INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 13, Issue 1, (2024) E-ISSN: 2226-6348

Teaching Early Numeracy Skills: Hands-On Learning in Times of The Covid-19 Pandemic

[1]Noor Atiqah Mohd Noh, [2]Ho Teh Eng, [3]Aini Marina Ma'rof

[1, 3]Faculty of Educational Studies, University Putra Malaysia, Serdang, Malaysia

[2]Faculty of Psychology and Education, University Malaysia Sabah, Malaysia

Corresponding Author Email: noor_atiqah@msu.edu.my

To Link this Article: http://dx.doi.org/10.6007/IJARPED/v13-i1/17640 DOI:10.6007/IJARPED/v13-i1/17640

Published Online: 26 January 2024

Abstract

The advent of the pandemic and the ensuing move to remote learning however, did not stop educational providers from offering experiential educational experiences but its effectiveness is yet to be determined. This study aimed to survey children's attainment of early numeracy skills and sought to understand challenges faced by teachers in conducting hands-on lessons during the COVID-19 pandemic. In this explanatory mixed method research study, 70 five years old children and four teachers from four private preschools who have been using hands-on approach in teaching and learning were selected. Data was collected using one-to-one assessment for the children followed by semi-structured interviews with the teachers. Descriptive analyses, One-way ANOVA and summative content analysis were utilized to analyse and present the findings. The results show that the children's numeracy skills were high in number knowledge and quantity knowledge followed by number comparison, sequencing, and number combination. No significant differences in numeracy skills attainment among the preschools were found. From the interviews, the teachers highlighted the need to overcome three main challenges for effective mathematics teaching during the pandemic, i) student's attention, ii) internet connection and iii) teacher's creativity. Despite lessons being delivered online, the hands-on approach is still applicable during these trying times and teachers have been able to modify and adapt its use to maintain effective mathematical instruction for the young learners indirectly providing specific recommendations for supporting learning during the COVID-19 and post COVID-19 eras.

Keywords: Numeracy Skills, Teacher Challenges, Hands-On Approach, Online Learning, Private Pre-School, COVID-19

Introduction

Numeracy skills are crucial abilities to nurture in early childhood and necessary with the transforming nature of the workforce associated with Industry 4.0 with an increasing demand for science, technology, engineering and mathematics (STEM) skills (Hafni et al., 2019). The education of mathematics provided for the children in preschool period will be the first step in developing positive attitudes toward mathematics in their future life. It was noted (Göbel et al., 2014; Hachey, 2013) that a strong foundation in early mathematics predicts academic achievement in Grades K–6. However, the COVID-19 pandemic has negatively impacted

young children's education, psychological, physical, social, emotional, and cognitive development. This disturbance poses a serious and long-term threat to their general well-being (Benner & Mistry, 2020; Gromada et al., 2020).

While people are hoping that the adverse effects of COVID-19 will be temporary, it is too hard to predict when education systems throughout the world will resume normal operations. Currently, school closures have affected more than 1.6 billion students worldwide (UNICEF, 2020). Given these numbers, unless we take active measures to minimize the pandemic's impact on young children's schooling, we can expect dropout rates to rise soon with serious long-term consequences for the most vulnerable (Spiteri, 2020; UNESCO, 2020b). In this circumstance, authorities appear to be more concerned with minimizing negative economic consequences and the spread of the virus than with other aspects such as education (Spiteri, 2020). Education cannot be neglected, hence all parties in the field of education especially the educators should take the initiatives to make sure that early childhood education is not lacking behind.

Therefore, online learning usage has increased dramatically during this pandemic (Schleicher, 2019). Many countries have been able to adopt online learning swiftly (Jalongo, 2021; Araújo et al., 2020). However challenges remain for some, especially in early childhood education. The transition negatively impacts preschoolers learning since early years education focuses on providing real-life sensory experiences, hands-on activities, and meaningful face-to-face interactions, which are challenging to achieve virtually (Timmons et al., 2021; Sailin & Mahmor, 2018). They need to have first-hand experiences with the learning materials rather than learning through observation or through another person’s experiences and perspectives.

