

Awe and wonder - Science, mathematics and the outdoors

Rosalyn Silvers

1)



(Source: Bright Blooms Nursery LTD, 2024)

2) There are many opportunities for mathematical and scientific development in early years children when looking at this space. This part of the portfolio will focus on the mathematical concept of patterns. Department for education (2024) identify how important it is for children to be encouraged to develop their pattern noticing when it comes to their mathematical skills. The information is inclusive of many different forms of patterns which can be presented to children in the early years such as patterned materials, small objects, matching objects or photographic material. Further explaining how a child's language development over the early years will increase their ability to explain the patterns they see, giving practitioners a deeper understanding of how children comprehend patterns, allowing for further improvement of play affordances from the practitioner.

Department for education (2023) in the Early Years Foundation Stage statutory framework identifies the necessity of early years settings to equip children with the strong mathematical foundation needed for them to excel in future mathematical learning. To nurture a fun, enthusiastic, enjoyable experience with mathematical learning is a key part of this. As well as growing their vocabulary to support the understanding of mathematical terminology and additional objects which can be used in mathematical learning.

Looking at the picture above, a variety of patterns present themselves. Focusing on patterns in this case would give practitioners the ability to use multiple areas in this space. To the left, there is fencing which is in a rectangular pattern. On the floor, there are square tiles. For the pergola, it is held by six posts which have rounded edges at the top, with a rectangular tiled yet triangular roof featuring a point. Four trees live in the background to the right and two matching plants in matching plant pots either side of the pergola entrance. A multitude of pattern and shape learning opportunities present themselves.

Bringing together mark making, colours, shape and pattern can easily be done in a painting activity. Painting with wet chalk is environmentally friendly as it washes away in rain. Practitioners can take the children out to the area with a bowl of clean water and a separate bowl of chalk. The children can wet the chalk and paint the shapes they see. Sally, an Early Years practitioner of Bright Blooms Nursery achieved this activity.

Sally was excited to take her small group of key children, aged 2-3, out to the Pergola area of the nursery garden (as pictured above). Sally wanted to encourage her key children to understand shapes and pattern better but found they lost interest easily indoors. Sally had developed an activity plan with wet chalk and the patterns she could identify in this outdoor area.

On Monday they grabbed the chalk and the bowl of water and started towards the outdoor area.

Sally: "Children, today we are going to find all the shapes we can! When we find a shape, we are going to colour it in. I'm going to go first!"

Sally pretended to look very inquisitively around the area, she said lots of 'hmmms' and she thought out loud.

"Hmmm, this is a stick... is a stick a shape? No! I'm not colouring that"

"Hmmm oh! I am standing on a square tile! I'm going to colour my square in pink!"

Sally dipped her pink chalk into the bowl of water and coloured her square pink. She then handed the pink chalk to one of the children.

“Okay everyone grab a chalk please”. The children each took a chalk and started to look around the area.

Sally took a step back, where she could still observe the children and watch out for any risks or dangers, however she knew it was best to allow the children safe space to explore the area themselves. Sally knew it was an important role to facilitate not dictate a child’s learning.

A few of Sally’s notes...

Billy is a confident child, straight away he went hunting for shapes. Billy found the rectangles on the fence and coloured the rectangles he could reach whilst shouting proudly “I found a rectangle!”.

Samantha is quite a shy child, she just decided to colour in the square next to mine very slowly. I stepped in and held her hand while we went searching for more shapes. I got down to her level and let her guide me as much as she could, just giving that little bit of encouragement when needed. Samantha subsequently found a long rectangle (the posts holding up the Pergola). She also found the circles around the top of the plant pots either side of the pergola. “Circle” she said timidly as she pointed to them. I delighted “Yes! Well done Samantha, Circle!” I showed her how to draw around the top of the plant pot, and encouraged her to do the same to the other one.

Freddy struggles with shapes, but Billy likes to show him. They went around together and Billy would point out shapes for Freddy to colour in. Billy very diligently found a star shape in the leaves to the left of the outdoor space. Billy and Freddy were both inspecting these leaves for a while until I came over.

