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Utilizing scaffolding strategies in teaching pre-numeracy skills in an inclusive education setting

Subadrah Madhawa Nair[1*], Thirumani Marimutthu[2], Hariharan N Krishnasamy[3], Gurdip Kaur Saminder Singh[4], Muhammad Siddique[5]
[1,4]Faculty of Education & Humanities, UNITAR International University, Kelana Jaya, Selangor, Malaysia; subadrahmadhawanair@gmail.com (S.M.N.) gurdip.saminder@unitar.my (G.K.S.S.).
[2]Faculty of Education and Liberal Studies, King's University College, Petaling Jaya, Selangor, Malaysia; sonyrai2705@gmail.com (T.M.).
[3]Faculty of Education and Liberal Arts, INTI International University, Nilai, Negeri Sembilan, Malaysia hariharan.samy@newinti.edu.my (H.N.K.).
[5]Faculty of English, Govt. Shalimar Graduate College, Higher Education Department Punjab, Lahore, Pakistan; muhammad_siddique.edu@hotmail.com (M.S.).

Abstract: This study investigates how the teacher used scaffolding strategies in teaching pre-numeracy skills (seriation skills, pattern generating skills and understanding consistency) among preschool children in an inclusive education setting. The study also explored challenges faced by the teacher while teaching and how she overcame them. The qualitative study used observations and semi-structured interview questions to collect the data. Purposive sampling was used to choose five preschool children and a pre-school teacher from a private school in Selangor as sample of the study. Two instruments were used to collect the data namely observation checklist and semi-structured interview questions. The researchers did six classroom observations to collect the qualitative data on how the teacher used the scaffolding strategies to teach the pre-numeracy skills (seriation skills, pattern-generating skills, and understanding consistency). The researchers also conducted face-to-face interviews with the teacher on the challenges faced by her while teaching and how she solved them. Results from the observations indicated that the teacher used various scaffolding strategies to enhance the children's pre-numeracy skills namely seriation skills, pattern generating skills, and understanding consistency. In addition, the children's performance improved when the teacher used the scaffolding strategies. The teacher also faced many challenges while teaching namely children get confused, the teacher has to be patient and cool, children not paying attention, lesson preparation and getting suitable materials. This study has crucial pedagogical implications because it sheds some light on how to use the scaffolding strategies in teaching pre-numeracy skills in an inclusive education setting.

Keywords: *Consistency, Inclusive education, Pattern generating, Pre-numeracy skills, Preschool children, Scaffolding, Seriation skills.*

1. Introduction

Van Kleeck et al. (2006) and Pentimonti et al (2010 stressed that very little research has studied how preschool teachers use scaffolding strategies in developing children's literacy. Informal numeracy skills is important to understand the developmental children's mathematics skills at early ages but research in this area is lacking (Purpura & Lonigan, 2013). In addition, de Chambrier et al. (2021) stressed that pre-numeracy skills are critical predictors of children's academic performance. Their findings showed that playing the games at kindergarten helped children with average and above-average to make more progress in their early numeracy skills. Furthermore, games also helped low achievers from various backgrounds to progress in their task.

Several of the studies indicated that low-performing or at-risk children have demonstrated significant progress in their numerical skills when the teachers employed appropriate intervention and

* Correspondence: subadrahmadhawanair@gmail.com

scaffolding (Scalise et al., 2017; Schacter & Jo, 2016). As such, research on preschool teachers' instruction in the inclusive classroom is crucial especially in helping the low achievers. To contribute to this literature, current research focused on how the teacher uses scaffolding strategies to help slow learners in an inclusive education setting. The current research focused on three numeracy skills namely seriation skills, pattern generating skills and understanding consistency. In addition, the current study also investigated challenges faced by the teacher while providing scaffolding to the slow learners and how she addressed them.

1.1. Research Questions

1. Did the scaffolding strategies employed by the teacher help the preschool children's performance in per-numeracy skills?
2. What were the challenges faced by the teacher when providing scaffolding to children during pre-numeracy lessons?

2. Literature Review

This section discusses the underpinning theories related to the study, scaffolding strategies in teaching and learning, and inclusive education in pre-school settings.

2.1. Theoretical Framework

This study is based on Vygotsky's social constructivist theory (1978). Scaffolding was proposed by Russian psychologist, Vygotsky, emphasizing human high-level mental activities that existed in social interaction from the beginning of other-regulation, or social negotiation, to internal self-regulation. Scaffolding integrates Piaget's constructive cognitive theory of individuals on knowledge and Vygotsky's Zone of Proximal Development (ZPD) of teachers' and students' dialogues in social discrimination and authentication of negotiation. When students remain at a certain level of cognition, if teachers or peers systematically guide them or give the key instruction, students tend to go beyond the original cognitive level more easily.

While teaching teachers use various scaffolding strategies to help the learners master the skills and knowledge. Teachers are expected to evaluate the skills of the learners and the progress of their learning process, besides having an in-depth knowledge and understanding of the tasks involved.

In addition, this study is also related to inclusive education theory by Salamanca which was documented in The *Salamanca Statement and Framework for Action on Special Needs Education* that was crafted in 1994 (UNESCO,1994). However, the idea of inclusion refers not only to diversity in the form of ability but also to other differences such as gender, race, socioeconomic status, and cultural background. Nair et al. (2024) also advocated that child coming from a low socio-economic background are disadvantaged groups because they get less support and guidance from parents as compared to those coming from a higher socio-economic background. Inclusive education in this study refers to pre-school children's differences in completing the task successfully which reflects their ability in numeracy skills. Therefore, a teacher is required to assess students' current ability and make an ongoing evaluation based on both individual changes of each student, from the beginning up to the end of the learning process at different time points, and make relative comparisons from individual to individual. This can be monitored using several methods such as dynamic assessment, formative assessment, online diagnosis, or monitoring and checking students' understanding. In inclusive education, the teacher does not neglect children who fail to complete the task but provides them with effective communication and various scaffolding strategies to support learning and inclusion.