Therefore, it is pertinent to determine an approach that works for young children regardless of teaching mode in learning mathematics for the sake of their future. Children with poor numeracy skills will have difficulty reasoning and solving everyday life’s problems (Lewis Presser et al., 2018). Decades of research have shown that early numeracy is strongly predictive of later cognitive and educational outcomes (Balala et al., 2021) that are very important for future success and well-being.

Importance of Numeracy Skills in Early Childhood

The early years of an individual's life are the foundation on which the rest of life is built (UNESCO, 2020b). Early childhood research has shown that the first six years of life demonstrate the significance of early mathematics experiences. Children's confidence and ability to understand and apply mathematics develop in an engaging and supportive environment throughout their early interactions with mathematics. These good experiences may support the development of curiosity, imagination, adaptability, inventiveness, and perseverance, which contribute to a child's future success in and out of school (Clements et al., 2004).

Moreover, what they know in mathematics also predicts their reading achievement later. Mathematics appears to be a core component of cognition since early mathematics predicts later mathematics and reading (Jordan et al., 2012). Children with good mathematics skills will be better at thinking and problem-solving. People often think of mathematics in terms of sums and figures in school. However, mathematical thinking includes problem-solving,

manipulating data, dealing with information, making decisions, and a way of understanding things around us (Lewis Presser et al., 2018). Having encouragement and enough opportunities to learn these skills in the early years will let children construct a strong background for understanding advanced mathematics (Dyson et al., 2013; Hachey, 2013).

Research shown that children's experiences with numbers in elementary school years have a significant influence on their beliefs and attitudes toward mathematics (Dyson et al., 2013; Erdogan & Baran, 2008). They are more likely to develop positive attitudes and beliefs about mathematics if they have enjoyable experiences in their early years eventually developing a growth mindset from young. Therefore, knowledge of mathematics is associated with a lot of positive benefits to the children that not only focus on academic success but also on their future life. They are more likely to develop positive attitudes and beliefs about mathematics if they have enjoyable experiences in their early years.

Development of Numeracy Skills through Hands-on Approach

Children's knowledge about the world accumulates since they are young (MacDonald & Murphy, 2019). They learn best by exploring and actively engaging with the surroundings through their senses, which leads to cognitive development (Coles at al., 2019; Vygotsky, 1978). The hands-on approach is a method that allows children to interact and experience by manipulating objects. Through this approach, children can engage in actual life applications and observe the effects of changes in different aspects (Lewis Presser et al., 2018; Piaget, 1952). It has been identified as one of the effective methods to increase children's academic achievement and understanding of concepts which may make abstract knowledge more concrete and apparent (Cole at al., 2019). This also have been supported by American psychologist, Jerome Bruner thought Concrete, Pictorial and Abstract (CPA) approach. This approach builds on the children's prior knowledge by introducing them to abstract concept in a concrete and tangible way before they can be independent to gasp the concept. This approach was widely applied in mathematics learning.

During the pandemic hands-on learning was demonstrated virtually by the teacher in front of a video-camera. Children then follow the sessions from home. Teachers taught and provided virtual guidance through the various available online platforms such as ZOOM and Google Hangout. Teachers need to adapt by demonstrating techniques on online platforms and encourage children to send photos and communicate the final result back to the teacher digitally (Szente, 2020). Many preschools arranged the educational contents and materials to be delivered to the children at home for their online learning during the pandemic even it may not be ideal as these young children need appropriate interactions with adults and peers to scaffold their learning (Timmons 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). Past studies also revealed that experiential learning allows the children to have a deep understanding of the concept instead of the conventional chalk and talk method (O.Ekwueme et al., 2015). When children connect the existing and new representations, they can access powerful mathematical ideas relevant to their everyday lives (Piaget, 1952).

