Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

The Use of Scaffolding Strategies to Enhance Pre-Numeracy Skills Among Preschool Children

Subadrah Madhawa Nair[1], Thirumani Marimutthu[2], Hariharan N Krishnasamy[3], Gurdip Kaur Saminder Singh[4], Muhammad Siddique[5]

Abstract

This research was designed to study how the teacher uses scaffolding strategies in teaching pre-numeracy skills among preschool children. The qualitative study has employed the phenomenology research design. The sample comprised five preschool children and a pre-school teacher from a private preschool at Klang district in Selangor. Purposive sampling was employed in choosing the sample. Three instruments were used to investigate the children performance level and to identify how the scaffolding strategies employed by the teacher helped to enhanced preschool children's pre-numeracy skills. The instruments were classroom observation checklist, document analysis (namely children's worksheet) and face to face interviews with the teacher. Five classroom observations were conducted by the researchers to collect the data. Results of the document analysis and the observations (ten observations) indicated that the teacher used excavating, modelling, guiding, focusing, and extending scaffolding strategies to enhance the children's pre-numeracy skills. In addition, the children learned very fast when their engagement improved and they were willing to learn in an atmosphere of fun and excitement. The findings also revealed that these strategies are effective in helping the children to master the pre-numeracy skills and their level of performance improved. This study has crucial practical implications whereby the results suggest that The Ministry of Education can train preschool teachers to employ scaffolding strategies to teach numeracy skills. In terms of pedagogical implication preschool teachers can use scaffolding strategies as an alternative method to assist students in mastering numeracy skills.

Keywords: *Preschool Children, Pre-Numeracy Skills, Scaffolding, Excavating, Modelling, Guiding, Focusing, And Extending.*

Introduction

The Malaysian Ministry of Education implemented the "Education Blueprint 2013 – 2025" as one of the platforms to address the issue of the *achievement gaps that exits between and within (states) across Malaysia* (Malaysian Education Blueprint 2013- 2025, p.3-17). Moreover, education system has emphasized the development of strong content in subjects such as science, mathematics, and languages. Alongside, the National Preschool Curriculum and the National Philosophy of Education in the National Education Act 1996, two well-known preschool educational program are utilized as a part of most private preschools in Malaysia; International Preschool Curriculum (IPC) and Montessori. Both educational programs consider are play based interaction to develop early proficiency in young children. One of the primary aims of the national preschool education system is to reinforce the strong foundation in basic literacy and numeracy (Malaysia Education Blueprint 2014, p.42).

Scaffolding is an instructional technique whereby a teacher provides successive levels of temporary support that help students achieve higher levels of comprehension and skill acquisition than they would without assistance. This concept, rooted in Vygotsky's sociocultural theory (1978), emphasizes the importance of social interaction in learning and the potential of learners when provided with appropriate support.

[1] Faculty of Education & Humanities, UNITAR International University, Kelana Jaya, Selangor, Malaysia, Email: subadrahmadhawanair@gmail.com.
[2] School of Education and Social Sciences, Kings University College, Kuala Lumpur, Malaysia, Email: sonyrai2705@gmail.com.
[3] Faculty of Education and Liberal Arts, INTI International University, Nilai, Negeri Sembilan, Malaysia, Email: hariharan.samy@newinti.edu.my.
[4] Faculty of Education & Humanities, UNITAR International University, Kelana Jaya, Selangor, Malaysia, Email: gurdip.saminder@unitar.my.
[5] Government Islamia Graduate College Civil Lines Lahore, Higher Education Department, Punjab, Pakistan, Email: muhammad_siddique.edu@hotmail.com

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

During early childhood, which is known as the informal numeracy stage, children should develop the ability to count in sequence and recognize the characteristics of objects. Activities suitable for this stage include counting or identifying the number of items. It is important for children to learn how to understand, write, and read information related to numerical symbols (Indah, 2023).

Numeracy skills, including basic concepts of numbers, counting, patterns, and shapes, are crucial for the cognitive development of preschool children. Early numeracy lays the foundation for future mathematical understanding and academic success. It also enhances critical thinking, problem-solving skills, and logical reasoning.

This study mainly explores the use of scaffolding strategies to enhance the pre-numeracy skills among young children. Scaffolding can be defined as bridge used to build upon what students already know to arrive at something they do not know. If scaffolding is properly administered, it will act as an enabler, not as a disabler" (Hogan & Pressley, 1997). Litkowski et al. (2020) also stressed that children's pre-numeracy skills undergo extensive development during preschool years if teachers use the appropriate scaffolding strategies.

Problem Statement

Providing the right, scaffolding is crucial because it helps to deepen the young children understand level in pre-numeracy skills. When young children go through the scaffolding process in pre-numeracy lesson, their understanding of the pre-numeracy skills will improve and also foster young children's engagement in the lesson. A school with a well-equipped teaching resource centre cannot help the young children in learning if the teacher is not competent to use the materials and teaching strategies effectively (Ali and Mukhtar, 2017). As such this study is important because it explores the scaffolding strategies employed by the teacher to enhance the preschool children's pre-numeracy skills and performance level. This study also explores the teacher's views on the types of scaffolding se provided to children during pre-numeracy lessons. There also very limited study found on scaffolding strategy in pre-numeracy based on Malaysia study.

According to, the Malaysia Education Blueprint (*Pelan Induk Pendidikan Malaysia 2013 - 2025* the poor understanding of children in numeracy is highly obvious as the statistics show that more than 100,000 from level one (year one, two and three) in primary school all over Malaysia are currently unable to perform well in reading, writing and count. National assessments and international testing revealed that a large portion of Malaysian pupils do not meet minimum proficiency benchmarks in mathematics subject (Department of Statistics Malaysia, 2020; MOE Malaysia, 2019). This could be a struggle for students to acquire higher mathematical skills in later years. In addition, Malaysian students also scored below the international averages in Mathematics and Science in TIMSS 2011. However, in TIMSS 2015, Malaysian students showed some improvement but it was still unsatisfactory (Abdullah,2018).

Similarly, one of the national agendas is achievements in the field of science and mathematics which affects all levels of education beginning from preschool until tertiary level (Majzub, 2012). Unfortunately, it is also a compulsory learning subject for slow learners and special needs students to enhance their mathematics skills or thinking process. Although mathematics is regarded as a core subject, and students are learning it from a very young age, the majority of students face difficulties in this subject; especially in understanding the basic concept of numbers and counting, the understanding of space, basic space geometrical figures and measuring the sizes, classification, clustering and comparison (Beka, 2017). Positive learning experience in pre-numeracy skills at early age among children can develop their confidence in understanding Mathematics at later age. Rajanthran et al. (2023) suggested that when student engagement rises, it leads to student success.