2.2. Scaffolding Strategies in Teaching and Learning

Van de Pol et al. (2014) defined *scaffolding* as support provided by teachers to children in small groups during learning and completing a task. This support will fade over time when the learners succeed and can complete the task on their own. However, providing scaffolding is crucial for preschoolers especially the slow learners to promote learning and enhance their understanding.

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Rajanthran et al. (2023) advocated teaching and learning, to have flexible and diverse instructional planning, and to diversify teaching methods.

Additionally, Barqawi et al. (2021) conducted a quasi-experimental study among preschool children on the effectiveness of using scaffolding strategies to teach basic scientific operation. The study sample consisted of 22 children in the experimental group who were taught using the scaffolding strategies, and 23 children in the control group, were taught using the conventional method. The findings revealed that the children from the experimental group outperformed their counterparts from the control group in their performance. The study confirmed that the scaffolding strategies used by the teacher helped the children from the experimental group in developing their basic scientific operations.

Likewise, the study by Alvarez-Vargas et al. (2023) concluded that when teachers used motivational scaffolding strategies, children's learning motivation is enhanced. Similarly, Kangas et al. (2017) and Sun et al. (2023) revealed that teachers play an important role to motivate preschool children in their learning process by providing scaffolding strategies such as guidance and encouragement.

In addition, the study by Boehm and Franklin (2023) indicated that a fun learning environment helps preschoolers to learn multiliteracy skills in a playful way. Lammers et al. (2022) also opined that children learn better when the teacher brings the joy of learning into the classroom. Findings by Bitew et al. (2021) showed that play methods and using concrete materials during scaffolding can boost preschool children's motivation in learning.

2.3. Inclusive Education in Pre-School Settings

Piaget believed that the duration of time each child spends in each stage of learning varies by environment (Piaget, 1981). All children in a class are not necessarily operating at the same level. Teachers could benefit from understanding the levels at which their children are functioning and should try to ascertain their children's cognitive levels to adjust their teaching accordingly. By emphasizing methods of reasoning, the teacher provides critical direction so that the child can discover concepts through investigation. Piaget also stressed that a child should be encouraged to self-check, approximate, reflect, and reason while the teacher studies the child's work to understand his thinking better.

A study by Balik et al. (2024) revealed that preschool teachers perceived that there are several challenges in implementing inclusive education such as; lack of teaching materials, large class sizes, limited knowledge, support from parents, and lack of experience. The teachers also highlighted the need for practical training on implementing inclusive activities on how to engage children actively in the learning process. In addition, Akbulut et al., (2021) also stressed the importance of providing practical training to teachers on inclusive education.

According to Sanches-Ferreira et al. (2022) for the past two decades, the focus of early childhood education has been focused on outcomes of an inclusive school. As such, preschool teachers require training to facilitate them in child interaction in inclusive education settings. Vieira-Rodrigues and Sanches-Ferreira, (2017) also advocated that preschool teacher should equip themselves with various scaffolding strategies to enable them to provide support to children in inclusive education. Many of the studies highlighted the impact of scaffolds on student learning success, but did not explain *how* teachers can plan and implement scaffolds to help the children (Dominguez et al., 2023). This information is crucial as it can provide guidance to preschool educators on how to plan and implement scaffolding to slow learners in inclusive education.

3. Methodology

This study used a qualitative research design (Creswell & Poth, 2016). This study focused on preschool children in an inclusive education setting children whereby their ability in pre-numeracy skills varies. The teacher provided scaffolding strategies and guided them to master pre-numeracy skills (seriation skills, pattern-generating skills, and understanding consistency).

The sample of the study consisted of five preschool children (two boys and three girls) with mixed abilities. They are slow learners, and 6 years old. The researchers used purposive sampling to choose the sample from the 24 children to investigate how the teacher used scaffolding strategies to facilitate their learning and the challenges faced by the teacher in teaching them. The teacher (sample of the

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study) had attended several courses and workshops on scaffolding strategies. The researchers did six classroom observations over a period of six weeks to collect the qualitative data on how the teacher used the scaffolding strategies to teach the pre-numeracy skills.

Besides, two types of instruments were used to collect the data namely, classroom observation checklists (six observations) and semi-structured interview questions (face-to-face interviews with the preschool teacher). The researchers used the qualitative data obtained from classroom observation checklists to answer Research Question 1, and the data obtained from the teacher's interviews were used to answer Research Question 2. The qualitative data were analyzed using emerging themes. Following are the pre-numeracy skills taught by the teacher:

- Seriation Skills
- Pattern generating skills
- Understanding consistency

However, prior to the actual study, the researchers obtained permission from the parents, the head of school, and the class teacher to carry out the study. The researchers also ensured them that all the data were confidential and only be used for the study. The teacher was willing to participate in the study and the head of the school granted full cooperation to the researchers.

4. Findings

4.1. Did the Scaffolding Strategies Employed by the Teacher Help the Preschool Children's Performance in Per-Numeracy Skills?

4.1.1. Seriation Skills to Teach Pre-Numeracy (First observation)

In the first observation, the teacher used seriation skills to teach pre-numeracy. The teacher arranged the objects based on their sizes, from small to big. The objects used during the activity were jasmine flowers, small rose flowers, morning glory flowers, hibiscus, lilies and sunflowers. The first scaffolding strategy employed by the teacher was modelling, whereby she demonstrated and directed the children by giving examples of the process of a baby's growth.

