

The Young Mathematician Exploration and Problem Solving

Cynllun Gweithgaredd Activity Plan		
Gweithgaredd: <i>Activity: Goldilocks has left the house in a mess again. Children need to help by sorting and tidying the house before the 3 bears get home.</i>		
Nifer o blant: <i>Number of children: 6</i>	Oed y plant: <i>Age of children: 3-4-year-old</i>	Nifer o oedolion: <i>Number of adults: 1</i>
Lleoliad: <i>Location: nursery garden, play house.</i>	Amser paratoi: <i>Preparation time: 15 min</i>	Amser gweithgaredd: <i>Activity time: 30 min</i>
Adnoddau: <i>Resources: 3 different size bowls made from different materials, e.g metal, wood and plastic. 3 different size spoons made from different material. 3 cups different size and materials. 3 different size chairs made from different materials. 3 cushions in different size and patterns. 3 beds in different size and material. 3 blankets in different sizes and patterns with matching pillows. Picture cards of bowl, chair, bed, spoon and cup in different sizes.</i>		
Amcan/ion y weithgaredd: <i>Aim/s of activity: children to sort out the items in the bears house correctly by size- small, medium, large. They will be using mathematical language to describe how they have sorted the objects.</i>		
Cysylltiadau â deilliannau: <i>Links to outcomes: compare, sort, and order two objects in terms of size, weight, or capacity by direct observation. (Welsh government, 2005). p33</i>		
Gwahaniaethu: <i>Differentiation: simplify the activity for children by showing visual picture cards big and small to match with the items.</i> <i>Challenge the more able children if they can sort the items in a different way, e.g. sort by colour.</i>		
Iechyd a diogelwch: <i>Health and safety: undertake a risk assessment.</i>		
Rôl yr oedolyn/oedolion: <i>Role of adult/adults: support children with key language big, medium, small. Question the children why they have sorted the items in that way. Use open questions when talking to the children. Encourage turn taking and sharing by working as a team. Support and scaffold children with needs. Always maintain safety.</i>		
Y weithgaredd: <i>The activity:</i> 1. <i>Collect all the items then put it in the playhouse in different places for the children to find.</i>		

2. ***Print out the picture cards to use as prompts when needed.***
3. ***Check the outdoor area for any hazards on the day. Check the weather and wear suitable clothing.***
4. ***Take the children in small groups to the play house. When they see the mess ask the children who might have been in the 3 bears house? How would the bears feel to see their house in a mess? What can we do before the bears come back?***
5. ***Get the children to remember what things the bears had in their house in the story.***
6. ***Let the children explore in the house and talk about the things they find e.g. big bowl, medium bowl, small bowl and where they found it e.g. under, in, on top. Support the children with prompts and pictures.***
7. ***Get the children to put the items back in the right places. Support the children with prompts and pictures.***
8. ***Ask the children what we can do to the house so no one can get in again?***
9. ***Recap in mathematical language what the children did in a group. Praise the children to say they have done an excellent job.***

Evaluation.

Story books that cover mathematical concept can help to develop children's mathematical development. This was used for the activity plan and was very successful with the children. According to Pound and Lee (2015) stories can be a fantastic tool for practitioners to use to engage children, stories can help children to make sense of mathematical concepts. Stevens, (2008) states books and stories are a valuable resource, children and adults can engage and explore different aspects of mathematical development by planning activities and experiences. This was observed during the activity, the children engaged very well with the scenario and enjoyed helping to sort and tidy the house before the bears got home. The aim of the activity was for children to find and sort the items in the bears cottage. According to Skinner and Stevens, (2012) children can develop visual discrimination and descriptive language when they are involved with a sorting activity. It is important that children can talk about the objects by identify what is same and different about the objects. The link to outcome was to compare, sort and order two objects in terms of size, weight or capacity by direct observation (Welsh Government 2015). By focusing on the story of goldilocks and the three bears children got the opportunity to explore size and become competent at comparing size. Children need to experiment with measuring in lots of different situation in order to have the opportunities to use a variety of measuring words. The children used words big, bigger and biggest, in order to develop children's mathematical understanding and vocabulary adults need to encourage more accurate language such as long, longer, longest or heavy, heavier and heaviest Taylor and Harris, (2014). Few children used mathematical language and understood the concept of small, big, biggest, light and

