

Mathematical ConceptsContents Page

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Activity Plan		
Activity: Den building and baking a cake influenced by 'Little Bear's Grandad'		
Number of children: Seven children	Age of children: Five to six years	Number of adults: Three adults
Location: Indoors and outdoors	Preparation time: Two hours	Activity time: Three hours
Resources: • Sticks • String		

- Stones
- Tarpaulin
- Eggs
- Self-rising Flour
- Sugar
- Milk
- Weighing Scales
- Bowls
- Jugs
- Utensils – wooden spoons, tablespoon, teaspoons

Aim/s of activity:

This activity aims to allow children to use and understand mathematical concepts within den building and baking a cake which are influenced by the book 'Little Bear's Grandad'.

Links to Outcomes:

Expected Foundation Phase (2015) outcomes for children ages five to six years are, developing an understanding of mathematical concepts like identify 2D and 3D shapes, use symmetry, patterns and sequences, sort items into groups of similarity, understand temperature difference, use fractions like halves, addition and subtraction up to ten, understand basic multiplications, count to twenty, and understand length, height, weight and capacity.

Donaldson (2015) four purposes include expected outcomes within mathematical concepts for these activities, including developing problem-solving skills, handling and analysing data, exploring, investigating, locate valuable information, use subtraction, addition and multiplication effectively, and use evaluation skills to understand what they can do to improve and adapt.

Differentiation:

A child with a physical impairment will need additional support which will be provided by a teaching assistant during the activities. The activity will be adapted to allow for all children to participate by ensuring there is wheelchair access to the indoor and outdoor environment.

Children who have a higher capability level will be given the opportunity to work independently and encouraged to follow the instructions without adult intervention.

Health and Safety:

To ensure health and safety regulations are followed an adult- child ratio for five to six-year old's will be followed because it enables children to be observed efficiently which reduces the likelihood of a child becoming injured.

A risk assessment of the indoor and outdoor environment will be conducted to ensure that there is minimum risk to a child's health and wellbeing, and to ensure that practitioners are aware of risks within the environments.

Role of the Adult:

The role of the adult is to plan the activities effectively, conduct risk assessments of the indoor and outdoor environment, participate in sustained-shared thinking to allow for children to understand reasoning. Practitioners within the den building activity will ensure it is self-directed to improve children's ability to make choices and express themselves, among other benefits. During the baking activity an adult will be using the oven due to the risks involved, however this is to be the only adult intervention involved because children should be enabled to direct their own play and understand what happens if they change something through self-discovery.

The Activity:

The children will be sat on the carpet and the practitioner will read the story 'Little Bear's Grandad'.

After the story, the children will have the opportunity to choose from two possible activities where they will help prepare the activity of choice with all resources that are needed. The first activity is baking a cake, which will include the weighing scales, utensils, bowls, jugs, eggs, self-rising flour, sugar and milk. Each of these items will be child sized and at a height that a child can reach. The second activity is building a den, which includes using the opportunities of the outdoor environment, where they will find sticks, wood, string, stones and tarpaulin.

Practitioners will encourage children and provide positive reinforcement to give children reassurance that they are doing the activity correctly.

Children who need additional support will be supported by the practitioner within the environments, but only if a child invites the practitioner into their play. However, those who can work independently will be encouraged to follow instructions with a minimum amount of practitioner intervention.

After every child has been given the opportunity to become involved in both activities, the practitioners will use sustained-shared thinking to allow children to ask any questions they have and to explore why something takes place, which supports children's curiosity and provide them with more knowledge of mathematical concepts.

Evaluation

The activity plan supports children to develop mathematical concepts. The Foundation Phase (2015) states, activities should be planned to provide opportunity for children to use concepts like symmetry, patterns and sequences. Understand 2D and 3D shapes, understand temperature difference between hot and cold, and use fractions like halves during cooking. The children are also able to use and develop concepts like sorting items into groups of similarities and this is done when separating leaves or sticks, children will also have the opportunity to understand mathematical concepts like Addition and subtraction up to ten when knowing how many of each item is needed, understand basic multiplications and understand length, width, height and capacity during den building. Donaldson (2015) additionally states that it is important to provide children with

experiential learning as this supports the development of mathematical concepts because children can use their problem-solving skills during cooking because if the cake mix is too thick then they understand they need to add water, and during den building children will use problem-solving skills to understand how tall it needs to be and how they can use the environment in building. This then supports their resilience which is important as discussed by Daniel and Wassell (2002), in understanding formulas within mathematical concepts, such as, division within understand how much cake everyone should get, and multiplication in understanding how many sticks are needed to build a door.