- *Note to self: I could have improved this activity with magnifying glasses, the children could have found shapes in even smaller areas!*

“What have you two found?” I asked them.

“Look! Star leaf, Star leaf!” Shouted Billy.

“Wow Billy” I said “Freddy, can you see this shape? It’s a star! You two are super explorers, can you colour in all the stars?”.

They started colouring the leaves.

Sally was very happy with the outcome of the activity. The children seemed to enjoy the space and loved exploring. They helped each other and found shapes even Sally did not realise were there. The children also weaved through the trees, they weaved through the posts, they climbed and bent down to look for further shapes. Their physical

development was nurtured in this activity as it was allowed to flourish in a pre-risk assessed safe area. Devlin (2023) expresses children's need for cross lateral movement a concept which has been identified as crucial in allowing a child's brain to connect, get both sides of the brain working together, forging new connections whilst making room for more complex understanding. Balancing and stability is physical movement which can contribute to self regulation in a child, deepening their focus at other times. Children given deep sensory awareness moving opportunities are able to develop spatial awareness and reasoning. Building on this, Sally understands that giving children further apparatus to be able to discover which is crucial in getting the most out of activities. In this case, magnifying glasses. However this could be many different items, Department for education (2023) in the Early Years Foundation Stage statutory framework discusses manipulative objects such as play dough, or pipe cleaners. As well as loose parts such as non-chokable stones and materials which can be counted. Or as described above, bigger items which develop the child's moving skills such as big plastic crates, to stack and climb.

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	Risk rating after precautions
Tree area	Trees provide nature in abundance, giving children the opportunity to witness various scientific processes with insects, animals, growth, life cycle and more. Children will be able to	There seems to be a type of plant growing around the tree area which we are unsure if it is dangerous or can sting. Animals could also run down from the trees and could attack	Children	Children must be wearing appropriate clothing in this area, desirably an all in one outdoor suit and wellies. If not available, bodies must be covered in suitable clothing, e.g not shorts. Feet must also have suitable footwear e.g not sandals. This is	Low

	feel and come into contact with different aspects of the trees and foliage around the area.	if they are scared children.		because the area has foliage which could be dangerous and sting children. Children should be made aware of the risks and that they should not taste or touch any of the foliage without a grown up. However they should be made aware of the difference between plants on the ground and trees. They are allowed to touch the trees without permission. Staff will remain present and vigilant the whole time of access to this area. They will carry their first aid kits which are checked regularly for stock. Children should be aware of how to behave around wildlife. They should understand we are to be quite and not make sudden movements	
--	--	-------------------------------------	--	---	--

				around any wildlife. We explore and investigate without scaring them.	
Fence area	Children are able to develop their understanding of patterns through the fence area. They could also understand structure and construction .	The fences could have splinters. The fence could fall in harsh weather.	Children and staff	Children must be aware not to rub their hands along the fence. If they are with a staff member then the staff can assess the area the child wants to touch and check for splinters first. Staff will carry the regularly checked first aid kit incase of splinters. Staff will go out every morning before the nursery opens to check for any fallen fence or other hazards in the garden. Staff must report any incidences of this to the appropriate person (manager or owner) when they see it. If the area is assessed as too hazardous due to a fallen fence, then it will not be used until the	Low

				issue is adequately rectified. Children will need to be provided with ample indoor opportunities during this time or they must use a different area of the garden.	
Pergola	Children will be able to experience a variety of sensory emotions whilst exploring the pergola. The tent like structure gives children something to weave in and out of and to feel as though they are inside a structure which is actually outdoors. They may find comfort and safety in the structure. Words like 'magical' come to	The pergola may have splinters. The pergola may be broken in different weathers or over time. There may be wildlife which finds shelter in the pergola.	Children and staff	Children must be aware not to rub their hands along the wood of the pergola. If they are with a staff member then the staff can assess the area the child wants to touch and check for splinters first. Staff will carry the regularly checked first aid kit incase of splinters. Staff will go out every morning before the nursery opens to check for any changes in the pergolas structure or other hazards in the garden. Staff must report any incidences of this to the appropriate	Low

	mind when seeing the pergola. It also provides shelter from different weathers.			person (manager or owner) when they see it. If the area is assessed as too hazardous due to a break, then it will not be used until the issue is adequately rectified. Staff will also check for wildlife every morning and appropriately assess the risk and if children are able to explore the wildlife safely or whether extra measures need to be taken. Children will need to be provided with ample indoor opportunities during this time or they must use a different area of the garden.	
--	---	--	--	---	--