heavy. Most of the children met the objective by sorting the objects by big and small but struggled to use mathematical language to describe the medium size objects. Some children found it difficult because of their language barrier to use mathematical language to describe the objects, however with the support of visuals and with the help from the practitioner reinforcing the vocabulary they managed to sort the items in the correct order. McGrath, (2010) suggests using visual picture cues for children whose English is a second language and for children with additional needs, and not just relying on auditory input, this can help the children to engage with the activity and by using auditory and visuals children can be supported until they are familiar with the words. Piaget's (1936) theory of cognitive development suggest that children move in four different stages of mental development. The age of the children taking part in the activity is 3-4-year old according to Piaget, (1936) children are at the pre-operational stage, at this stage children begin to think symbolically and learn to use words and pictures to represent objects. By aiding children with picture cues children got support from the adult and learnt new words of the objects. Children should get to develop their skills, knowledge and understanding of mathematics through oral, practical and play based activities, children can develop their understanding by using appropriate mathematical language to talk about their work, explore alternative ideas and explain their thinking and the methods they use to support the development of their reasoning Welsh Government, (2015). The story of Goldilocks and the three bears engages children to develop their mathematical understanding and offers opportunities to talk about all aspects of mathematics. The activity also offered other areas of mathematical development for children to experience, the children had the opportunity to describe and discuss shapes, lengths and patterns and use simple words to describe the position of objects. The children were able to use and recognise a variety of 2d and 3D shapes in lots of different ways. This also covers the skill, 'recognise and use the names for 2D shapes (circle, square and triangle) with in play activities and the environment' (Welsh Government, 2015, p35). Skinner and Stevens, (2012) state that children should become familiar with preposition words that are used to indicate where things are and the position in relation to other objects. This was very noticeable when the children were engaged in looking for the items, practitioner asked where they found the item, the children responded by saying under, in, on, behind. Some children pointed to the area where they found the items practitioner supported the children with the right vocabulary.

Skinner and Stevens, (2012) suggests children need lots of opportunities to explore number names spontaneously and as part of their play before they begin to put numbers in the correct order. Gelman and Gallistel, (1978) first generated the counting principles, children need to develop their counting skills this why they will begin to understand the counting principles. The children demonstrated one-to-one correspondence by counting the three bears bowls, cups, chairs, beds repeatedly. During the

activity the practitioner got the children to count the numbers in order and helped children to count who had difficulty counting. Having awareness of the principles of counting by Gelman and Gallistel, (1978) practitioners can understand the difficulties that children may face during their journey to counting Hansen, (2014). For the children who were able to count to three the practitioner could have extended counting further to five. Also, if the numbers were visible in the bears house the practitioner could have asked the children to recognise the numbers to consolidate their understanding.

Fox and Surtees, (2010) states differentiation is about including all children in an ongoing task that can be altered to meet the appropriate needs and ability of the child, it ensures that all children can enjoy the task and be manageable for the adult. The activity included all children at different stages in their mathematical development. The practitioner supported children with counting and sorting the items with language and visuals and challenged the able children with new vocabulary. Vygotsky, (1978) believed that children learn and develop their knowledge when they are active and learn at their own pace, by providing a rich and stimulating environments, interaction with peers, children get to learn from one another. Vygotsky, (1978) developed the concept called the Zone of Proximal Development (ZPD) when children are in the ZPD for a task, providing the appropriate assistance will give the child enough courage to achieve the task Doherty and Hughes, (2014). Bruner, (1957) also believed that children can learn from adults, experts and children by scaffolding. The term scaffolding was used when an adult interacts to support the child's learning, this enables the child to move from being dependant to being independence Smidt, (2015).