The plan also provides opportunities of free flow between the indoors and outdoors, which according to Howard and McInnes (2012) allows for children to have the ability to experience the world through hands-on experiences, and to therefore be able to develop more efficiently as they become engrossed in play activities which are a provision of self-directed play. Furthermore, Piaget (1976) and Foundation Phase (2015) supports that children should be enabled to participate in free flow play because the outdoors allows for children to have first-hand experiences and develop through stages more efficiently, eventually allowing for children to grasp mathematical concepts. Tucker (2014) also believed that the outdoor environment provides more opportunities for children to develop mathematical concepts, because children are able to practically use mathematical concept skills to problem solve different activities. Montessori (2013) and Howard and McInnes (2012) believed that writing mathematics can be less enticing to children because they are not actively involved; making children less likely to want to participate in activities and they also believe that a child's experiences can impact their perception of mathematics and mathematical concepts.

Tucker (2014) believed that a math's environment should be taken advantage of and children should have a wide range of choice within the environment. The activity plan provides this because the activities are not limited and there is a choice of which activity they want to participate within, where children can express themselves. Donaldson (2015) and Anderson (2016) believe that children should have a choice in their learning to ensure

that children can become motivated to learn and can direct their own play, which will encourage children to engage in mathematical learning, therefor supporting the development of understanding mathematical concepts.

However, the activity plan on reflection, would have benefited from clear guidance on how to provide the necessary adaptation for children with additional learning needs (ALN). ECLRE (no date) discusses how it allows for every child to be provided with equal opportunities of development without discrimination, therefor allowing for all children to develop mathematical concepts. There also needs to be consideration of the specific individuals additional needs to allow for an understanding of the adaptations that need to be taken place (ECLRE, no date).

Quinn (2013) believed that Froebel avored children using natural materials and discovering natural materials themselves during their play because it enables children to have endless opportunities within the play and understanding mathematical concepts, however this activity plan includes the adult providing the materials for the children whereas they could find and look for the materials themselves; especially during the den building activity. This would enhance an understanding of mathematical concepts because Piaget believed that children are provided with more opportunities of understanding concepts through stages when they are enabled to use the advantages of the outdoors and be able to experience finding objects rather than the practitioner providing the resources for the children (Beard, 2013). Vygotsky allows for further understanding of when children need to be supported; to know when self-directed play can take place during mathematical concept learning during den building (Shabani, Khatib and Ebadi, 2010). According to Shabani, Khatib and Ebadi (2010) independent and self-directed learning allows for children to discover mathematical concepts through understanding activities without an adult consistently asking questions directly linked with mathematical concepts.

Furthermore, the activity plan could have more detailed direction on how practitioners and adults can support all mathematical skills and provide children with more sustained-shared thinking opportunities throughout the activity, because Vygotsky believed children should be scaffolded through their mathematical learning to enable them to have the support that they need to develop their mathematical concept skills (Chaiklin, 2003: Wass, Harland, and Mercer, 2011).

Discussion

Resources such as loose parts promote mathematical concepts as Victoria: State Government (2019) discuss that loose parts allow for children to develop problem-solving skills as discussed by Piaget within Adeyemo (2010), thus explaining that problem-solving skills enable children to gain resilience to be able to understand and overcome issues during understanding mathematical concepts. Victoria: State Government (2019) also states that loose parts allow for children to be supported and scaffolded, which Vygotsky focuses on largely through the zone of proximal development as he believes that resources that support children's mathematical concept skills ensure children can be provided with the opportunity to achieve milestones (Chaiklin, 2003: Beard, 2013). Furthermore Victoria: State Government (2019) and Tucker (2014) also explain that resources can allow for children to develop mathematical concepts through reasoning and problem-solving skills which allows for children to understand addition, 2D and 3D shapes, multiplication, height, weight and length.

Montessori believed that providing resources for children which are child-sized and correct representations of the real world, is important to their learning because it allows for children to have the necessary items to enable them in developing their mathematical concept skills (Montessori Group, no date). However, Montessori also believed that every resource provided to children should be child sized and relate to real life because it ensures they have a true conception of the world around them. This can allow for children to understand risks and consequences of actions, therefore responsibility of items such

as glass jugs, forks and knives. These are used within mathematical concept learning (Montessori Group, no date). Glass jugs allow for children to understand measurement, addition and subtraction, experimentation with water, sand or ingredients during baking and allows for addition skills, such as holistic development, communication skills and repetition because they would be enabled to participate in self-directed play (Famm, 2018).

Additionally, Strauch-Nelson (2012) explains, Froebel also believed that natural resources are important to children's mathematical concept development, because it allows for children to be provided with items that can be used to support problem solving skills. Piaget (1976) suggests that this also allows children to use trial and error to understand the limits of different mathematical concepts. Early Education: The British Association for Early Childhood Education (no date) state Froebel also believed that resources which are provided should be wooden and natural because it allows for children's play to be more open-ended and therefore allowing for children to improve their understanding of mathematical concepts, rather than being focused on one development opportunity and having limited use in plastic toys or objects.