Teaching Online in Early Childhood Education

The number of children who are currently using online tools rapidly increase due to the development of touchscreen technology and Internet accessibility. Nowadays, children can engage in creative and communicative activities with the use of Information and Communication Technology (ICT) in modern schooling. Hence, the ability of the teacher to use technology during teaching can affects the success of remote education. These can be seen when teachers are unable to handle the online tool well that can reflect their attitude, which could impact children's motivation and learning (Kim, 2020). During face-to-face teaching, teachers frequently employ technology in their classrooms such as displaying pictures or movies. Compared to online teaching, they will need to take on new responsibilities (Ghavifekr & Wan Athirah, 2015). Teachers may discover that incorporating technology into their lessons is challenging (Hébert et al., 2021; Konca et al. 2016; Lindahl and Folkesson, 2012). A reason for this situation because of the gap between the e-courses they studied in their educational programmes and the degree of current ICT required them to do more practice. It becomes a barrier for them to teach using ICT effectively (Kim, 2020; Kalogiannakis 2010).

In addition, study from Gurung (2021) also mentioned that most teachers found challenges in tracking students' progress during online learning. Naturally, each student has their styles of learning ability and some of them require special attention during learning. However, a minority of the teachers believed that they could keep track of the students by assisting with the software and application. It is an additional responsibility for teachers to think on children's unique peculiarities as well as their developmental levels when online teaching. After the students have logged in, teachers must manage each child's unique needs, by taking into account their learning styles, personalities, and interests. This became critical when online teaching limits the number of interactions with children. Teachers must optimise the value of their communications and language with each child and create a welcoming social atmosphere in order to encourage all children to participate in learning (Kim, 2020).

Study from Lindahl and Folkesson (2012) to the preschool teachers stated that while technology aids children's success and learning, it is also challenging to be utilised (Ghavifekr & Wan Athirah, 2015). It becomes challenging when the teacher needs to prepare the materials to teach, such as PPT's, Docx, videos and many more. It consumes more time to prepare the materials compared conducting the classes. However, developing online course content will be useful in the future as it does not consume time as previous time consumed in preparation. Besides, other teachers mentioned that they did not require much time to prepare the content as the content already develop by other people such as curriculum developers or content available in the open resource (Gurung, 2021).

Based on Kim (2020) various tasks must be completed during the planning, execution, and reflection phases of online teaching. Skills such as critical thinking, creativity, teamwork, and communication are always necessary whether the subject is taught online or offline. Therefore, appropriate instructional practices courses for teacher's education and online collaborations with schools and families can support teachers' experiences for efficient online teaching and learning (Hébert et al., 2021; Kim, 2020).

Existing Mathematics Preschool Programs using Hands-on Approach in Malaysia

Preschools established by the private sector have always been seen as an alternative for high-quality early childhood education compared to public preschools (Mustafa & Azman, 2013). Nonetheless, these private preschools must adhere to the National Preschool Curriculum

Standards (NPCS) as needed in the National Education Act 1996. The teaching and learning approaches emphasized in NPCS are inquiry, play-based, project-based learning and integrated approach. Many private preschools offer additional programs with various emphasis on different types of pedagogy to cater for different needs of the market while ensuring these programmes are aligned with the NPCS. In addition, these private preschools offer selected programs at an additional fee, striving to enhance further the children's knowledge and skills.

Along with the recent emphasis of STEM education by the government, many program providers in Malaysia (e.g., Alfa and Friends, MiKids and Learning Box Education) offer hands-on programs in learning mathematics that comes with individual children learning kit which aims to support experiential learning (e.g., Euler Maths, Mathematical Modelling Programme and Mathematics MiKids). The program providers would ensure its program meet the NPCS, including the mathematics learning standards stipulated. These providers would usually offer a programme encompassing ages three to six years old and each child would be provided with a mathematics' kit. Generally, the program aims to give a systematically interactive programme that brings out fun, stimulating activities that aim to help children develop numerical skills early in their life that help them develop numerical skills early in their lives (Alfa and Friends, 2021; Learningbox, 2020). Besides learning about numeracy, children learn other skills such as patterning, spatial, measuring and problem-solving (Alfa and Friends, 2021) that relate to real-life situations.