Betts et al. (2020) highlighted the need for the development of scaffolding strategies that address pre-numeracy skills and readiness skills for young children before they start formal schooling. Previous studies also showed that teachers' ability to provide scaffolding can determine young children's understanding and performance in pre-numeracy skills (Clerkin et al., 2018). If teachers fail to utilize new approaches and appropriate scaffolding for young children, they face difficulties in learning numeracy (Vygotsky, 1978).

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

Numeracy is a vital part of early childhood as the knowledge acquired through mathematics generates a generation of children who would integrate into society as individuals who can use mathematics in the future (Keles et al., 2016). On the other hand, Anders and Rossbach (2015) stressed that preschool mathematics is remarkably different from that of elementary and secondary mathematics, wherein the content of the preschool curriculum covers themes such as number sense, pattern, ordering, shapes, spatial sense, and comparison.

Study related to pre-numeracy skills among young children very limited in Malaysia. As such, the current study aimed to fill the gap in children pre-numeracy skills. This study focuses on the type of scaffolding strategies provided by the teacher to enhance the children pre-numeracy skills. The study also explore how the scaffolding strategies improve the young children performance level. Furthermore, the difficulty faced by the teacher providing scaffolding the will be explore. This qualitative study usage semi-structure interview questions, classroom observation and document analysis took collect the data.

Research Questions

Current study aims to answer two research questions as follows:

- What are the scaffolding strategies employed by the teacher which helped to enhance preschool children's pre-numeracy skills?
- To what extend do scaffolding strategies helped the pre-school children's performance in per-numeracy skills?

Literature Review

Theoretical Framework

This study is based on two theories namely Piaget's cognitive learning theory (1981) and Vygotsky's social constructive theory (1978). The cognitive theory is deemed to be the most relatable philosophy for mathematics instruction as it allows educators to recognize the mental capability of the learners and therefore apt fully design the right tasks for them to carry out. Hence becoming a solution to the incompatibility that exist between how educators teach and how students actually learn. This theory enables learners to understand the concept and relate them to the real world as opposed to merely memorizing concepts, As such, this allows them to become life-long independent learners.

Social constructivism is the type of constructivism that recognizes social interaction as a fundamental role in a learner's cognitive development; thus, it is effective and applicable in a classroom where interaction occurs. In social constructivism learners comprehend concepts and ideas and make sense of the real world through interaction and exposure to interactive activities. Scaffolding strategies was proposed by Russian psychologist, Vygotsky, in 1978, emphasizing human high level mental activities existed in children's social interaction with elders and peers. from the beginning other-regulation, or social negotiation, to internal self-regulation. Scaffolding provide platform for children to achieve the Zone of Proximal Development (ZPD). In this study, preschool teachers provide scaffolding for children to master the pre-numeracy skills.

Furthermore, the scaffolding strategy adopted in a learning process does not only aim to guide a student to complete a task at hand but to aid the development of a student in all aspects of learning. For instance, if a teacher opts to provide a support system by adapting to the level of understanding of the student throughout a series of tasks then the teacher is teaching provisionally. However, if a student has been made to understand the lesson the teachers' support may fade gradually; thus shifting the responsibility to the learner himself to take charge of his own learning. Eventually the student's responsibility over his/her own learning increases as a result of the decreasing support from the teacher (Van de Pol et al. 2010).

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

Piaget's theory of cognitive development it explains how children think, understand, and learn (Piaget, 1981). His theory helped children basically a logico-mathematical theory in cognitive development is perceived as consisting primarily of logical and mathematical abilities, such as numeration, seriation, classification, and temporal (time) relationships.In addition, Piaget (1981), along with Dewey (1958) and Vygotsky (1978), laid the foundation for constructivism, a cognitive theory of development and learning. Piaget believed that through direct experience with the physical world children develop intelligence. According to Piaget intelligence is the cognitive, or mental, process by which children acquire knowledge, in this sense, intelligence is "to know,". It is synonymous with "thinking" in that it involves the use of mental operations to mentally and physically interact with the environment.

Studies on Utilizing Scaffolding Strategies

Scaffolds can be defined as the way or method to achieve scaffolding. For example, training walkers' act as a scaffold when a child is learning to walk for the first time and an adult guiding the process. There are numerous types of scaffolds but their purpose is unified, which is to provide support. With the help of different scaffolds, children can complete more advanced tasks and engage in critical problem solving and thinking (Hardy et al., 2021). Further, the effect of feedback as a form of scaffold during exploratory mathematical problem-solving. Feedback is any kind of information which a child can use to accept, reject or change his prior knowledge. Prior knowledge of a child is an important characteristic when evaluating the effect of feedback as a scaffold (Hardy et al., 2021).

The discussion conducted by Anghileri (2006) on scaffolding practices which enhance mathematics learning, compiled teaching approaches based on scaffolding. This discussion particularly looked at several mathematics instructions and how the interaction of the teacher and children's took place inside the classroom. Anghileri (2006) concluded that teachers are most effective if they are able to use a range of teaching approaches in an understanding consistency. Current study focuses on the use of scaffolding strategies (excavating, modelling, guiding, focusing and extending) by the teacher can help children's numeracy skills such as matching, comparing quantities of objects, seriation skills, pattern generating skills and understanding consistency.

Providing the right, scaffolding is crucial because it helps to deepen the young children understand level in pre-numeracy skills. When young children go through the scaffolding process in to pre-numeracy lesson, their understanding of the pre-numeracy skills will improve and also foster young children's engagement in the lesson. A school with a well-equipped teaching resource centre cannot help the young children in learning if the teacher is not competent to use the material and strategy effectively (Ali and Mukhtar, 2017). As such, this study is important because it explores the scaffolding strategies employed by the teacher to enhance the preschool children's pre-numeracy skills and performance level. There also very limited study found on scaffolding strategy in pre-numeracy based on Malaysia study. As such, current study fills the research gap in this area.