> *The teacher asked the children, "Children, may I know when you were a baby, you look small or big?" All the children replied, "Small baby." The teacher said, "Yes…we looked small." The teacher again asked the children, "Now do you look big or are you still a small baby?" All five children replied, "I look biggggg."*

After asking the questions she continued with the activity and showed how to arrange objects based on their size, from small to big, using real flowers. She taught the children how to arrange the objects from smallest to small.

> *The teacher said to the children she was going to arrange the flowers from small to big, namely the jasmine flower, small rose flower and morning glory. The teacher asked the children "In this box which flower looks the smallest"? Every child started thinking and looked at the teacher. After that, child C said, "this flower" teacher (Jasmine). The teacher said, "Yes, correct dear Child C and well done. The smallest is the jasmine flower". Next, the teacher asked, "Next which flower is smaller"? Child C and child B said, "rose flower". The teacher replied, "Yes, well done". The teacher asked, "After the rose flower what flower will it be"? Child E showed the purple flower. The teacher said, "yes good job; it's the morning glory".*

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The teacher explained the meanings of small, smaller and smallest to the child.

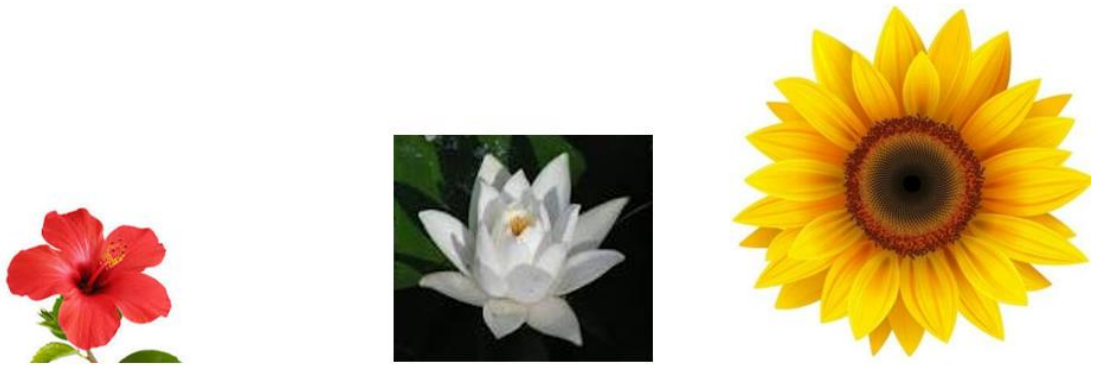
Morning glory (Small) Rose (Smaller) Jasmine (Smallest)

Figure 1.

The teacher asked the children, "Children…which flower looks big in this box"? All the children were silent. "Hmmm" …. Child D said, "Red flower teacher". Then the teacher asked Child D, "What is the flower's name?" Child D looked at the teacher. The teacher told the children to say together the flower's name (hibiscus). The teacher questioned them again, "Children next is what flower?". Child A pointed to the "white flower." The teacher replied, "Hmmm…. Yes, well done." The teacher asked, "What flower is this?" Then Child A was thinking and the teacher got surprised when child A said, "Lily flower". The teacher said, "Good! Well, done." Lastly, the teacher asked, "Which is the biggest flower"? "Sunflower", said all the children. The teacher said, "Wow…Very good children".

After she had explained, the teacher arranged all the flowers from small, smaller, and smallest (morning glory, rose, and jasmine

Next, the teacher explained the meaning of big, bigger, and biggest. Then she taught the children how to arrange the flowers from big to biggest. The teacher arranges the flowers from; big, bigger, and biggest (hibiscus, lily, and sunflower).



Hibiscus (Big) **Lily (Bigger)** **Sunflower (Biggest)**

Figure 2.

For the first attempt, the teacher asked the children to arrange the objects based on their size, from smallest to small and big to biggest, individually. Child E arranged correctly. Unfortunately, Child A,

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and Child B arranged in the order smallest to small (jasmine flower, rose flower, morning glory) but failed to arrange big to biggest because they arranged lily, hibiscus, and sunflower. Child C and Child D failed to arrange both the sizes as they arranged jasmine flower, morning glory, and rose (small to smallest); followed by lily, hibiscus and sunflower (big to biggest). Child A, Child B, Child C, and Child D did not get it right while arranging the flowers from small to smallest and big to biggest. Before the second attempt, the teacher used the guiding scaffolding strategy to help Child A, child B, Child C and child D. The teacher encouraged and motivated the children while doing the activities again and again and gave them sufficient practice. Then, the teacher asked child A, child B, child C and Child D to do the task individually. Child B and Child C arranged the flowers correctly, but Child A and C, and Child D did it wrong again when arranging the flowers from small to smallest. Furthermore, the teacher asked them to do it again with her assistance, and child D did arrange it correctly but child A was still confused and needed some help. In the last attempt, the teacher asked Child A to arrange the flowers by giving clues while Child A was doing the activity. Finally, Child A did it correctly and the teacher used the focused scaffolding strategy. After completing the worksheet, the teacher asked Child A to arrange the flowers again and Child A did arrange them correctly without any guidance or clues from the teacher.

Based on this observation it can be concluded that the teacher successfully used modelling, guiding and focused scaffolding strategies to help the children arrange objects based on size, from small to smallest. First, she used the modelling scaffolding strategy by demonstrating and directing the children on how to arrange the objects from small to smallest. Second, she used the guided scaffolding strategy by encouraging and motivating the children to arrange the objects based on size, from big to biggest. Lastly, she used the focused scaffolding strategy by coaching Child A to arrange the objects from small to smallest and big to biggest.