During the activity some children were not sure what to do or how to start to sort the items but by having a mix ability group the children watched other children and with the help from the practitioner they participated with the activity. Bruner, (1957) developed the concept of the Spiral Curriculum this explains how a complex idea can be taught at a simplified level, and then re-visited at more complex levels later, by simplify the question the adult got the children to understand the mathematical concept. For those children who met the objective of the activity the practitioner used her metacognitive thinking by thinking aloud and asking open questions. Skinner and Stevens, (2012) states open ending questions can support children's knowledge and understanding, practitioners can extend their vocabulary and use questions which extend learning and support children's thinking. Pound and Lee, (2015) suggests adults can help to pose problems that engage children to find mathematical solutions, raising questions as much as it is about solving them. The problem was posed on the children by the practitioner when the children were taken to the bears house. By not telling the children about what activity they were going to do at the house, the children had to see for themselves what the problem was and how they were going to resolve it. Problem solving occurs when children get the opportunity to choose, reason and make decisions. Challenging children to solve

problems, talking about their observation and predicting will help and inspire children to enjoy mathematical learning. This helps children to persevere if the problem solving gets difficult for them Skinner and Stevens, (2012).

Discussion.

Pound, (2006) expresses mathematical resources to support mathematical development should be found in all areas of the setting for children to experience and practice their mathematical development. When setting up the activity in the role play area outdoors, the practitioner collected different size items such as bowls, spoons, cups, chairs, beds for children to explore and discuss and items that the children were familiar with. Mcgrath, (2010) suggests by providing everyday materials for play opportunities allows children to use the materials in a natural, open-ended way.

Beckley, et al. (2010): Fox and Surtees, (2010) states that it is important to have resources that are interesting to count to support the understanding of numbers for children these can be natural objects, everyday manufactured objects, craft materials, mathematical resources, toys, number books, number songs and number games. Many of the resources are available for the children to access all the time in the setting such as the creative area, maths area, role play area, construction area, reading area, malleable area, small world area, snack bar, sand and water play. Some of these areas are also available to access outdoors for children to explore naturally in their play with practitioners supporting the children with vocabulary and enhancing their knowledge. Taylor and Harris, (2014) states extending play outdoors helps children to be curious and extend their learning actively, children can move the resources freely this may lead children to make connections and be creative. Children also get the opportunity to work with other children and communicate with each other. Both indoor and outdoor resources should be changed to encourage children to interact with the resources in different ways, Tylor and Harris, (2014). More items can be added to the activity to keep the children interested, such as tools to fix the chair and clothing to dress up.

Children need to have choice to choose how they access the resources Pound, (2006) expresses that choice is important for children's learning development, children become independent thinkers by making decisions, being persistent and making connections to their learning. Taylor and Harris, (2010) also agree that children need choice which is necessary in the learning of mathematics and in problem solving within mathematics. Having a range of materials to count helps to develop the abstraction principle but also provides an opportunity to personalised learning by responding to children's interest Beckley, et al, (2010). Maria Montessori observed children and stated that children engaged and stayed focused when children had the opportunity to select the resources for their activity,

Montessori used resources that are made from wood this creates a calming environment for the children O'Donnell, (2013). Stories can provide a meaningful starting point for children to develop their mathematical understanding Tylor and Harris, (2014); Stevens (2008), by using the story Goldilocks and the three bears in the activity children were able to discuss the size of the items, count the objects, solve problems by working out which item belongs to the bears. The practitioner set up the activity with resources that was in the story, Pound, (2006) suggests keeping the resources simple, maintain quality and creating a satisfying learning environment while realising that practitioners are the most valuable resource by supporting children with the mathematical language and vocabulary. Fox and Surtees, (2010) expresses resources such as pictures and photographs, ICT and displays can also support and reinforce children's knowledge and understanding of new topics, theme or concept. Children's work on display can give them a sense of ownership, raise self-esteem and gives a sense of achievement.