Studies on Pre-Numeracy Skills

Early childhood research has shown that the first six years of life demonstrate the significance of early mathematics experiences (Balala et al., 2021). Through the hands-on approach, the children's exploration of and interaction with the materials and surroundings involving many mathematical concepts would give them valuable mathematical experience from which they learn (Vogt et al., 2018). Coles et al. (2019 also stressed that the hands-on approach is an effective method to increase children's pe-numeracy skills and understanding of abstract knowledge in a more concrete and apparent manner. In addition, children are more likely to develop positive attitudes and beliefs about mathematics if they have enjoyable experiences in their early years.

Study by Litkowski et al. (2020) indicated that preschool classroom mathematics instruction tends to be both sparse and misaligned with children's ability levels. To address the researchers suggested two key challenges, first call for more rigorous research on children's early numeracy skills in order to provide

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

teachers with a better understanding of children's early mathematics skill development and second to adopt a more appropriate and supportive activities that can be used to foster numeracy skills.

Similarly, Betts et al. (2020) carried out a study among 292 low-SES children in 20 preschool classrooms in Southern California. Their study involved an adaptive digital mathematics program designed to assess and teach number sense skills to preschool children. Results of the study indicated that there is a need for the development of interventions that address early mathematics readiness skills for pre-schoolers, and call for educational programs that can quickly identify children who may not be ready to take full advantage of school mathematics instruction.

Learning style is one of the supporting factors related to numeracy literacy skills that can facilitate the learning pre-numeracy skills of preschool children. Study by Indah et al. (2023) revealed that the numeracy literacy skills of children with visual learning styles when given pictorial test questions, responded quickly and gave complete answers. While children with auditory learning styles do not immediately respond, children with this type of learning style feel insecure. Meanwhile, a child with a kinaesthetic learning style is not happy if he is given a picture test question, he prefers to walk from his bench to his friend's bench, so the answers he produces are not complete. As such their study suggested that teachers need to tailor their scaffolding strategies according to the learning styles of their students.

In line with suggestions made by Litkowski et al. (2020) and Betts et al (2020), current study explores the effectiveness of utilizing scaffolding strategies and hands-on learning approach among slow learners in learning the pre-numeracy skills. The teacher employed scaffolding strategies as an intervention to facilitate the children in mastering the pre-numeracy skills.

Methodology

Research Design

This study used phenomenology research design which is also known as an educational qualitative research design (; Creswell & Poth, 2016). This study focused on the children whereby the learning environment whereby the teacher provided scaffolding strategies to enhance the young children pre-numeracy skills. The researchers used the qualitative data obtained from classroom observation checklist, interviews and analysis documents. The data from interview and observation was used to answer (RQ 1), the data obtained from teacher's interviews analysis of document were used answer (RQ2) Methods of collecting the data and the sources are explained in Table 3.1.

Table 3.1. Qualitative Methods and Sources

Methods	Sources
Non-Participant Classroom Observation	Pre-schoolers
Semi-structured Face to Face Interviews	Teacher
Document Analysis	Photography during lessons, curriculum materials, worksheets and children performance level.

Sample

As this is a since phenomenology qualitative study, purposive sampling was explored to selected sample (Creswell et al., 2016). The logic and power of purposeful sampling lies in selecting information-rich cases for study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research (Patton, 2014).

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

This study was conducted in one of the preschools at Klang district in Selangor, Malaysia. Participants for this study consist of five preschool children who are slow learners and purposeful selected by the researcher from the 24 children. In addition, the teacher who taught them pre-numeracy lessons is also the sample of this study. The teacher in this study is known as Daisy (not her real name). She is a female and 32 years old. She completed her Bachelor degree in Early Childhood Education at private university. She worked as preschool teacher more than eight years.

Her knowledge, experience and expertise were in preschool education. Further, for the past eight years she has been teaching Mathematics, English and Malay language in preschools. She works in this preschool for the past six years. She attended a few trainings related to early childhood education to enhance her skills in teaching and learning. In addition, she also attended a scaffolding workshop and training for slow learners in her school, The teacher Daisy also had attended scaffolding training and workshops outside her school Organized by private bodies). As such, she uses scaffolding strategies in teaching pre-numeracy skills to slower learners. Besides that, the teacher Daisy is also very competent and willing to participate in the study.

The five preschool children who have been selected as sample of this study are from low socioeconomic background. Their parents' income were below (RM 2500) a month. They come from three different ethnic groups namely two Malays, one Chinese and two Indians. In this study these five children were named as Child A, Child B, Child C, Child D and Child E (not their real name). The demography of the children are further explained in Table 3.2:

Table 3.2. Demography of Children

Name	Gender	Ethic	Parents Monthly Income
Child A	Girl	Indian	RM 2200
Child B	Boy	Malay	RM 1800
Child C	Boy	Chinese	RM 2300
Child E	Girl	Malay	RM 2000
Child D	Girl	Indian	RM 2500

Pre-Numeracy Skills

Following are the numeracy skills taught by the teacher during the five weeks:

- Matching skills (matching similar pair of objects)
- Matching skills (matching match the two groups of objects of the similar quantity)
- Skills of comparing quantities of objects (more and less)
- Skills of comparing quantities of objects (equal and not equal)

Instruments

Three type of instruments were used in this study. Namely, classroom observation checklist, semi-structured interview questions, and performance assessment scale. By using the observation checklist, the researchers were able to identify how the scaffolding strategies employed by the teacher helped to enhanced preschool children's pre-numeracy skills such as matching and comparing quantities of objects. Each pre-numeracy skill was conducted in two lessons. Each observation was carried out for 30 minutes in the classroom according to the school schedule. The pre-numeracy classes were conducted twice a week. The researchers observed the students for 4 times (5 weeks) during pre- numeracy lessons.

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

Ethical Issues

Prior to the research, the researchers obtained consent from the children's parents allowing the children to participate in the study. During this study (five weeks) the teacher used scaffolding strategies to enhance the children pre-numeracy skills.

The headmistress gave permission to the researchers to conduct the study. The researchers ensured the teacher that all the information regarding the students' performance level were confidential and only used for the research purpose.

Validity and Reliability of the Instrument

In order to obtain the validity of the instruments (observation checklist, interview questions and performance assessment scale) three qualified experts were asked to check and validate the instruments. These three experts had background in early childhood education and they are also well-versed in early numeracy. The experts confirmed that observation checklist, the semi-structured interview questions and the children assessment performance scale were suitable for the study. Three experts also gave high rating to all the three instruments. As such, all the three instruments have high validity and can be used for the study.