There many arguments in multiple aspects in achieving high-quality early childhood education (Mustafa & Azman, 2013). However, adopting a good program for teaching and learning is also an important aspect to produce quality early childhood education. Previous studies have mentioned a lot about the importance of play-based approach through hands-on activities in teaching and learning in early childhood (Ali & Mahamod, 2014). Therefore, by taking into account the various aspects above, this current study had come out with these research objectives:

(1) To survey the preschooler's numeracy skills after nine months-long of COVID-19 interruptions in their learning.
(2) To compare the differences of numeracy skills among preschools that used a hands-on approach during the COVID-19 pandemic.
(3) To understand the challenges in conducting hands-on lessons and how they handle it during the COVID-19 pandemic.

Methodology

Research Design

This study employed the explanatory mixed-method design where preschoolers' numeracy skills were surveyed via one-to-one test assessments and semi-structured interviews conducted with the teachers to elicit a clearer understanding of the questions under study. This design was deemed most appropriate because this study seeks to clarify the quantitative result (Ivankova et al., 2006) by understanding the challenges faced by the teachers in delivering the lessons and yet how they managed to handle it during this challenging time. The population of this study were private preschools around Klang Valley, Malaysia, that used a hands-on approach in learning. Four private preschools were purposely selected because they used a hands-on approach in learning mathematics for the past nine months during the

pandemic through online or blended face-to-face (in-person) learning. A test via one-to-one, face to face assessment was conducted after receiving approval from each preschool's operator. A total of 70 five-year-old preschoolers assented to participate in this study, with additional consent from their parents. Most of the subjects taught in the preschools, such as science, language, art and craft, also uses hands-on approach. A simple semi-structured interview was conducted with the teachers after completed the student's assessment with their informed-consent.

Table 1 shows the background information of preschools and mathematics classes for the five-year-old preschoolers in this study. Data consists of the number of students who participated, the number of teachers per class and their teaching experience.

Table 1
Background Information

Preschools	Number of students	Numbers of teachers	Teaching experience
A	24	2	21 years
			8 months
B	24	2	3 years
			6 months
C	16	1	1.5 years
D	6	1	9 months
Total	70	6	

There were four private preschools, and 70 preschoolers participated in this study. The number of students in each preschool is not consistent due to the current pandemic resulting in lower students' enrolment in some preschools. The participating teachers were the primary teachers who taught mathematics to these students. The primary teachers from three preschools have an average of one to five years of teaching experience in mathematics. One preschool has a teacher with teaching experience of more than 10 years.

Research Instruments and Procedure

Questionnaire were adapted from several existing assessments such as ROOTS assessment of early numeracy skills (RAENS) (Shanley et al., 2018; Clarke et al., 2012) and previous studies on math literacy and numeracy skills (Shanley et al., 2018; Purpura et al., 2017) with Cronbach alpha .80 to .92. Besides that, the items constructed were also based on the NPCS (Ministry of Education, 2017).

There were 62 test items divided into five main components of mathematics literacy, namely number knowledge, quantity knowledge, number comparison, and number sequence. In order to establish construct validity of the items, a panel of three field experts was sent the questionnaire to get their opinions. Based on their feedback, questions were finalized. Aside from that, a reliability test was conducted with 28 children to ensure the internal consistency of the questionnaire. As a result, the questionnaire showed high reliability with Cronbach alpha .95. Description of each construct is listed in Table 2.

Table 2
Description of Constructs in the Numeracy Skills Questionnaire

Construct	Items	Description
Magnitude comparison	13	Able to compare different objects (size, length) and numbers (small and bigger numbers).
Numeral knowledge	14	Able to recognize and write numbers 1 to 20.
Quantity knowledge	9	Able to associate numbers with objects.
Number sequence	5	Able to compare and sequence numbers from smaller to the bigger number.
Number combination	21	Able to add and subtract numbers within 20 and solve mathematical story problem.

Adapted from RAENS (Shanley et al., 2018; Clarke et al., 2012)

The semi-structured interview questions were developed to address the research objectives of the study while also ensuring that a range of perspectives and experiences could be captured from teachers. All measures were individually administered to the children. The test was conducted in March, 2021 for three weeks. Each child took about 15 to 20 minutes to complete the test. We first ensured consent letters from the preschool and parents for the participation of their children were verified before conducting the research. Ethical considerations were made to protect the anonymity and confidentiality of the teachers and children involved to ensure that the participants would not be at a disadvantage. Mathematics materials such as link-cubes, counting sticks and ten-frame were used during the test.