4.1.2. Seriation Skills to Teach Pre-Numeracy (Second observation)

During the second observation teacher was using seriation skills to teach pre-numeracy. The teacher arranged objects based on the following criteria: short to long. The objects used to conduct this activity were ruler, umbrella, bottle, and Christmas tree. The first scaffolding strategy employed by the teacher was modelling whereby she explained how to arrange object based on the following criterion from short too long.

> *Meanwhile, the teacher asked child-friendly questions, "Which object is long"? The pencil or the ruler?" The Child A said, "Teacher ruler is long". Teacher said, "Well done". The rest was silent.*

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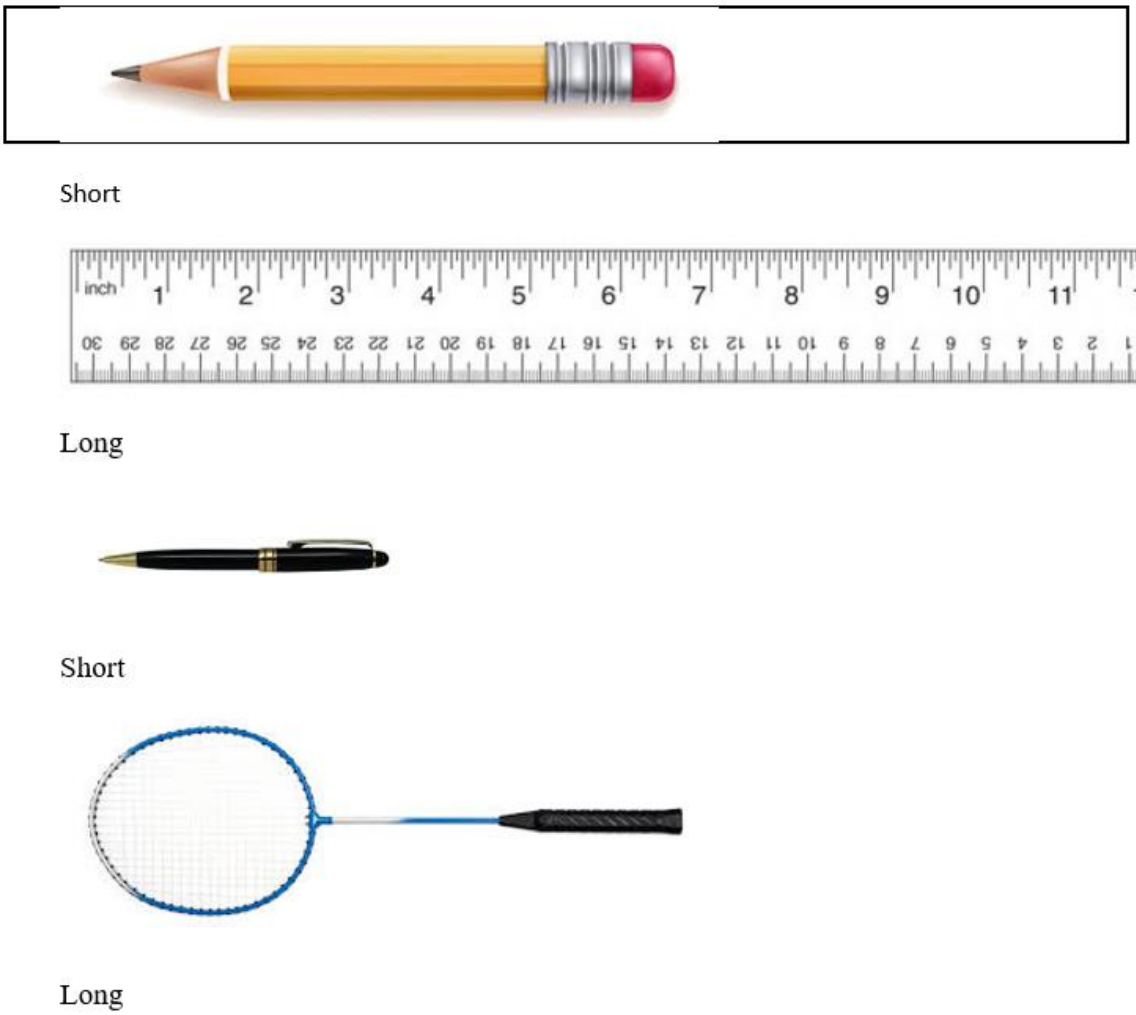

Figure 3.

After that, the teacher showed three times how to arrange the objects from short to long. Then the teacher asked all the children to arrange the objects based on their length. At the first attempt child A, child C and child D did arrange correctly from short to long. Sadly, Child B and Child E were still confused about how to arrange the objects correctly from short to long. Child B was only able to arrange the ruler and pencil correctly. The badminton racket and the pen were not arranged correctly. On the other hand, child E successfully arranged the badminton racquet and the pen correctly but failed to arrange the pencil and ruler correctly.

Before the second attempt, the teacher used guiding scaffolding strategy to help child B and child E. The teacher also motivated and monitored the children during their practice to arrange the objects from short too long. In addition, the teacher coached them using the focused scaffolding strategy to child B and child E while doing the practice activity. For the second attempt, both children were able to arrange the objects from short to long by themselves.

Therefore, based on this observation, it can be concluded that the teacher used modelling, guiding, and focused scaffolding strategies to help the children arrange the objects from short to long. First, she used the modelling scaffolding strategy by explaining to the children how to arrange the objects from short too long. Second, she used the guided scaffolding strategy by motivating and monitoring the children while they arranged the objects from short to long. Lastly, she used the focussed scaffolding

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strategy by mentoring the children while doing practice work in arranging the objects from short to long.