Tucker (2014, p.12) discusses that practitioner should facilitate children's understanding of mathematical concepts through the indoor and outdoor environment, as he believed the environment should include creative and natural materials, include "mathematical displays" which are created by the children, and ensure that children are able to take risks. Risk is important for children to have during mathematical concepts because it enables children to gain hands-on experiences and be able to extend their problem-solving skills (Almon, 2013).

Alternatively, Excelsior (2017) believes that plastic has more benefits for children because it is more durable than wooden resources, they reduce the possibility of children becoming injured, it is cheaper than natural resources and it is more sterile whilst also

being easier to clean. Plastic can ensure that children who explore objects with their mouths, can do this because plastic resources can be continuously sterilised to ensure they do not contract illnesses through bacteria that cannot be cleaned easily through wooden and natural resources (Excelsior, 2017). However, this does not support sensory learning as suggested by Montessori and Piaget, therefore a balance of different resources is preferred within a learning environment (Lillard, 2016).

Explanation

Vygotskian principles suggest that practitioners play a large role within children's understanding of mathematical concepts. Children need to be scaffolded and supported with an understanding of where a child is in their mathematical development, because this allows for adults and practitioners to include the correct support to ensure every child can achieve an understanding of mathematical concepts (Vygotskiĭ and Vygotskiĭ, 2010). Howard and McInnes (2012) further discuss that a child's understanding of mathematical concepts can be influenced by the environment an adult prepares, the amount of opportunities and support the adult provides, and an understanding of what the role of the adult is. Additionally, Howard and McInnes (2012) state that a practitioner must ensure there is an understanding of how they should be involved within the child's play to support their understanding of mathematical concepts, because it enables the adult to know what interventions should take place and whether or not they need to be directly involved within play activities.

The Foundation Phase (2015) makes use of observations to ensure that adequate provision is provided, and it involves the ways a child's progress is monitored and assessed. Children will first have a baseline assessment where practitioners can understand the basics of where a child is in their development, therefore identifying skill base and interests which will then inform planning to meet the necessary mathematical outcomes as specified with both the Foundation phase and numeracy framework. (Welsh Government, 2017).

In comparison, Donaldson (2015) approaches assessments in a different way, and they focus on assessing and monitoring children during play activities they are involved within, rather than possibly making children feel under pressure. Donaldson (2015) states that when a child feels under pressure, it is more likely to influence the outcomes of the child in their understanding of mathematical concepts because children under pressure will act differently due to the feeling of being judged or they may refuse to participate. Therefore, supporting Howard and McInnes (2012) research, where the child's perception of play activities can affect the ways in which a child will participate in the activity, because a child that has chosen to become involved in mathematical concept play is more likely to engage. To further support this Montessori and Piaget believed that all assessments should be conducted during an activity and a practitioner must never intervene in the child's activity, because this can influence the outcomes of the assessment and cause it to become inaccurate to a child's actual potential as children will present themselves differently (Lillard, 2016).

Self-directed play has a large emphasis within the Donaldson (2015) framework because he believed that child develop their mathematical concepts more efficiently when they partake in play that is chosen and directed by them, which is without adult intervention unless a child has specifically asked for the practitioner to become involved within the play activity. Donaldson (2015) approach therefore supports Piaget's theory, as Piaget believed that children should experience hand's on play and learning because it enables more efficient understanding of mathematical concepts, thus allowing children to progress through stages and eventually understand complicated mathematical concepts (Gallagher and Reid, 2002: Halpenny and Pettersen, 2013). This also supports Bruner (1971) and the new Donaldson (2015) framework, there is an emphasis on experiential learning and revisiting play activities, to allow for children to evaluate an activity that they have participated in and possibly adapt it to improve.

Scandinavian countries involve forest schools where children are supported and assessed differently to the Foundation Phase curriculum in Wales. Scandinavian countries enable children to have more freedom with a focus on providing children with opportunities in taking risks and challenge within their play. This experience enables them to learn through hands-on play, thus allowing children to learn mathematical concepts through physical experiences (SBS Dateline, 2016). Williams-Sieghfredson (2019) also explains that forest schools enable children to have freedom of choice and expression, therefore allowing for encouraged participation and encouragement because a child wants to be involved in the activity and they are more likely to improve their understanding of mathematical concepts because they are within an open-ended environment. Williams-Sieghfredson (2019) discusses, within the forest school there is very little adult intervention to enable children to use self-directed play throughout, whilst ensuring children are aware of limitations and risks to their safety. Enabling children to participate in self-directed play is further discussed in Davies and Hamilton (2016) and Tucker (2014) because they believe that it enhances children's knowledge and understanding of mathematical concepts.

According to Wien (2015) the Reggio approach involves focus on opportunities within the indoor and outdoor classroom environment, to which it emphasises the importance of children having free flow play between the indoors and outdoors because it enables choice and use of natural materials where the child wants. Furthermore Wien (2015) also discusses that practitioners should facilitate children's development by enabling mathematical concept opportunities in every space of the environment and ensure that children always have a choice of activities.

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