Even though the one-to-one assessment was time-consuming, it was employed in order to create an understanding of what children know and can do, and for planning instruction. It enabled the researcher to observe the children striving to determine the strategies they used to solve the problems and any misconceptions they have (Gervasoni & Sullivan, 2007). Children were allowed to use the written method for difficult calculations to perform mentally (Gervasoni et al., 2017). At the end of the research period, one teacher from each preschool was interviewed to share their experience in conducting the lessons during this pandemic. For the preschools with two teachers in a class, purposive sampling was used by choosing the primary teacher instead of the assistant teacher for the interview.

Data Analysis

In this study, descriptive and inferential statistical analysis using SPSS version 25 was used to analyze the quantitative data. Descriptive analysis was used to describe the overall frequency of children numeracy skills and also to analyze the differences of numeracy skills among preschools that using hands-on approach in teaching. By using this statistical analysis, the researcher was able to compare and identify the level of numeracy skills among preschools during pandemic. The qualitative interviews were analyzed using summative content analysis. Once data were transcribed into written text, the data were organized using open coding. The scripts have been thoroughly and repeatedly read so that as many headings as necessary can be found and written down in the margin to describe all the aspects of the content (Hsieh and Shannon, 2005). Then, similar heading was grouped into sub-categories. Finally, the main

categories or themes that emerged from the transcribed interview data were analyzed to answer the study's objective.

Results and Discussion

This part discusses the findings the three objectives of the study: level of children's numeracy skills; differences of numeracy skills among children and challenges teachers faced in conducting hands-on lesson during the pandemic.

Level of Preschoolers Numeracy Skills

Descriptive statistics on the level of children's numeracy skills is shown in Figure 1.