4.1.3. Pattern-Generating Strategies (Third observation)

In the third observation the teacher was using pattern-generating strategies to teach pre-numeracy skills. The teacher completed the given patterns, namely a circle, a triangle, a star, a square, and a rectangle during the lesson activity to complete the patterns. The first scaffolding strategy employed by the teacher showed excavating her drawing out the patterns on the whiteboards and showing them to the children, to teach them to complete the patterns given. After that, the teacher asked the children to name the patterns one by one.

> *The teacher asked, "Children, what is the next pattern after the triangle"? Child A said, "Circle". The teacher replied, "Well done child".*

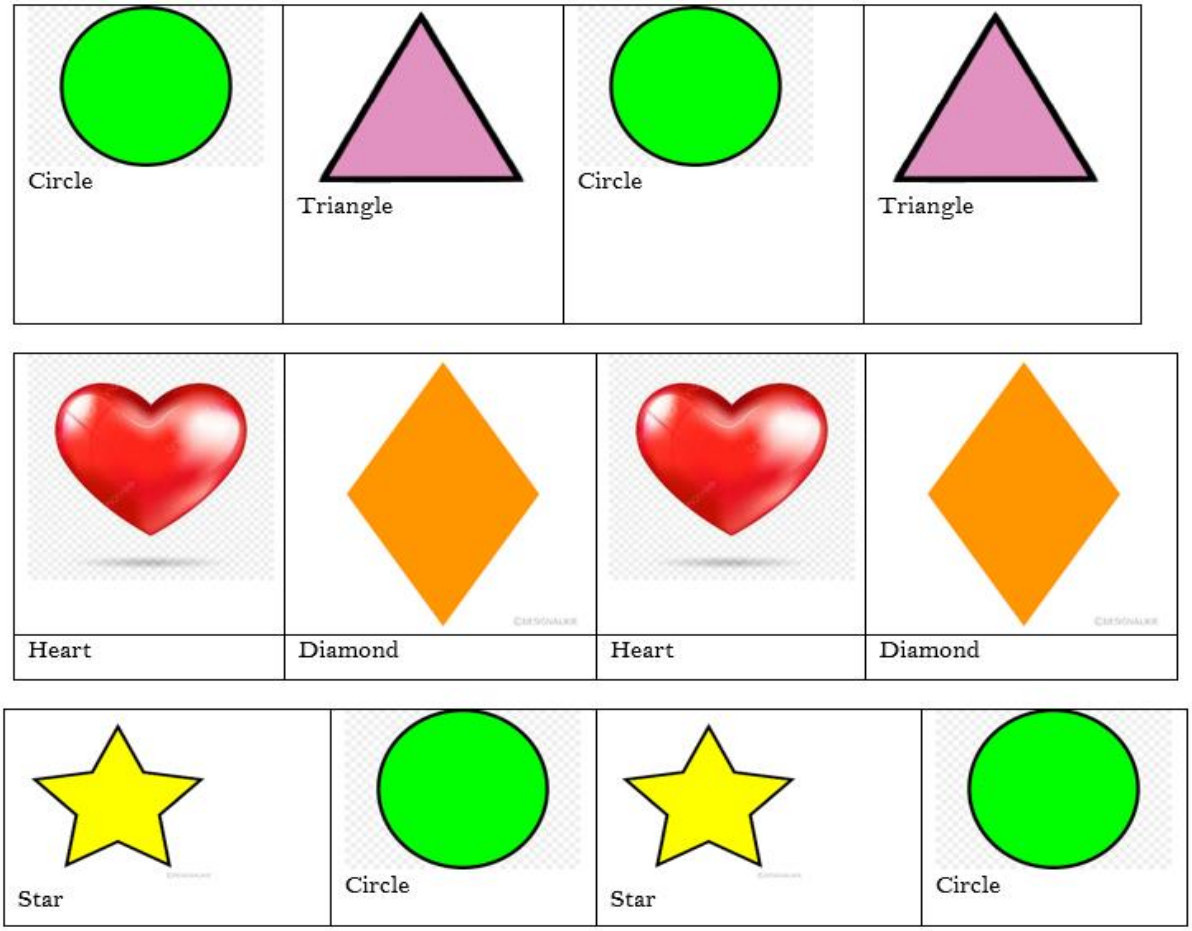

Figure 4.

Next, the teacher used the modelling scaffolding strategy to demonstrate the real patterns of the objects and showed them how to complete the patterns given using pattern blocks. Then, she asked the children to complete the given patterns. Each child was given a set of colourful pattern blocks for every task. At the first attempt Child A, Child B and Child E were able to complete the given patterns, *(a circle,*

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a triangle, a circle, and a triangle), that is by working on two sets of objects: a heart, a diamond, a heart, and a diamond and a second set of a star, a circle, a star and a circle. Unfortunately, child C and child D were only able to complete two sets of patterns, which were the set on a c*ircle, a triangle, a circle, and a triangle and the set on a heart, a diamond, a heart and a diamond.* Both children failed to complete another set of patterns depicting a s*tar, a circle, a star and a star.* However, the children completed the patterns with guidance from the teacher.

Before the next attempt, the teacher used the focus scaffolding strategy to help and coach Child C and Child D. The children practiced more on the skills and the teacher monitored them while they were doing this activity several times. To help the children understand further, the teacher also provided opportunities for child C and Child D to understand the skills through the activity; and let them do it themselves until they understood well how to complete the pattern given. Then, the teacher praised Child C and Child D for being able to complete the task.

