and strengthen their capabilities, resilience, and proprioception. Additionally, Little (2017) suggests that facing controlled risk and pushing boundaries allow children to better gauge their physical limits during play, improving their capability to manoeuvre around outdoor environments safely. As supported by Van Dijk-Wesselius, *et al.* (2020), the need to meet the criteria for the curriculum due to inexperience, lack of confidence, and physical limitations can also

prevent educators from teaching mathematics and science outdoors. Moreover, educators are advised to seek out solutions for these challenges such as, further educating themselves on such topics so they are able to regularly implement engaging outdoor learning experiences for the children within their care.

As supported by White (2019), many children have limited access to an outdoor environment, especially those whose living situation is without a garden, or they are cared for by adults who may not recognise the impact that the outdoors can have on a child's holistic development. Therefore, it is considered important for practitioners to be mindful of their roles, ensuring that they are continuously encouraging and creating stimulating outdoor experiences for children. In addition to this, Watts (2020), believes that it is practitioners' responsibility to work with parents in partnerships to provide insight and advice for those who may be struggling to find the time and location to allow their children to explore outside. Outdoor environments allow children to freely explore large areas compared to potential indoor restrictions. As supported by Capio, *et al.* (2023), physical movement for children does not just encourage healthy lifestyles and positive well-being, it also allows children to personally experience scientific and mathematical concepts. For example, running can teach children about distances, pace, and spatial awareness.

Robertson (2017) explains that there are many ways in which adults can facilitate a stimulating scientific and Mathematical environment. Often children will create learning opportunities from their natural surroundings. For example, they may compare different sizes of twigs and sticks, utilizing mathematical thinking to find a conclusion. However, as supported by Flannigan and Dietze (2017), introducing additional materials such as loose parts can often enhance children's learning and play experiences. As highlighted within the Early Years Foundation Stage Statutory Framework (2024), educators should offer regular and diverse opportunities and materials for children to physically see and manipulate, allowing children to create positive connections with these concepts, further building upon their knowledge and mathematical understanding.

Furthermore, physical representation of objects may assist children to better comprehend abstract concepts, such as numeracy in mathematics or gravity in science. In addition to this, affordance theory, as developed by Gibson (1979), is a

concept that children do not only gain an understanding of their surrounding world from object appearances and relationships but also from their potential uses or actions. This can mean that children learn best through sensing and performing at the same time. Linking to this, PennState Extension (2019), describes that loose parts can be considered to be anything synthetic or natural that children are able to move, pick up, stack on top of each other, and more. Potential loose parts may include string, water, cardboard tubes, pebbles, and leaves. They further explain that there is no specific way in which one would use loose parts and that the possibilities are endless, especially for young flourishing imaginations. As supported by Nicholson (1971), having an abundance of loose parts enables children to be as creative as they desire. This further supports both open-ended and child-led learning for children, as they are able to utilise these resources how ever they wish rather than through instruction. This accentuates different forms of play such as role play, using these items as props to fully immerse themselves in an activity.

As supported by Jacobson (no date), enabling adults who are invited into an activity by children should be aware of any opportunities to support metacognitive speech. This can be exhibited by the adult further developing an activity by asking questions such as, “What do you think would happen if...” or “Why do you think that would happen?”. This can allow children to better improve and develop their cognitive ability to connect observed reality to potential outcomes and hypothetical situations. Additionally, as Jackson (2023) explains, metacognitive speech can support children to use their own reasoning from already acquired knowledge and apply it to any potential problems or unknowns. Moreover, Norling and Sandberg (2015) suggest that the outdoors can best facilitate the development of metacognitive speech by exposing children to a plethora of external experiences such as sightings of nature, birds, insects, and plants.

Further seen throughout Assessment Arrangements: Subordinate Legislation Resultant of the Curriculum and Assessment (Wales) Act (2021), the mechanisms of learning and teaching play integral parts of both documentation and assessment during the design of both curricula and outdoor play. It is a requirement that assessments are conducted over a period of time rather than one-off events. The educator can record and document required assessments through various means. Such as, note-taking, video recording for future use, and observation. As supported by

Davies and Hamilton (2020), by gathering an increasing amount of information on the children's outdoor habits during child-led play in nature, the practitioner can better assess specific variables that may have an impact on the child's individual needs. They further add that this can permit practitioners to make more informed decisions on potential areas requiring additional support during the child's activity.

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