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Part 1:



Source: authors own

## Part 2

By looking at the outdoor environment in the chosen image there seems to be plenty of opportunities for young children to explore through play. There are many resources such as the boat, tyres, ropes, trees and a range of natural materials for children to use. Rather than learning as you would in a formal classroom lessons in this environment are more of giving them a starting point for children's own curiosity and interests to guide the learning. The main scientific concept I would explore is forces and movement as there is a lot around to use as examples of this. The children will investigate what happens when objects are pushed, pulled, rolled, lifted or moved on different surfaces. The uneven woodland area makes this particularly easier as children can also experience how objects behave differently on soil, leaves, grass and slopes.

The question I will use to get the children's attention and to introduce the investigation is : "What makes things move?"

By asking this question and not giving the children an answer they will naturally use their own imitative to find out the answer through hands on investigations. Then I observe

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what they naturally do and use their comments and actions to develop the investigation.

### **Beginning the investigation/exploration**

The children immediately began exploring the resources in many different ways each child finding their own ways of doing things and also helping each other to move and lift heavier objects. Some children were more mesmerised by the boat and spent a lot of time in there using it for imaginative play, whilst others investigated the tyres and the other resources. One child picked up a tyre and started to push it:

Child A : “ Look! It’s moving!”

The child then pushed the tyre again with both hands and the tyre moved even further.

Child B: “ Wow look how far it’s gone!”.

Rather than explaining straight away to the children what’s happened I asked a question.

Practitioner: “ Hmmm... I wonder why it went so much further the second time?”/

This encouraged the children to think about what had changed. I then asked a few other questions they could think about:

Practitioner: “ What happens if you push it gently?”.

“ What happens if you push it really hard?”.

“ Can we make it go even further?” .

The children repeated this experiment a few times, I slowly introduced simple vocabulary such as pull, move, fast, slow, heavy and light. At a young age children can’t be expected to understand the formal scientific definition of force therefore I support them in developing a better understanding through repeated experiences. I also thought I’d add in some maths and brought out the tape measure and asked:

Practitioner: “ How can we work out which tyre travelled the furthest?”.

Child A: “ I know ! I know!.

Child A took the tape measure and with help from a practitioner and the other children they measured the distance from the starting point to where each tyre stopped. They used mathematical language such as further, closest, shortest, longest, more and less.

### **Investigating the surface/ground**

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The ground in the image is not completely smooth or even and there are also natural surfaces such as soil, leaves and grass. This allows children to see whether objects move differently depending on the surface they are on. Children could use natural items such as sticks, pinecones and conkers to see how they move around on different surfaces.

Practitioner: “ Do you think the conker will move the same way on the grass and the leaves?”.

Child C: “ I think it will be super fast on the grass”.

The children then rolled the conker across the grass and the leaves to observe what happens.

Afterwards I asked:

Practitioner: “ Which surface did the conker roll faster on?”.

“ What could we do differently next time?”.

I also added some maths into this investigation by asking

Practitioner: “ How far do you think the conker will travel on the grass?”.

Each child then placed a stick to mark their prediction and afterwards compared it with the actual distance travelled.

### **Slopes and gravity**

The children then became interested in the sloped area, so I decided to ask:

Practitioner: “ What do you think would happen if we rolled a tyre down the slope?”.

Child A: “ OHHHH I want to try!”.

Child B: “ I don’t think it will work!”.

Child C: “ Quick, let’s get the tyres and see!”.

The children took it in turns to roll the tyre down the slope and also on flat ground to compare the difference.

Practitioner: “ Let’s measure which one went the furthest”.

The children used their footsteps to measure the distance travelled by the tyre on both surfaces. They discovered that the tyre travelled further on the flat ground which they were not expecting. I explained to them this is because when rolling down the slope, the tyre moved too quickly and kept tipping over, which stopped it from travelling as far. This encouraged the children to think about how the speed and direction of movement can affect the distance that was travelled.

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The Curriculum for Wales, (2022) encourages children to be curious about science through asking questions, be creative and search for explanations of how things have happened. This investigation links to these ideas as the children were given the opportunity to explore forces and movement for themselves. Instead of being given the answers, the children were encouraged to make their own predictions, try different things and talk about what they noticed. For example, they explored what happened when they pushed tyres with different amounts of force and looked at how objects moved across different surfaces, such as grass and leaves. Through these experiences, the children began to develop an early understanding of forces and movement in a practical and enjoyable way.