Pilot Test

Pilot studies are useful procedures as preparation of a full-scale study, regardless of paradigm (Tashakkori & Teddlie, 2003). The pilot observation and pilot interviews were conducted in at the preschool classroom taught by teacher Rose (not her real name). Letter of informed consent was given to teacher and researchers obtained approval from teacher and head of school, prior to the pilot study. The observations and interviews were recorded using phone recorders. The interview ranged in time between approximately 20 and 30 minutes. The results of the pilot test indicated that the researchers can obtain sufficient data through the observation, interview and document analysis to answer the research questions.

Selection of Research Site

Little Teddy Preschool (not the real name) was chosen for the study because the headmistress gave permission to the researchers to carry out the study and the teacher Daisy in school had attended scaffolding training and workshops. She uses it in teaching preschool numeracy skills to slower learners. Besides that, the teacher Daisy is also well versed in scaffolding strategies and willing to participate in the study. The administration of the preschool also showed their kindness and understanding by giving their full cooperation to the researchers.

Each class in the preschool was provided with a teacher and a teacher's assistant by the administration. Both the teacher and the teacher's assistant were fully in charge of their class. The total enrolment of the Little Teddy Preschool was 64 children (Class Apple 1 = 18 children six-year-old, Class Apple 2 = 21 children six-year-old, and Class Apple 3 =25 children five year old). This study took place in the Class Apple 3, as the five participants of the study came from that class. The slow learners adapted well in the classroom (Apple 3) since they have been learning in the class from the beginning. The Apple 3 classroom was the most suitable location for the study to take place, in order to provide a sense of security to the subjects during the scaffolding intervention in per-numeracy lesson. All lessons during the intervention were carried out during school hours.

Observation Protocol

The researcher obtained permission from the head of school, class teacher , and parents to carry out the classroom observation during the pre-numeracy lesson**.** A non-participant observation protocol was designed by the researchers and reviewed by three experts in the area of early childhood education. The observation checklist was used during the observation for each lesson. Using the observation checklist, the

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

researchers were able to identify how the scaffolding strategies employed by the teacher helped to enhanced preschool children's pre-numeracy skills such as matching, and comparing quantities of objects.

Interview Protocol

The researchers obtained written permission from principal to allowed them to carry out classroom observations and to interview the teacher who was involved in this study. The researchers also obtained permission from the teacher to carry out five interviews after each lesson for 5 pre-numeracy lessons. The researchers also ensured the teacher that all the information gathered from interviews was confidential and only be used for the research purpose. Data from the classroom observations were used to answer RQ1. Five interview questions and document analysis (children's performance assessment scale) were used to answer RQ 2. The researchers conducted interviews immediately after each lesson to identify the scaffolding strategies used by the teacher to enhance children's pre-numeracy skills.

Performance Assessment Scale

The Daisy teacher used children's worksheet to assess their pre-numeracy skills performance. The researchers transferred children performance in pre-numeracy skills from the worksheet to performance assessment scale. The researcher ensured the teacher that all the information regarding the student performance level was confidential and only used for the research purpose.

Data Analysis

Marshall and Rossman (1989) mentioned that using a combination of data sources increases the validity of the findings. According to Maxwell (1996), triangulation helps the researcher to decrease his or her own biases in the conclusion, which may increase the validity of the study's assessment. After analysis, the data, *i.e.* interview transcripts, observation field notes, and documents, were triangulated for obtaining a detailed and comprehensive picture of the findings. In this study, the researchers collected information through non-participant observation of students, semi-structured interviews with the teacher Daisy and document analysis of children's worksheets to assess their pre-numeracy skills performance.

Findings

The researcher carried out four classroom observations and four face interviews with the preschool teacher in order to collect the data and answer the research questions.

Research Question 1: What are the scaffolding strategies employed by the teacher which helped to enhance preschool children's pre-numeracy skills?

The following are the findings from each observation:

During the first observation the teacher used matching activities to teach pre-numeracy skills. The teacher matched similar pairs of objects, namely balls, socks, oranges, pens and rose flowers during the matching activities. Here, the first scaffolding strategy employed by the teacher was modelling whereby the teacher showed the children how to match similar pairs of objects. Then, she asked the children to match the objects individually. At the first attempt Child A, Child B and Child E were able to match the five pairs of objects correctly. Unfortunately, Child C was only able to match two pairs of objects, namely balls and oranges, but failed to match the other three pairs of objects. On the other hand, Child D was able to match pens, socks and oranges but was unable to match the other two pairs of objects (rose flowers and balls). Before the second attempt, the teacher used the focussed and guided scaffolding strategies to help child C and child D. First, the teacher coached both children individually to match the objects correctly (focussed scaffolding strategy). Then the teacher employed the guided scaffolding strategy to motivate and encourage them to practice matching until they were able to do it correctly.

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

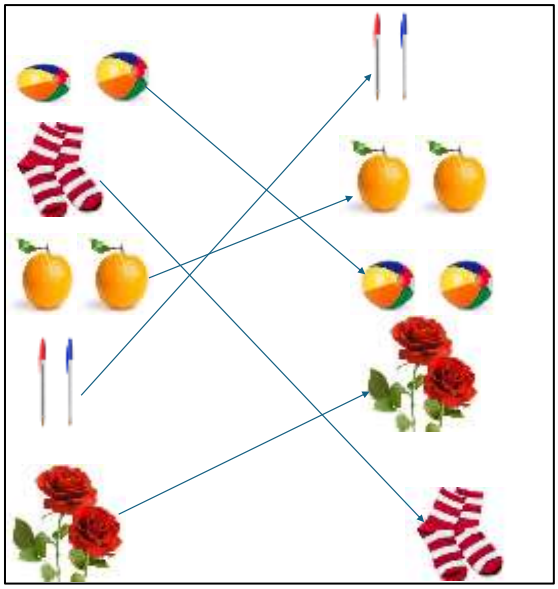

Figure 1. Matching Similar Pairs of Objects

The teacher said to Child C and Child D, "Try again. I'm sure both of you can do it. Try." Once they had matched one pair of objects correctly the teacher said, "Well done, you can do it." After they had matched all five pairs of objects correctly the teacher said, "Well done! Good job both of you." The teacher praised child C and child D when they completed the task successfully.