4) Lancaster (2010) explains how listening to the child in Early Years practice provides a practitioner with the foundation for teaching that child. Recent EYFS framework (Department for education 2023) supports this theory as it emphasises the importance of knowing the unique child. Unicef (1992) especially Article 12 and Department for

education (2003) Every child matters further demonstrate the progression of underpinned values in the early years, from teaching children in the early years with a 'one size fits all' curriculum to developing unique knowledge of each child's likes, dislikes and preferred styles of learning.

Isaacs (2007) who describes the Montessori approach in Early Years, identifies children as 'active participants' in their own lives, who should be respected and valued by early years practitioners. A noteworthy mention from Isaacs (2007) is that children require safe, comfortable spaces where they can express themselves and their own choices. As described in part two of this assignment, an activity which includes the mathematical (and scientific) elements which pre-exist in an outdoor space rather than adding many non-natural resources such as plastic shapes or laminated number cards, will offer children greater inclusivity to express their learning how they desire. It can be surmised that there are benefits from settings who create mathematically and scientifically rich outdoor environments which are used regularly by the children. To develop their comfortability with the outdoor space, giving ample opportunity to explore the area at least once a day.

A skilled practitioner may add loose parts to the outdoor space to encourage and support mathematical and scientific concepts. Isaacs (2007) further details how the Montessori approach to early years education includes adults bringing materials and objects to the attention of the child, in an already educationally maximised environment. A practitioners role is to scaffold on childrens knowledge. A montessori environment facilitates accessibility for the child, freedom of movement, choice, personal responsibility and harmony. Adding child-sized loose parts such as safe from splinters, smooth wooden blocks in all shapes and sizes. Child size counting materials such as tea spoons, bead stairs, egg cups, hollow wooden items (for collecting and sorting), natural items such as acorns, conkers, pebbles, leaves, shells, feathers and pine cones, can endlessly support mathematical and scientific development in early years. The core values of montessori include the need to bring in real life, living items which demonstrate the natural life cycles for children. Allowing them to absorb the energy of the living thing and connect to nature. Early years practitioners can include living plants for children to explore and fresh flowers, using these in a variety of ways for example to learn about colour, smell, life-cycles and growth. An all season flower bed would be beneficial in the outdoor environment. Giving children the opportunity to explore living plants all year round. Providing a plant pot with a clear wall supports further scaffolding as children can see the plants roots in real time.

Play Wales - Playwork (2020) advises how loose parts are part of everyday life children yet can create rich and exciting learning opportunities. Practitioners who include every possible resource from loose parts are truly being resourceful. For example, using the

cardboard box which a bought resource came in. There are endless opportunities for the use of cardboard and it is a resource which we come across regularly. The idea of loose parts play is that children are allowed to fully express their ideas and learn processes through trial and error. In the early years sector which is often under-funded, loose parts are usually readily available sometimes for free, settings can ask shops and supermarkets for their unwanted cardboard boxes. Settings can ask staff to bring in unwanted items such as clean and safe recycling items. Settings can explore different kinds of shops such as a carpet shop and ask for offcuts, a carpentry or builders store and ask for offcuts of a huge variety of materials (pipes, wood, tile, to name a few).

As mentioned by Play Wales - Playwork (2020), Teachkloud (2023) delves a little deeper into the scientific insights of loose parts play on cognitive development. Problem solving skills are refined through trial and error, learning and scaffolding on the child's understanding of how things work together, when they need additional support, how they collapse, stand up, build, have force or have none. Critical thinking skills are crucial when children are exploring the scientific concepts that naturally occur through loose parts play. Concluding their play, whether on the same day or at a later stage when the child has managed to process and make sense of the concept, with the use of their problem solving skills.