The investigation also links to The Curriculum for Wales, (2022) in regard to mathematics and numeracy. Mathematics was naturally included in our investigations the children estimated how far objects would travel, counted their footsteps, measured distances and compared the results. They used simple mathematical words such as *further*, *closer*, *longer*, *shorter*, *more* and *less* when discussing what they had found. This gave the children a meaningful reason to use mathematics and helped them understand how maths can be used to investigate things in their everyday environment without it having to feel like a formal maths lesson.

Overall, I feel as though the investigation went well and the children enjoyed and were given the opportunity to learn about forces and movement through play. The children were encouraged to make their own predictions, test their theories and observe what happened rather than being given the answers. . Asking open-ended questions helped to keep the children interested and encouraged them to think about why things happened. I also found that mathematics could be included naturally through activities such as measuring, estimating and comparing distances without making it feel like a structured maths activity. The children also discovered that things do not always happen in the way they expected or wanted. For example, they thought the tyre would travel further down the slope, but they found that it actually travelled further on the flat ground. This encouraged them to talk about what they had observed and share their own ideas about why this happened. If I continued the activity, I would give the children more opportunities to investigate using different objects to explore how they move on different surfaces. This would allow them to continue building their understanding of movement while following their own ideas and interests.

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(1277 words)

( Bream Bay Kindergarten, 2016).



### Part 3

| Activity                          | How will children benefit from this activity?                                                                                                                                                                | Hazards/Risks                                                                                                                                                                         | Who is at risk?    | Control measures                                                                                                                                                                                                 | Overall risk |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Large boat structure              | Highly stimulating environment for imaginative play. Children could explore height, position, size and movement while developing problem solving, cooperation, and communication skills.                     | Children could fall while climbing, become trapped in small spaces, or bump into other children. Parts of the boat could also present sharp or unstable surfaces if poorly maintained | Children and staff | Check that the boat is structurally secure, stable, and free from sharp edges or damaged areas. Children should be shown appropriate areas to climb/ use. Also ensure children are supervised.                   | Medium       |
| Low tree branches                 | Trees provide opportunities to investigate living things, natural materials, seasons and habitats. Children can develop better awareness of their physical environment and learn to assess height and space. | Children could bump their heads or scratch themselves. Branches could potentially fall if damaged or unstable.                                                                        | Children and staff | Practitioners should complete regular visual checks for damaged or unstable branches and establish areas that are unsuitable for climbing. Children can be encouraged to notice and assess obstacles themselves. | Low          |
| Wooden tables, benches and spools | These resources provide opportunities for children to create dens, organise objects, compare heights and sizes, count, balance objects and engage in role play                                               | Children may climb onto furniture and fall or trap fingers. Unstable or damaged wood could cause splinters.                                                                           | Children and staff | Check furniture is stable and free from significant damage or splinters. Practitioners should consider whether climbing is appropriate and                                                                       | Low          |

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|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|                                                           |                                                                                                                                                                                                                               |                                                                                                                                     |                    | provide clear boundaries whilst still allowing children to use the resources creatively.                                                                                                                                                                                                               |        |
| Ropes/string and hanging materials                        | Ropes can support imaginative play, pattern making and consider lengths, position and movement. Children can compare long/short rope .                                                                                        | Children could become tangled, trip over ropes or pull materials down.                                                              | Children           | Keep ropes at an appropriate height and regularly check their condition. Avoid loops or arrangements that could present a strangulation risk. Supervise children's use and remove damaged materials                                                                                                    | Medium |
| Loose natural materials such as sticks, stones and leaves | Loose parts encourage children to investigate properties of materials, classification, counting, sorting, patterns, construction and problem solving. Natural materials can encourage curiosity and scientific observations.  | Children could trip, put objects in their mouths, scratch themselves or hurt other children if sticks are used unsafely.            | Children and staff | Practitioners should do a walk around before children enter setting to ensure safety. Establishing safety expectations, such as not putting objects in mouths or using sticks to hurt other children or staff is important. Children can also be encouraged to assess and choose materials themselves. | Low    |
| Tyres around the boat                                     | Tyres are a valuable open-ended resource. Children can count them, compare their sizes, arrange them into patterns, roll them, compare weights, movements and forces. They also encourage collaborative and imaginative play. | Children could trip or fall between tyres or even trap their fingers when moving the tyres. Tyres may also become slippery and wet. | Children and staff | Check tyres for damage, sharp objects and excessive water/debris. Children should be supported when moving larger tyres. Practitioners should also model safe lifting and encourage children to work together.                                                                                         | Medium |

#### Part 4

Outdoor environments provide children with many opportunities to learn through play, exploration and their own interests. Being outdoors gives children the freedom to make their own choices, investigate their surroundings and use resources in different ways. This section will focus on how open-ended and child-led play, as well as loose parts, can encourage young children to engage with maths and science outdoors. It will also consider how adults can support this learning without taking control of children's play.