> *The teacher said, "Very good, you got it right children. Now you know the patterns well. Clever! Can you show me the circle?"* Child C and Child D picked the circle from the pattern block. *"Right," said the teacher. After that, the teacher asked them to show the shapes of triangles, stars, diamonds, and hearts. Child C and Child D showed the correct patterns. The teacher praised them, "Clever children, clap your hands." Both the children were excited and clapped their hands.*

So, based on this observation it can be concluded that the teacher used excavating, modelling and focussed scaffolding strategies to coach and assist the children to complete the patterns given. First, she used the excavating scaffolding strategy by drawing out on the whiteboard all the patterns she wanted to teach. Second, she used the modelling scaffolding strategy by showing and explaining to the children how to complete the patterns given. Lastly, she used the focussed scaffolding strategy by helping and coaching the children how to complete the patterns given using colourful pattern blocks.

4.1.4. More Pattern-Generating Strategy (Fourth observation)

In the fourth observation, the teacher used a pattern-generating strategy to teach pre-numeracy skills. The teacher taught the children to produce patterns according to their individual creativity; patterns such as triangles, crescent shapes, circles, and rectangles were created during the activity on creating patterns. The first scaffolding strategy employed was extending whereby the teacher asked open- ended questions related to past activities on patterns and the current activity.

> The teacher asked all the children, "Children can you tell me the name of the patterns that you learned yesterday". *Child A and Child C answered very fast, "Circle, triangle". After that, child B, child D and child E said together, "Heart, diamond and circle teacher".*

Surprisingly, all the children were able to answer correctly. Hence, the teacher employed the focused scaffolding strategy to coach the children on how to produce patterns according to one's own creativity, based on the shapes given. To demonstrate the activity, the teacher drew out on the whiteboard the patterns, namely a triangle, a crescent shape, a circle and a rectangle. Then, using these shapes the children created their own patterns., matching a *circle with a circle, a triangle with a triangle, a crescent with a cresent, and a rectangle with a rectangle.* Then, she asked the children to create their own patterns using the shapes given. The children used pattern blocks and arranged the blocks as shown by their teacher. All the children created their patterns using their own creativity.

After that, the teacher drew out on the whiteboard more creative patterns namely a triangle, a crescent and a circle followed by a triangle, a crescent and a circle. In the next line the teacher drew a diamond, a rectangle and a circle followed by a diamond, a rectangle and a circle. Then, the teacher asked the children to use their creativity to make their own patterns using the pattern blocks. For

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example, Child A created patterns based on a circle, a triangle, a diamond, a circle, a triangle and a diamond. Child B arranged a triangle, a rectangle, a crescent shape, a triangle, a rectangle, and a crescent shape. Child C created a pattern using a rectangle, a heart, a diamond, a rectangle, a heart, and a diamond. Child E created a pattern using a crescent shape, a crescent shape, a rectangle, a rectangle, a circle, a circle, a rectangle and a triangle. Child D arranged a rectangle, a circle, a triangle, a rectangle, a crescent shape, and a crescent shape. The teacher encouraged and guided Child E and Child D to complete the patterns using her own creativity. Finally, Child E and Child D were able to complete the task.

Thus, based on this observation it can be concluded that the teacher used extending, focusing and guided scaffolding strategies to help the children to complete the patterns given, by using their creativity. First, she used the extending scaffolding strategy through the use of open-ended questions to elicit the children's prior knowledge about patterns. Second, she used the focusing scaffolding strategy by mentoring the children on how to complete the patterns given, using their own creativity. Lastly, she used the guided scaffolding strategy by encouraging and giving clues to the children to help them complete the patterns using their creativity.

4.1.5. Understanding Consistency (Fifth observation)

In the fifth observation the teacher was using the technique of understanding consistency to teach pre-numeracy skills. The teacher explained the concept of consistency of length. The materials used during the activity were ropes, rulers, pencils and a straw. The first scaffolding strategy employed by the teacher was excavating whereby she drew out the objects (pencils) on the whiteboard with the concept of consistency of length (shortest to longest).

> The teacher asked the children, "Children can you all tell me which pencil looks shortest." Then, child D said, "This green pencil." Teacher said, "Good." After that, the teacher asked again, "Children now which pencil on the white board looks the longest?" Immediately child A replied, "Teacher, red pencil.". After that, the teacher said, "Good job". The rest were silent.

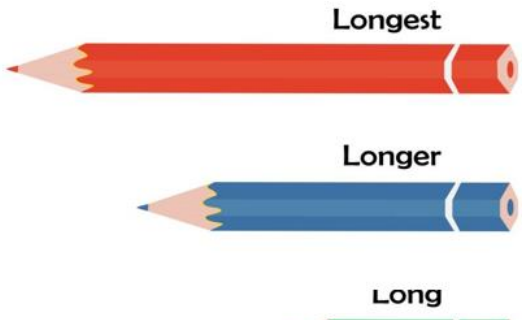

Figure 5.

Further on, the teacher demonstrated to the children the concept of consistency of length (shortest to longest) by using real pencils. Then, she asked the children to point out the arrangement individually. At the first attempt child D and child A were able to say and point out the shortest pencil and longest pencil correctly. Unfortunately, child C, child B and child E were only able to show the longest pencil. Before the second attempt, the teacher coached and mentored child B, child C and child E on the concept of consistency of length (shortest to longest), one by one. Then the teacher asked child B, "Can you point the shortest pencil on the table"? Child B pointed it out correctly. After that the teacher asked the

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same question to child C and child E. Both of them pointed out the correct pencil. Then, the teacher praised all the children for their correct answers. Next, the teacher told the students to repeat the activities using ropes, straws and rulers. When the children were able to point out correctly she praised them.