Based on the first observation it can be concluded that the teacher used modelling together with focussed and guided scaffolding strategies to help the children match similar pairs of objects correctly. First, she used the modelling scaffolding strategy by demonstrating to the children how to match the pairs of objects. Second, she used the focussed scaffolding strategy by coaching the children on how to match the pairs of objects. Lastly, she used the guided scaffolding strategy by encouraging, motivating and praising the children when they were able to do it correctly.

During the second observation, the teacher used guiding scaffolding strategies to improve Child D and Child E's understanding of this skill. The teacher observed Child D and Child E who tried again to match the two groups of objects of the similar quantity. Meanwhile, the teacher gave some cues to child D and child E, who then completed the activity correctly.

The teacher asked, "Child D here there is one book and on the other side there is one more book. Can you match the same quantity?" Child D was thinking, "hmmmm…..". Then child D matched the objects correctly. Then, the teacher said, "Clever child."

At the second attempt the teacher gave cues to child D and child E to match the objects of the same quantity correctly. The teacher also mentors them one by one on how to match two groups of objects of the similar quantity, using four groups of objects. Furthermore, the teacher asked the children to complete the task by themselves at the third attempt, and they were able to match all groups of objects of the similar quantity correctly. Finally, the teacher used the extending scaffolding strategy to ask open-ended questions to explore the extent to which the children understood this skill.

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

The teacher asked, "Children can you answer me this? Here there are two cups and you have to match with how many cups"? All the children said together, "Teacher two cups." Then the teacher said, "Wow well done."

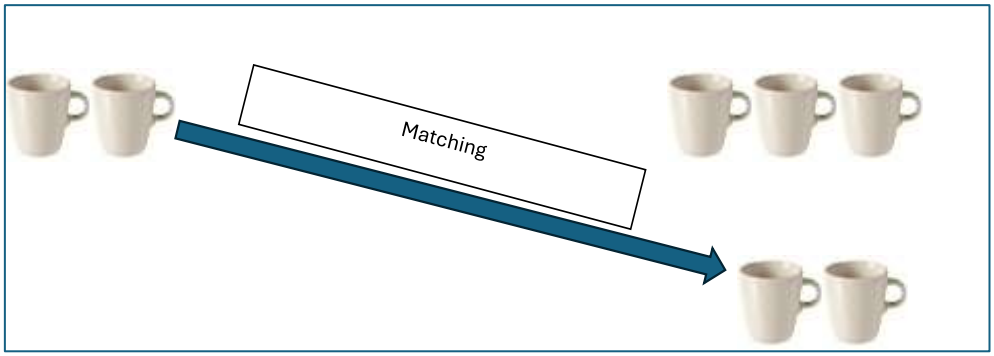

Figure 2. Matching the Objects of the Same Quantity Correctly

Based on the second observation it can be concluded that the teacher used modelling, guiding focusing and extended scaffolding strategies to help the children match two groups of objects of the similar quantity.

During the third observation the teacher compared two groups of objects, namely durians, sweets, spoons and cups during the comparing activities (more and less). The scaffolding strategy employed by the teacher was an excavating whereby she asked simple questions related to the lesson to find out what the children knew about the lesson before she started to conduct the lesson.

The teacher asked the meaning of the word 'more'. Everyone was silent and looking at the teacher. Again the teacher asked everyone. Child B and Child D opened up both their palms and said "This is more, teacher." The teacher replied, "Yesssss……smart." *The teacher also* asked *the meaning of the word 'less'. All five children showed less sign using their hands and said, "Very little teacher." After that, the teacher showed a picture of two groups of objects (more and less) and asked the children, "Which basket has more durians and which basket has less durians?".*

The child A, child B and Child D showed the basket with more durians and said, "Teacher this basket has more and this basket got less". Teacher replied, "Wow smart children."

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

Figure 3. Comparing Two Groups of Objects (More and Less)

In addition, the teacher showed and encouraged them to compare two groups of objects by stating (more or less). At the first attempt she asked the children to compare two groups of objects individually. Child A, child B, child C, child D and child E were able to compare two groups of objects by stating (more and less). For example, the red circle had ten sweets and blue circle had five sweets. The teacher asked the children one by one and the children said red circle has more sweets, and the blue circle has less sweets. At last, all the five children answered correctly.

Based on the third observation it was clear that the teacher used excavating, modelling, and guided scaffolding strategies to help the children compare two groups of objects. First, she used the excavating scaffolding strategy by asking simple questions using pictures to get to know about more and less. Second, she used the modelling scaffolding strategies by showing the children how to compare two groups of objects; to teach more and less. Lastly, she used the guided scaffolding strategy by encouraging the children when they were doing the activity.

In the fourth observation, the teacher used the technique of comparing quantities of objects to teach pre-numeracy skills. The teacher compared two groups of objects (equal and not equal) namely: flowers, toy cars and apples. The first scaffolding strategy employed by the teacher was modelling whereby the teacher demonstrated to the children how to compare two groups of objects (equal and not equal).

> *Before starting the activity, the teacher asked the children, "Children in these two boxes, are the number of rose flowers the same?" All the children remained silent but child C said, "Yes, teacher same." Teacher replied, "Good…good."*

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

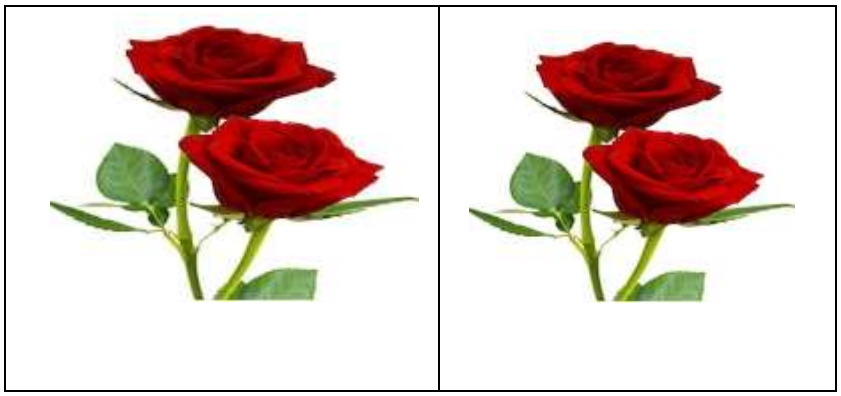

Figure 4. Comparing Quantities of Objects (Equal and Not Equal)

After that, the teacher asked one more question, "Children in these two boxes, are the number of roses the same or not?"Child D said, "Not same teacher." Teacher replied, "Yesss,... because the first box only has two roses but the second box has five roses." "Well done, child D."