The role of the adult is important in supporting this type of learning. Practitioners can observe children to understand their interests and what they are already exploring, then provide suitable resources, introduce appropriate mathematical and scientific vocabulary and offer support when needed. This can be done while still allowing children to lead their own play, make choices and explore their ideas rather than making the experience feel like a formal classroom activity.

Open-ended and child-led play allows children to use the outdoor environment and available resources in their own ways. This is different from a structured activity where a practitioner has already decided what the children need to do. Instead, children can explore their own ideas, experiment and try things out in different ways. For example, children may roll a tyre, build something using sticks and other loose parts, or create their own game. These experiences can support imaginative play while also providing opportunities for children to develop mathematical and scientific ideas naturally through their exploration.

Child-led play does not necessarily mean that the adult has no role. Practitioners are encouraged to observe children's play and provide support if needed, while still allowing children to make their own choices and feel in control. Silalahi (2019) explains that Vygotsky believed children can develop their learning when supported by someone who may have more knowledge or experience. This links well to Vygotsky's theory of the Zone of Proximal Development. This theory can be linked to outdoor learning as practitioners can support children when trying new things that they may find difficult to do or understand independently. An example of this would be if a child is rolling a tyre and starts to get frustrated because it is not going very far. A practitioner could ask, "I wonder how we can make it go further?" or "What would happen if you pushed it a little harder?" By asking questions, the adult is encouraging the child to experiment without

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showing them exactly what to do. This allows the child to stay in control of their own play whilst still developing their understanding of movement and forces. This also links to research on sustained shared thinking as research shows that positive adult-child interactions can help extend and develop children's thinking (Siraj-Blatchford et al., 2002; Sylva et al., 2004). Sustained shared thinking involves adults and children working together to explore ideas, solve problems and develop their understanding. This can be useful outdoors, as practitioners can observe children's play and use questions or comments to encourage them to explore their ideas further.

Another vital aspect in supporting open-ended and child-led play is providing children with access to loose parts. Research suggests that loose parts can support children's curiosity, creativity, problem-solving and communication skills by giving them the freedom to decide how they want to use different materials (Only About Children, 2020). Research also suggests that loose parts can support children's independence and confidence, as well as encouraging relationships and leadership (Spencer et al., 2019). Loose parts do not have one specific purpose and can be changed, moved or combined in many different ways. In the outdoor environment shown in the photograph, there are many examples of loose parts that children could use, such as sticks, stones, leaves, tyres, ropes and pieces of wood. These resources can all be used in different ways depending on what the child wants to do. For example, one child may use sticks to make a den, while another child may use the same sticks to draw in the soil. This allows children to make their own decisions and use their imagination rather than being told what each resource should be used for. Using loose parts can give children more freedom to investigate mathematical and scientific ideas through their play. However, providing loose parts does not necessarily mean that children will simply just engage with maths or science. Some children may need encouragement or support from the practitioner to develop an idea further. This means that the adult still has an important role in observing how children are using the resources and deciding when the right time is to get involved.

However, although children are leading their own play and using the loose parts for imaginative child-led play, the role of the practitioner is still important in making sure that the environment provides opportunities for learning. Practitioners can support children by providing a range of resources and allowing them the time and space to explore these in their own ways. They can also recognise when a child may need some extra support or encouragement to develop an idea further. This does not mean taking over the play; it means being available to support children as and when needed.

It is particularly important that practitioners are aware of finding the right balance between involving themselves in children's play and giving them the freedom to explore independently. Practitioners therefore need to think carefully about how they can support children without taking over their play. The Education Endowment Foundation (2023) explains that adults still have an important role in providing resources and supporting children's learning, while children are able to lead and direct their own play. This also links to the Welsh Government's curriculum for funded non-maintained

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nursery settings, which encourages child-centred learning and gives children opportunities to learn through play, being outdoors and real-life experiences (Welsh Government, 2022). This balance is particularly important when supporting mathematical and scientific learning outdoors, as children may be developing these skills without even realising it. For example, when children are building with loose parts, they may compare the size or length of different objects, count how many resources they are using or investigate why something keeps falling down. The practitioner can notice these opportunities and encourage the children to think about what they are doing without making the activity feel like a formal maths or science lesson.