Explanation.

Observation and assessments can give practitioners an understanding and identify the child's knowledge, skills and development Pugh and Duffy, (2006). According to Urie Bronfenbrenner, (1989) every child develops within a microsystem children's development and behaviour are influenced by the child's immediate relationships and activities. The interaction that the child has with their microsystem can develop the child's informal knowledge from everyday activities such as home, shops, journeys and other settings. This informal knowledge is an important base for developing children's development. Much of the child's informal knowledge can differ within social classes, medical conditions and where they live Baroody, Lai and Mix, (2005). Responding to children's needs in pre-school education could help children from less advantage backgrounds. This can support and provide children with a better start to school Siraj-Blatchford et al, (2008). Therefore, assessing children is very important for practitioners to track, support and plan to develop the children's needs, set goals, set aims for staff and organise the environment with the correct resources.

When the child first arrives at a Foundation Phase setting, they are assessed on their development by using a Baseline assessment, which refers to the Foundation Phase learning outcomes. This assessment provides information about what the child can do or cannot do and what gaps they have in their learning, which can help practitioners to plan according to the needs of the child Welsh Government, (2015). Practitioners observe and do formative assessments to provide and support the children to develop holistically within all areas of the curriculum. Children are also assessed on their language development using WellComm, this assessment identifies any speech and language difficulty

or delay that children may have that can affect their overall development WellComm, (2010). Early interventions can be put into place for those children who need additional support or who need to improve on a skill Welsh Government, (2015). By observing and assessing the children practitioners can gather the information, document the data, reflect on the information and then use the information for planning the next steps for children's learning Pugh and Duffy, (2010). Observations and assessments using video recordings, photographs and learning journals, can be used for sharing with parents, Local Authority assessment moderators and other professionals, McGrath, (2010). Local Authority can use the information to see how well the school is doing, categorise schools, help the challenged schools, and decide on grants.

With the observations and assessments, practitioners can provide children with a well-planned curriculum that will give the children the opportunity to be creative and get involved in their own learning by building on their interest, skills and what they understand Welsh Government, (2015). When planning in the setting practitioners use long-term planning which embeds interest and ensures resources are in place. The short-term planning focuses on specific objectives which can build on children's interests, meet children's individual needs and make observations. The weekly planning focuses on how children's needs can be met, setting out resources for activities and what will be happening in the week. The learning objectives that are used in the planning comes from the Foundation Phase Profile and the National Literacy and Numeracy Framework (LNF). The LNF focusses on the children's ability to apply the skills and concepts that have been learnt to complete a task appropriate for their stage of development Welsh Government, (2015). The learning is planned throughout the continuous provision, children's interest is also used in the planning Fox and Surtees, (2010) state children should develop their skills through child and adult led initiated play- based activities.

When developing children's mathematical development, practitioners need to show good enthusiasm and positive attitudes when teaching the subject, if practitioners enjoy the subject the learning can be taken further by adapting to problem-solving and using open-question Fox and Surtees, (2010). Practitioners can relearn and turn their weaknesses to strengths and having a positive attitude towards mathematics can influence the children and parents McGrath, (2010). It is important to support parents to support their children with mathematics at home, there are many opportunities for parents to support children's understanding of numbers in their daily life and in their household routine Beckley et al, (2010). Children can develop in mathematics with support from the practitioners with new vocabulary and questioning that is relevant to the child's stage of development which encourages deeper thinking of their experience Beckley, et al, (2010). When children are exposed to challenges in mathematics children can make sense of their knowledge and experience by sharing

their ideas, coming up with solutions and recapping how they solved a problem Skinner and Stevens, (2012).

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