Therefore, based on this observation it can be concluded that the teacher used excavating, modelling, and focussed scaffolding strategies to help the children to explain the concept of consistency of length (shortest to longest). First, she used the excavating scaffolding strategy by drawing out the objects on the whiteboard before explaining to the children the concept of consistency of length (shortest to longest). Second, she used the modelling scaffolding strategy using real objects by showing the children the concept of consistency of length (shortest to longest). Lastly, she used the focusing scaffolding strategy by coaching and mentoring the children to understand the concept of consistency of length (shortest to longest).

4.1.6. Consistency of Weight (Sixth observation)

During the sixth observation the teacher taught the concept of consistency of weight (lighter and heavier). The materials used during the activity were a book, a fruit, a ball and a chair. The first scaffolding strategy employed by the teacher was modelling whereby the teacher demonstrated to the children the concept of consistency of weight (lighter and heavier). The teacher also explained through facial expressions the meaning of lighter and heavier objects to the children. Then, she asked the children to do the activity individually. At the first attempt, the teacher called child B and asked the child to hold a thin book. Then the teacher asked child B, "Is the book light or the wooden chair"? Child B looked at the teacher. After that, child A, child C, child D and child E were able to hold the objects and state correctly which object was lighter or heavier.

Figure 6.

After that the teacher coached child B to understand the concept of consistency of weight (lighter and heavier) before the second attempt.

The teacher asked Child B, "Which is the lighter object a ball or a bag full of books"? Child B said, 'Ball." Then the teacher said, "Yes, well done."

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Figure 7.

In addition, the teacher showed the children a watermelon and an orange. The teacher held an orange and watermelon and asked the children, "Which fruit is heavy?" The children replied, "Watermelon." The teacher asked, "Why is the watermelon so heavy"? All the children replied, "Its biggggggggggg". The teacher said, "Yesss, because it is big and heavy." The teacher showed the picture of a cat and an elephant, and asked one more question, "Dear children, which animal is lighter? Elephant or cat? All the children replied, "Cat teacher." The teacher said, "Well done. Clever children".

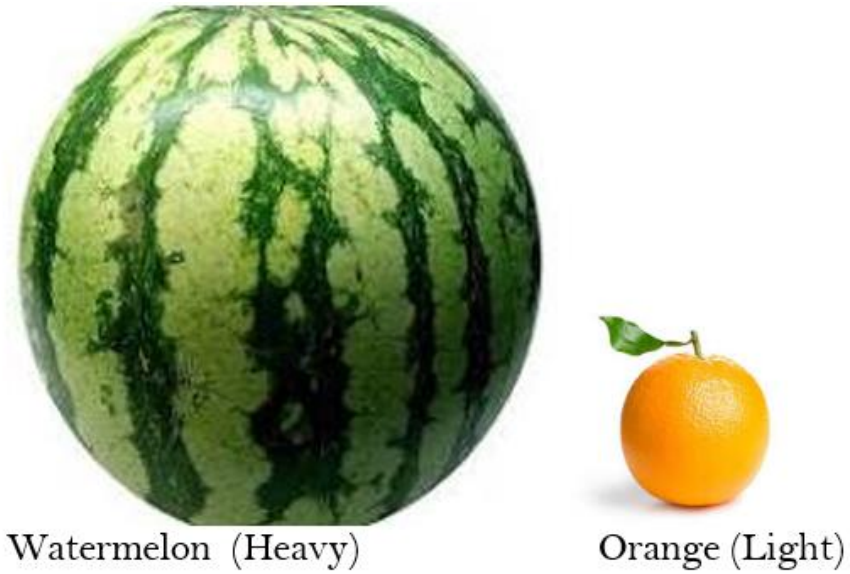

Figure 8.

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Cat (light)	Elephant (Heavy)

Figure 9.

So, based on this observation it can be concluded that the teacher used excavating, modelling and focussed scaffolding strategies to help the children understand the concept of consistency of weight (lighter and heavier). First, she used the modelling scaffolding strategy by demonstrating and explaining to the children, to help them understand the concept of consistency of weight (lighter and heavier). Second, she used the focussed scaffolding strategy by coaching child B to understand the concept of consistency of weight (lighter and heavier). Lastly, she used the excavating scaffolding strategy by using child-friendly questions to help the children understand the concept of consistency of weight (lighter and heavier).

Hence, it can thus be concluded, based on the five observations, that the teacher used excavating, modelling, guiding, focusing, motivating and extending scaffolding strategies to enhance the children's pre-numeracy skills, namely seriation skills in arranging the objects according to size (small to smallest; big to biggest, and short to long), pattern-generating skills and understanding consistency. She engaged the students actively in the learning process and used her own creativity to make the lesson interesting by using real objects and create a fun learning environment.

4.2. What Were the Challenges Faced by the Teacher When Providing Scaffolding to Children During Pre-Numeracy Lessons?

> *The first, challenge is when the children get confused during seriation skills. I have to explain and demonstrate many times until they understand the concept small, smaller and smallest, big, bigger and biggest, short and long.I was at a point of giving up when Child A and C, and Child D failed to arrange the flowers from small to smallest. But I didn't give up. I tried to talk to them slowly and make them comfortable with the learning environment. Then I changed their mood and brought a smile to their faces. After that, I asked them, "Can you try again?" and they replied, "Yess". Finally, after individual coaching, they completed the task happily.*
>
> *The second challenge is to be patient and keep myself cool all the time when some children cannot focus and easily distracted when I was teaching pattern generating skills. To overcame the problem I have to do mentoring individually, spoke softly to the children and changed the material to make the patterns more attractive. I also motivated them by using "praise." By doing this I could see that the child stayed focused, listened to instructions and were able to complete the task correctly.*
>
> *The third challenge is during my lesson there were two children who were not really paying attention. They were walking around and did not stay in the group with their peers. I handle this problem by motivating them and provide individual coaching, using the language that they understand, which is the Malay language. I used simple words to make them connect with the lesson. After a few attempts, finally*

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the they were able to make connections with the activity. The child could arrange objects from long to short and short too long. The child was able to differentiate between what was long and what was short.