Practitioners can also create opportunities for children to develop their maths and science skills by thinking carefully about the resources they provide and how children might use the outdoor environment. Research by Speldewinde, C and Campbell, C (2022) found that nature-based early childhood settings can provide opportunities for children to develop mathematical understandings through nature play, with educator support playing an important role. This does not mean that the practitioner has to set up a planned maths or science activity. Instead, they can provide different resources that encourage children to explore, compare, count, measure and investigate as part of their normal play. For example, children could be given sticks, stones, containers or pieces of wood and begin to compare their sizes, lengths or weights, or count how many they have. Practitioners can introduce simple words such as heavier, lighter, longer, shorter, more and less when they are relevant to what the children are doing. This allows the adult to support children's mathematical and scientific learning while still giving them the freedom to lead their own play and follow their interests.

Observation is therefore an important part of the practitioner's role when supporting maths and science outdoors. Guarrella et al. (2023) explain that observing what children do and say during play can help practitioners understand what children already know and use this information to make purposeful decisions about their learning, while still following their interests. For example, a child might repeatedly try to balance different pieces of wood. Rather than stopping the activity and turning it into a planned science lesson, the practitioner could observe what the child is doing and then ask questions such as, "Why do you think that one keeps falling?" or "What could we change to make it balance?" This gives the child an opportunity to think about their own ideas and test them. The practitioner can then use what they have observed to decide how they might extend the learning.

Questioning is another way adults can encourage children to think more deeply about mathematical and scientific ideas. Open-ended questions can encourage children to explain their thinking rather than simply giving a correct answer. Questions such as "What do you notice?", "What do you think will happen?", "How could we find out?" and "What could we try next?" can encourage children to make predictions, investigate and talk about what they have discovered. McNerney et al. (2019) found that the use of open-ended questions can support young children's science learning by encouraging them to think and talk about their ideas. This suggests that the adult does not always need to provide information directly. Instead, their questions can help children develop their own understanding.

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However, practitioners also need to consider when questioning is useful and when it may interrupt children's play. Asking too many questions could make child-led play feel like an adult-directed activity. If a child is deeply involved in building a structure, constantly asking questions could interrupt their concentration and enjoyment. Therefore, practitioners need to observe first and decide whether their involvement would add something to the child's learning. Sometimes simply listening, commenting on what the child is doing or giving them more time may be more appropriate than asking a question. This shows that supporting maths and science outdoors is not about constantly teaching children but about recognising opportunities to extend learning when they arise.

Adults can also support mathematical and scientific learning by introducing appropriate vocabulary during everyday play. Young children may already have ideas about size, shape, weight, position, movement and materials without knowing the formal words for them. Practitioners can introduce words naturally while children are playing, such as heavier, lighter, longer, shorter, wider, smaller, balance, roll, move, float and sink. For example, if children are comparing two sticks, the adult could say, "That stick is longer than this one," rather than simply telling the child the answer. Over time, hearing and using this vocabulary can help children communicate their ideas and describe what they have noticed.

The outdoor environment itself can also act as an important resource for learning. The practitioner does not need to provide every resource because children can investigate things that are already around them. Natural materials such as leaves, sticks, stones, soil and water can provide opportunities for children to sort, compare, count, measure and investigate. This means that adults need to think carefully about how they organise the outdoor environment and whether children have enough access to resources that they can use independently. Providing an environment with a variety of materials can give children more opportunities to develop their own questions and investigations.

There can also be challenges when supporting maths and science outdoors. Weather, limited resources, safety concerns and time pressures may sometimes make outdoor learning more difficult. Practitioners also need to consider children's different abilities, confidence levels and interests. Some children may immediately want to explore natural materials, while others may need more encouragement or support before becoming involved. This means that adults need to be flexible and adapt their approach depending on the individual child. For example, one child may benefit from being given more time to explore independently, while another may need the practitioner to model how a resource could be used before they feel confident to try it themselves.

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Overall, adults have an important role in encouraging young children to engage with maths and science outdoors, but this does not mean that they need to control the learning. Open-ended and child-led play gives children the freedom to explore their own ideas, while practitioners provide the resources, environment, support and language that can help develop their thinking. Through observation, questioning and careful interaction, adults can recognise mathematical and scientific learning within children's everyday play and extend it when appropriate. Loose parts and natural materials can provide children with opportunities to investigate and experiment, while theories such as Vygotsky's Zone of Proximal Development help explain why adult support can be valuable. The important part is finding a balance between supporting children's learning and still allowing them freedom to play and investigate themselves.

( Creative Star Learning, 2011).



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