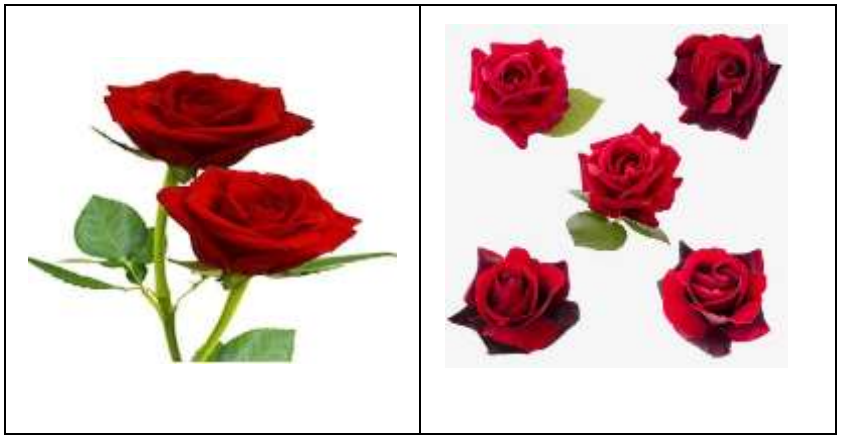

Figure 5. Comparing Quantities of Objects *(Equal* and *Not Equal)*

Then, she asked to compare two groups of objects which were equal and not equal, individually. The teacher placed two daisy flowers in the first box and second box. Both boxes had same number of daisy flowers, as shown below:

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

Figure 6. Comparing Quantities of Objects (Equal and Not Equal)

Then, the teacher placed three tooth brushes in the first box and four apples in the second box, as shown below:

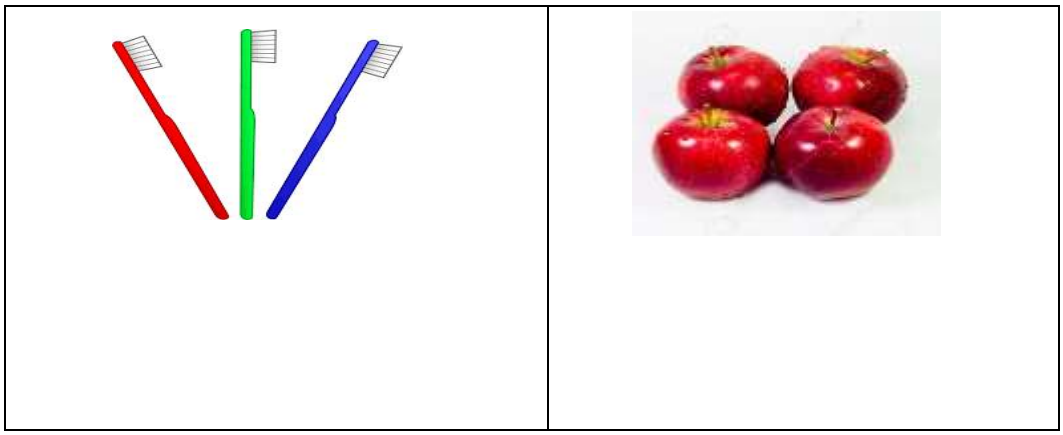

Figure 7. Comparing Quantities of Objects *(Equal* and *Not Equal)*

After placing the objects, the teacher asked the children to point out individually which line had an equal number of objects in the boxes and which line had not equal number of objects. At the first attempt child C, D and C were able to compare the two groups of objects correctly.

Unfortunately, child A was only able to compare two groups of objects which were equal. As for the second line, child A remained silent and was not able to state whether they were equal or not equal. On the other hand, child B was able to compare the two groups of objects, stating they were not equal. When the teacher asked which line was equal, child B looked at the teacher. Then the teacher asked which line was not equal. Then child B showed by hand the second line was not equal.

After that, the teacher used the guided and focused scaffolding strategies before the second attempt. The teacher coached child A and child B individually to help them understand the skill. Further, the teacher

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

asked them to do again and again the activities to make them understand the skill well. Then, the teacher asked them in the second attempt which one was equal and not equal. Child A and Child B were able to compare the two groups of objects correctly.

Based on this observation it can be concluded that the teacher used modelling, guiding, and focus scaffolding strategies to help the children compare two groups of objects by stating whether they were equal or not equal. First, she used the modelling scaffolding strategy by demonstrating to the children how to compare two groups of objects by stating whether they were equal or not equal. Second, she used the guided scaffolding strategy by encouraging the children while they were doing the activity. Lastly, she used the focussed scaffolding strategy by coaching the children individually on how to compare two groups of objects by stating whether they were equal or not equal.

Research Question 2: To what extend do scaffolding strategies helped the pre-school children's performance in per-numeracy skills?

> ***Lesson 1****: Today I used modeling, focusing and guiding to match similar pairs of objects during the lesson.*
>
> ***Lesson 2:*** *I used guiding, focusing and extending scaffolding strategies for today's lesson on matching two groups of objects of similar quantity.*
>
> ***Lesson 3:*** *I used excavating, modeling and guiding scaffolding strategies to help the children compare two groups of objects in today's lesson.*
>
> ***Lesson 4:*** *I used modeling, guiding and focusing scaffolding strategies to help the children compare two groups of Objects By Stating: Equal Or Not Equal in Today's Lesson.*

Based on the analyses of the interviews the teacher used scaffolding strategies to improve the children's understanding to conduct the pre-numeracy lessons. In Lesson 1, the teacher said *"Yes"* the children improved in their focus during the lesson. The children's understanding was enhanced by the motivation and coaching provided by the teacher. In Lesson 2, the teacher mentioned the scaffolding strategies helped the slower learners and low self-esteem children in the group to answer correctly and be excited to participate in the lesson. In Lesson 3 and Lesson 4, the teacher said the scaffolding strategies strongly motivated the children to participate in the activities and become more skilful as they desired to learn more and more once they had mastered the skills and understood the concepts.