Department for Education (2024a) gives mathematical insight into how many if not all concepts in mathematical and scientific learning can be taught through the use of large physical movement, spatial reasoning can often be utilised this way. Large physical movement can be utilised outside and incorporate physical education, running back and forth whilst collecting a loose part and counting each collection. Jumping up and down a certain number of times. Making patterns with our bodies as a team. Even babies are aware of spatial awareness through understanding where body parts belong and how large or small they are, where they fit and where they don't. Learning manipulation of objects is part of understanding how materials are adapted and changed to invent. For example, if a child is given a squishy ball which can be compressed to fit into a smaller space, they start to understand that this item can be manipulated. When given a firmer ball, plastic filled with air, they realise this one cannot be manipulated. They further figure out the properties of each item, not all balls are the same. Some are soft and squishy therefore it can fit into smaller spaces. Whereas some are hard and unable to be manipulated so easily. The learning of properties is crucial to be able to build on this knowledge as they grow and understand the mathematical and scientific properties of items in later life.

Department for Education (2021) explored how consistency is important to achieve mathematical and scientific learning for children in the early years. Consistency can be

assured through regular routines however these must allow for creative freedom which means having a daily time frame for an 'activity', therefore the 'activity' can be different daily but there is a specific time activities are always done. Rotating toys is important to be inclusive of all children and to create new learning opportunities; however to achieve consistency, toys should not be rotated too often, leaving children without the time to make deep connections with their play and to properly process their skill development. Accessibility is how a wise early years practitioner is able to provide all of the children fair learning opportunities. This is through having toys at their level and risk assessing items regularly and before they are given out to make sure children can access them without worry or limits. As an early years practitioner, supporting the child's learning is not always 'teaching' it can be through encouraging words, affirmations and genuinely being curious with the child. Asking them the questions which genuinely do come to mind when seeing the child play, wanting to know what they are learning and how. This positively affirms the child's learning as they feel like the early years practitioner is part of their play with them. Being aware of the language used when speaking with children by not limiting language will give children educational benefits. Using more complex language regardless of age will encourage language development rather than hinder it. To be able to connect with children using language, curiosity and play, fully supports the Department for education (2023) Early years foundation stage statutory framework learning outcome of developing positive attitudes and interests in mathematics. Linda Pound (2016) builds on the ideas which are reflected in this assignment using Bruner's theory. That learning is scaffolded, built upon. That there is a great importance placed on the need to create solid, educationally rich, play focused and positive foundations to ensure learning is facilitated.

University of Detroit Mercy (nd) explains how a spiral curriculum is that which gives children the opportunity to keep exploring deeper into a topic, strengthening their understanding through further details each time they revisit a certain aspect of the topic. Seeing the entire topic as an element with many layers and between each layer, more layers of understanding. It is not followed in a ladder system however, it is more circular in it's process. Jumping (in a thought out way) from area to area of the topic. Rather than following a straight road which does not revisit areas of the topic to give children more than one opportunity to learn about each area. Bruner suggests that early years educators can touch on various areas of the topic, even ones which seem complex at first, introducing children to the whole picture before delving into each area in detail.

Britannica (2024) expands on an important factor to remember when using Bruner's theory is that children need challenge not overwhelm. This is simply provided through the building of areas of a topic as described above, introducing the children to what will be learned in the future to create an intrigue in the learning, without giving too much

detail in this stage which could prove too much to take in initially. The Department for education (2023) Early years foundation stage statutory framework is supportive of Bruner's belief that early years practitioners must know their children well, when early years practitioners know their child well they are able to recognise the skills each unique child has and teach the topics in a way that builds upon their already acquired knowledge.