The fourth challenge was lesson preparation and getting the materials. I really have to put effort in preparing the lessons and getting the right material to help the children gain more experience and understand seriation skills, pattern generating skills and consistency. Since, planning activities for the children using the scaffolding method was time consuming, I asked for guidance and assistance from my principal. Besides that, I also did some references about scaffolding methods and concepts through videos and articles from the websites.

The findings from the interview indicated that the teacher faced four main challenges while teaching numeracy skills, namely children get confused, the teacher has to be patient and cool, children not paying attention and lesson preparation and getting suitable materials. However, as a dedicated, committed, and effective teacher, she used various scaffolding strategies such as excavating, modelling, guiding, focusing, and motivating to enhance the children's pre-numeracy skills and performance. In addition, she also used her creativity and her knowledge in scaffolding to attract the children's attention during the lesson. She also spoke gently to children and motivated them when they made mistakes. The findings also showed that children finally learned the pre-numeracy skills and their engagement improved and they were willing to learn in an atmosphere full of fun and excitement (when the teacher used scaffolding strategies). The findings also revealed that these strategies are effective in helping the children to master the pre-numeracy skills.

5. Discussion

Findings from this study indicated that the teacher successfully employed modelling scaffolding strategy, motivating strategy, guided scaffolding strategy and focussed scaffolding strategy by mentoring the children how to arrange the objects from small to smallest, big to biggest and short to long. These findings are parallel to results by Alvarez-Vargas et al. (2023;) Kangas et al. (2017) and Sun et al. (2023 which revealed that motivational scaffolding strategies, guidance and encouragement can enhance children's learning motivation and improve their performance. The modelling strategy used by the teacher by demonstrating and giving examples using realia that also attracted the children to be more engaged in learning and completing their tasks. These findings also support findings by Bitew et al. (2021) and Lambers et al. (2022) which revealed that play methods and using concrete materials during scaffolding can boost children motivation and learning.

Further, the teacher used to extend, modelling, focusing, guided scaffolding strategies and motivation to help the children to identify the shapes and complete the patterns-generating tasks. These findings support scaffolding theory by Vygotsky (1978) which stressed that children learn better with guidance from adults and peers. The children had hands-on experience playing with colourful pattern blocks (circle, triangle, diamond, star, and heart shape) to generate patterns. The children enjoyed playing with blocks of shapes. These findings support findings by Kangas et al. (2017) and Sun et al. (2023) who revealed that teachers play an important role to motivate preschool children in the learning process. In addition, the use of concrete materials enhanced their understanding of shapes and pattern-generating.

Finally, the teacher taught consistency of weight (heavy and light) using real objects, a book and a chair; an orange and a watermelon; a ball and a bag. She also used pictures (picture of a cat and an elephant) to teach consistency of weight. Besides using realia and pictures, the teacher employed appropriate scaffolding strategies such as excavating, modelling, guiding, focusing, and extending scaffolding strategies to help the children understand the concept on consistency. As stressed by Scalise et al. (2017 and Schacter and Jo, (2016) when the teachers implement appropriate intervention and scaffolding strategies children make significant progress in their numerical skills.

Likewise, the findings from the teacher's interviews revealed that the teacher faced four main challenges while teaching numeracy skills, namely children get confused, the teacher has to remain patient and cool, children not paying attention, lesson preparation, and getting suitable materials.

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However, the teacher overcomes these challenges by using various appropriate scaffolding strategies, speaking gently to children when they make mistakes, using real objects and colourful pictures to attract children's attention, engaging children in fun learning, and being patient throughout the lessons. These results support findings by Vieira-Rodrigues and Sanches-Ferreira, (2017) who opined that when preschool teachers equip themselves with various scaffolding strategies to provide help and support to children in inclusive education. Furthermore, Piaget (1981) stressed that children in a class are not necessarily operating at the same level. As such, teachers should adjust their teaching accordingly; by emphasizing methods of reasoning, and providing critical direction so that the child can discover concepts through investigation.

6. Conclusion

This study revealed some important findings which have pedagogical, practical, and theoretical implications. In terms of pedagogical implications, this study gives clear examples on how to employ the scaffolding strategies effectively to teach seriation skills, pattern-generating skills, and understanding consistency. As stressed by Dominguez et al. (2023) this information is crucial to preschool educators because they can use it as a guide on how to plan and implement scaffolding to slow learners. In terms of practical implications, the results indicate that Ministry of Education should provide courses and workshops to preschool teachers on how to implement various scaffolding strategies. Current study also has theoretical implications, because the results support scaffolding theory by Vygotsky (1978) and children's cognitive learning theory by Piaget (1981). However, this study has some limitations. First, this is a qualitative study that used the data from the classroom observations and teacher's interviews. As such, it may be expected that the future researchers will triangulate the quantitative data with the qualitative data to get more in-depth information. Second, the current study focused only on teaching three types of numeracy skills (seriation skills, pattern-generating skills, and understanding consistency). Therefore, the future researchers may use the scaffolding strategies to teach other pre-numeracy skills. The final limitation is the sample size; as only five students and a teacher were involved in the study. It is hoped that the future studies will involve a larger sample from more schools for a better generalization of the findings.

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