> *The children remained focused and showed interest towards the lesson. I coached them individually and they never refused to learn. When I asked them to do activities a few times, to make them understand the concept, they enjoyed doing the activities. This scaffolding strategy really encouraged the children to stay focused and engaged during the lesson. When, I provided them opportunities to participate in this activity I could see the children's understanding of the skills improve and they knew the concept well because I could see that all the children made attempts until they complete the task correctly.*

Based on the analyses of the interviews it is clear that the teacher used scaffolding strategies to get the children to remain focused and engaged during the pre-numeracy lessons. In Lesson 1 and Lesson 2, the teacher noticed that the children were able to stay focused until the end of the activity. The children gave

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

good response while the teacher asked questions. In Lesson 3 and Lesson 4, the teacher observed that the children were excited doing the activities and also helped their peers to complete the task. When the teacher used real objects (flowers) to conduct the activity and the children paid more attention and remained engaged throughout the activity because the teacher used real objects, demonstrated each and every one individually, and ensured that the activity attracted the children to understand the skills well and stay focused until the activity ended.

Discussion

The findings of this study showed that the teacher used modelling (demonstrating), focusing (coaching), and guiding (motivating and praising) scaffolding strategies to help children match similar pairs of objects correctly by encouraging and motivating them. The findings also indicated that the teacher used scaffolding strategies such as modelling (showing), guiding (giving cues), focusing (mentoring) and extending (asking questions) to help the children match two groups of objects of similar quantity. Additionally, the teacher used excavating (asking questions), modelling (showing pictures), and guiding (encouraging) scaffolding strategies to help the children compare two groups of objects by stating 'more' or 'less'. The results of this study also indicated that the teacher used modelling (demonstrating), guiding (encouraging) and focusing (coaching) scaffolding strategies to help the children compare two groups of objects by stating whether they were equal or not equal. These five children's performance levels at pre-numeracy skills showed improvement and the scaffolding strategies were effective in helping the children to increase their performance levels. These results support findings by Rebecca et al.(2018) and Hardy et al. (2021) which indicated that scaffolding strategies can enhance pupils performance in Mathematics.

Current findings are also parallel with findings by Prabawanto (2018) who mentioned that the teacher's interaction with children in cooperative learning provides an opportunity for children to improve their numeracy skills through scaffolding strategies. Similarly, Al Alia (2015) in her study indicated that young children were able to improve their understanding in Mathematics when the teacher used scaffolding strategies during activities.

The researcher experienced the same in the current study whereby the children were able to engage actively during scaffolding strategies. In other words, the scaffolding strategies provided the opportunities for the children not to give up but to complete the tasks given to them, after several attempts. Besides that, the scaffolding strategies helped to attract the children's attention and enhanced their understanding of pre-numeracy skills. The children were also motivated to learn and they kept on trying until they were able to do the task correctly.

These findings are aligned to that of previous studies whereby demonstrating is shown to address learning problems; teachers' actions include displaying a solution, explaining solutions and referring back to the pervious activity (Maryam et al., 2019). As indicated in the study, the teacher used modelling by displaying solutions and the child observed well and subsequently tried several times to do the tasks. Also, through the teacher's hand movements, slowly the child is able to see the teacher's demonstrations to complete the given task. These findings support findings by Kusmaryono et al. (2020) which indicated that utilization of scaffolding strategies in learning Mathematics can reduce anxiety among children and create a conducive learning environment.

In addition, the teacher used guiding and focusing strategies to improve the children's understanding of per-numeracy skill lessons. As stressed by Coles et al. (2019 hands-on – learning helped to enhance children's understanding of pre-numeracy skills. In addition, the teacher helped to guide them until they were able to do the task on their own. Further, the teacher also helped to improve the focus of the five children and give them opportunities to solve the pre- numeracy tasks. Similarly, Stalbrandt et al. (2007) mentioned that during the scaffolding strategies the teacher guided and facilitated the children to accomplish their task. They make children focus, understand the challenges and create opportunities for the them to analyse the pre-numeracy phenomena.

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3779 – 3795
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.4501

Conclusion

This study revealed some interesting results on the use of scaffolding strategies in teaching pre-numeracy skills (matching similar pair of objects; matching two groups of objects of the similar quantity; comparing quantities of objects, *more* and *less*; comparing quantities of objects, *equal* and *not equal*). The teacher successfully helped the five children to understand the pre-numeracy skills by using excavating ((asking question).), modelling (showing and explaining), focusing (coaching) and guiding (encouraging). These strategies motivated the children during the process of learning and they kept on trying until they completed the tasks. In addition, the children were actively engaged during learning, and they were focussed during the activities. The use of real object drew children's interest in learning and enhanced their motivation in learning. Once they mastered the skills they are eager to learn more skills.

These findings have theoretical implications because they support Vygotsky's (1978) social constructivist theory which explains how scaffolding strategies can help children's understanding and performance in learning. In term of pedagogical implications, these results affirm that preschool teachers can use various scaffolding strategies to teach pre-numeracy skills. In addition, preschool teachers should be trained and exposed on how to use scaffolding strategies effectively in the classroom.

As there are some constant results that have been gathered from this study, there are also some limitations. Firstly, this study only used qualitative data through non=participant observations and interviews. As such, the findings can only be generalized to similar samples. A quantitative study based on a questionnaire should be conducted in future to gain wider opinions from the children and teachers. Through questionnaires, future researchers would be able to gather more information on children's levels of understanding on numeracy skills and teachers' views on using scaffolding strategies. Secondly, by conducting quantitative surveys as well, future researchers would be able to get more data from a larger sample. Thirdly, current study only explored the use of scaffolding strategies in teaching pre-numeracy skills. It is suggested that future researchers can use scaffolding strategies to teach other skills such as reading and writing skills among pe-school children. In addition, future studies also can investigate the effectiveness of utilizing scaffolding strategies in teaching Mathematics among primary and secondary pupils.

References

A. H. Abdullah, A.H. (2018). Pentaksiran TIMSS : Di manakah kedudukan pelajar Malaysia?, Dewan Masyarakat, . April, pp. 21–24.

Al Aila, M. Z., & Keshta, A. S. (2015). Effectiveness of using scaffolding strategy on developing seventh graders' reading comprehension skills. Retrieved from, http://library.iugaza.edu.ps/thesis/117428.pdf

Ali, S. R., & Mukhtar, F. (2017). A case study of fun learning with numeracy of preschoolers. Southeast Asia Early Childhood Journal, 6, 51–58. https://doi.org/10.37134/saecj.vol6.6.2017

Anders, Y., & Rossbach, H.-G. (2015). Preschool teachers' sensitivity to mathematics in children's play: The influence of math-related school experiences, emotional attitudes, and pedagogical beliefs. Journal of Research in Childhood Education, 29(3), 305–322. https://doi.org/10.1080/02568543.2015.1040564

Anghileri, J. (2006). Scaffolding practices that enhance mathematics learning. Journal of Mathematics Teacher Education, 9(1), 33-52.