Curee (nd) explains Bruner's theory specific to scientific learning, Bruner is able to influence scientific approaches which encourages an intuition from the child, a seed which blooms into further learning. Finding the process is crucial for Bruner's theory. Demonstration and therefore development of this skill from early years practitioners themselves is crucial for this to influence children's ability of intuitive thinking. Early years practitioner must be open to guess, analyse, figure out, learn, test and hypothesise. Rather than finding a clear cut answer to a question, going through the entire scientific process is what will engrain the learning into the cognition, for practitioner and child. The process has multiple benefits for all, increase of self confidence, critical thinking skills, positive attitude towards learning, curiosity approach, pride with oneself and teamwork skills. Bruner's theory is an interesting and well practised approach to learning and could benefit both practitioner and child in various ways.

References

Barbara Isaacs. (2007). *Bringing the montessori approach to your early years practice*. Olton: Routledge.

Bright Blooms Nursery LTD. (2024). Available at <https://brightbloomsnursery.com/#gallery> (Accessed: 9th September 2024).

Britannica. (2024). *Jerome Bruner*. Available at: <https://www.britannica.com/biography/Jerome-Bruner> . (Accessed: 30th September 2024).

Curee. (nd). *How can ideas from the past about the curriculum help us make effective changes today?* Wolverhampton, England: Qualifications and Curriculum Authority. Available at: <http://www.curee.co.uk/files/publication/1224601725/Bruner.pdf> . (Accessed: 30th September 2024).

Department for education. (2003). *Every child matters*. Norwich: Crown Copyright. Available at: <https://assets.publishing.service.gov.uk/media/5a7c95a4e5274a0bb7cb806d/5860.pdf> . (Accessed: 27th September 2024).

Department for Education. (2021). *EYFS Maths - Patterns and connections*. [Online video] Available at: <https://www.youtube.com/watch?v=fsWEHuDpE8g&t=240s> . (Accessed: 30th September 2024).

Department for education. (2023). *Early years foundation stage statutory framework For group and school-based providers*. Department for education. Available at: https://assets.publishing.service.gov.uk/media/65aa5e42ed27ca001327b2c7/EYFS_statutory_framework_for_group_and_school_based_providers.pdf . (Accessed: 20th September 2024).

Department for education. (2024). *Patterns and connections*. Available at: <https://help-for-early-years-providers.education.gov.uk/mathematics/patterns-and-connections> . (Accessed: 9th September 2024).

Department for Education. (2024a). *Spatial reasoning*. Available at: <https://help-for-early-years-providers.education.gov.uk/areas-of-learning/mathematics/spatial-reasoning> . (Accessed: 30th September 2024).

Devlin, C. (2023). 'Physical development in early childhood', *Early Education*. Available at: <https://library-guides.ucl.ac.uk/harvard/journal-article> . (Accessed: 20th September 2024)

Lancaster, Y. Penny. (2010). 'Listening to Young Children: Enabling children to be seen and heard'. *Contemporary issues in the Early Years*. London: SAGE Publications Ltd, pp. 79-83.

Linda Pound. (2016). *Early Years Pioneers - Jerome Bruner*. Available at: <https://www.nurseryworld.co.uk/content/features/early-years-pioneers-jerome-bruner/> . (Accessed: 30th September 2024).

Play Wales - Playwork. (2020). *Playwork Essentials - Loose Parts Play*. [Online video]. Available at: <https://www.youtube.com/watch?v=JvXL46AedOk> . (Accessed: 30th September 2024).

Teachkloud. (2023). *Exploring Loose Parts Play*. Available at: <https://teachkloud.com/play-pedagogy-and-curriculum/exploring-loose-parts-play/> . (Accessed: 30th September 2024).

Unicef. (1992). *The United Nations Convention on the Rights of the child*. London: UNICEF UK. Available at: <https://www.unicef.org.uk/wp-content/uploads/2016/08/unicef-convention-rights-child-un-crc.pdf> . (Accessed: 27th September 2024).

University of Detroit Mercy. (nd). *What is spiral curriculum?* Available at: <https://eng-sci.udmercy.edu/academics/engineering/electrical-computer/spiral-curriculum.php#:~:text=What%20is%20spiral%20curriculum%3F&text=Spiral%20curriculum%2C%20a%20concept%20widely,complexity%2C%20or%20in%20different%20applications>. (Accessed: 30th September 2024).