Beka, A .(2017).The impact of games in understanding mathematical concepts to preschool children. Journal of Educational and Social Research, 7(1), 187-194. Doi:10.5901/jesr.2017.v7n1p187

Balala, M. M. A., Areepattamannil, S., & Cairns, D. (2021). Investigating the associations of early numeracy activities and skills with mathematics dispositions, engagement, and achievement among fourth graders in the United Arab Emirates. Large-scale Assessments in Education, 9(1), 1-21. https://doi.org/10.1186/s40536-021-00106-4

Betts A., Thai K., Jacobs D., & Li L. (2020). Math Readiness: Early Identification of Preschool Children Least Ready for Formal Mathematics Instruction in School ISSN: 2189-1036 – The IAFOR International Conference on Education – Hawaii 2020 Official Conference Proceedings https://doi.org/10.22492/issn.2189-1036.2020.40

Clerkin, A., & Gilligan, K. (2018). Pre-school numeracy play as a predictor of children's attitudes towards mathematics at age 10. Journal of Early Childhood Research, 16(3), 319- 334. doi:10.1177/1476718X1876223

Coles, A., Sinclair, N. (2019). Re-thinking Concrete to Abstract in Mathematics Education: Towards the Use of Symbolically Structured Environments. Can. J. Sci. Math. Techn. Educ.19,465–480.https://doi.org/10.1007/s42330-019-00068-4

Creswell, J. W., & Poth, C. N. (2016). Qualitative inquiry and research design: Choosing among five approaches. Sage publications.

Department of Statistics Malaysia. (2020). Sustainable development goals (SDG) indicators Malaysia 2019. https://www.dosm.gov.my

Dewey, J. (1958). Experience and nature (Vol. 471). Courier Corporation.

Hardy, I., Stephan-Gramberg, S., & Jurecka, A, (2021). The use of scaffolding to promote preschool children's competencies of evidence-based reasoning. Unterrichtswissenschaft,49(1110),1-25. https://doi.org/10.1007/s42010-020-00094-4 U

Hogan, K., & Pressley, M. (Eds.). (1997). Scaffolding student learning: Instructional approaches and issues. Brookline Books.

Indah, W. (2023). Analisis Kemampuan Literasi Numerasi Berdasarkan Gaya Belajar pada Anak Usia Dini. Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini, 6(6), 5840-5849.

Keles, O., Tas, I., & Aslan, D. (2016). Metaphor Perceptions of Pre-Service Teachers towards Mathematics and Mathematics Education in Preschool Education. Educational Research and Reviews, 11(14), 1338-1343.

Kusmaryono, I., Gufron, A. M., & Rusdiantoro, A. (2020). Effectiveness of scaffolding strategies in learning against decrease in mathematics anxiety level. NUMERICAL: Jurnal Matematika Dan Pendidikan Matematika, 4(1), 13-22 DOI:https://doi.org/10.25217/numerical.v4i1.770

Litkowski, E. C., Duncan, R. J., Logan, J. A., & Purpura, D. J. (2020). When do preschoolers learn specific mathematics skills? Mapping the development of early numeracy knowledge. Journal of experimental child psychology, 195, 104846. https://doi.org/10.1016/j.jecp.2020.104846

Majzub, R. M. (2012). Preschool children's early mathematics achievement based on gender and ethnicity. Asian Social Science, 8(16), 24-29. doi:10.5539/ass.v8n16p24 URL: http://dx.doi.org/10.5539/ass.v8n16p24

Malaysia, Ministry of Education. (2013). Malaysian Education Blueprint 2013-2025. Online www. moe. gov. my.

Maryam, B., Sören, H., & Gunilla, L. (2020). Putting scaffolding into action: Preschool teachers' actions using interactive whiteboard. Early Childhood Education Journal, 48, 79-92.
DOI: 10.1007/s10643-019-00971-3.

Ministry of Education Malaysia. (2019). Pelaporan pentaksiran sekolah rendah 2019 [2019 Primary school assessment report]. https://www.moe.gov.my/muat-turun/laporan-dan-statistik/lp/3056-pelaporanpentaksiran-sekolah-rendah-2019/file

Patton, M. Q. (2014). Qualitative research & evaluation methods: Integrating theory and practice. Sage publications.

Piaget, J. (1981). Their relations during child development. Palo Alto, CA: Annual Reviews.

Prabawanto, S. (2018, May). The enhancement of students' mathematical self-efficacy through teaching with metacognitive scaffolding approach. In Journal of Physics: Conference Series (Vol. 1013, No. 1, p. 012135). IOP Publishing.

Rajanthran, S. K., Wider, W., Wong, L. S., Chan, C. K., & Maidin, S. S. (2023). Utilisation of high-impact educational practices (HIPS) to engage undergraduates: A preliminary case study. Journal of Curriculum and Teaching, 12(1), 27-35. https://doi.org/10.5430/jct.v12n1p27

Rebecca L.B., Chenoa S. W., Tamara, B. J., Toby, J. P., Shouping H., David A. T., Amanda N. N, Sophia, G. R. & Sandra K. M. (2018) Scaffolding Mathematics Community College. Journal of Research and Practice, 42(2), 112-128, DOI: 10.1080/10668926.2017.1279089

Stålbrandt, E. E., & Hössjer, A. (2007). Scaffolding and interventions between students and teachers in a Learning Design Sequence. Psicologia Escolar e Educacional, 11, 37-48. DOI:10.1590/S1413-85572007000300004

Van de Pol, J., Volman, M., & Beishuizen, J. (2010). Scaffolding in teacher–student interaction: A decade of research. Educational Psychology Review, 22(3), 271-296.

Vogt, F., Hauser, B., Stebler, R., Rechsteiner, K., & Urech, K. (2018) Learning through play – pedagogy and learning outcomes in early childhood mathematics, European Early Childhood Education Research Journal, 26(4): 589-603. https://doi.org/10.1080/1350293X.2018.1487160

Vygotsky, L. (1978). The mind in society. Cambridge, MA: Harvard University Press.