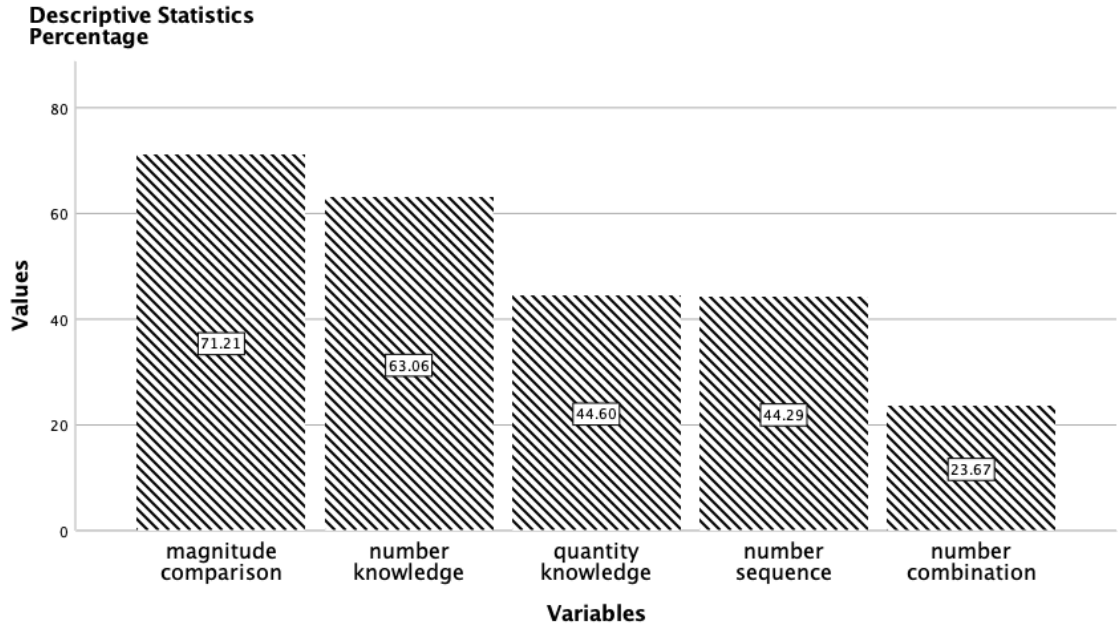

Figure 1: *Level of numeracy skills based on the construct*

The result showed that the level of magnitude comparison has the highest percentage with 71.21 percentage, followed by number knowledge 63.09 percentage. These two numeracy skills are essential to the children before they can advance to a higher level. Past research showed that children who acquired low level of these two numeracy skills often will have problems doing other basic mathematics (Schneider et al., 2018). The following numeracy construct was quantity knowledge with 44.60 percentage followed by number sequence 44.29 percentage and number combination 23.67 percentage. Number combination (e.g., addition, subtraction and number bond) comprises of part-part-whole relationship and the ability to differentiate and identify this structure has been described as critical for children's progress of powerful arithmetic strategies and skills (Baroody, 2016; Fritz et al., 2013).

Early number proficiencies follow a developmental progression (Clements & Sarama, 2007). Most children move from core knowledge of numbers (e.g., small number recognition and counting), to number relations (e.g., number after knowledge, determining the larger of two numbers) to number operations (e.g., mentally adding and subtracting with small numbers) (National Research Council, 2009). The progression repeats as children learn larger numbers. Children need to be prepared with basic number knowledge, magnitude comparison and quantity knowledge before they moving towards more advance number skills. Their

understanding from core knowledge of numbers will be further linked to numbers composition and decomposition (e.g., addition and subtraction). Many studies of young children's basic numerical skills development mainly focus on early counting skills from where children learn to add and subtract numbers, where one group of objects is added to another or removed from a larger group (Kullberg et al., 2020). This is supported by Gray et al., (2000) who founded that children who could not solve mathematics problems in elementary school also relied substantially on the counting methods.

Past studies of meta-analyses also stated the significant correlations between numerical skills and mathematics (Schneider et al., 2018) and numerous studies had shown a predictive association between mathematical performance and number comparison skills (e.g., Feigenson et al., 2013; Starr et al., 2017). Aside from that, the magnitude comparison task can evaluate the mental representation and processing of numerical magnitudes (De Smedt et al., 2009; Cueli et al., 2019), which can predict mathematical competence (Schneider et al., 2018). All the five constructs in this study are related to one another and essential as a basic mathematics foundation before the children start primary school.

Differences of Numeracy Skills Among Preschools

One-way ANOVA analysis was conducted to determine if there was any statistically significant difference among preschools that used a hands-on approach in teaching and learning towards children's numeracy skills.

Table 3
Descriptive Analysis of the Preschoolers

Preschools	N	Mean	Std. Deviation
A	24	.5131	.20144
B	24	.4973	.19535
C	16	.4247	.22258
D	6	.5852	.23059
Total	70	.4937	.20697

Levene's Test was conducted before further analysis were made to ensure the homogeneity of the groups and sample. The analysis result show that the variances were homogeneous ($p > .05$). This show that the variance is equal across the groups of the study. Table 4 shows the result of one-way ANOVA.

Table 4
Numeracy Skills Differences Among Preschools
One-way ANOVA
Mean_Numeracy Skills

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.136	3	.045	1.060	.372
Within Groups	2.820	66	.043		
Total	2.956	69			

The result showed no significant difference between preschools and children's numeracy skills F (2, 69) = 1.060, p > .05. This shows that all the preschools that used hands-on in teaching and learning offer the same level of numeracy skills during the pandemic. This can be related to a previous study that mentioned that hands-on learning allows the children to experience and explore by themselves a previous study mentioned that hands-on learning allows the children to experience and explore what has been taught and demonstrated by the teacher. Instead of listening to the teacher, children actively engage with the lesson by solving or create something. However, it is shown that the children still manage to synthesize the information taught by the teacher.

Hands-on-approach is an instructional strategy where children are guided to gain knowledge by experience. It is a method of doing mathematics in which students take an active role in the classroom (Alfa and Friends, 2021). Trnova and Trna (2015) hypothesize that the hands-on learning approach involves the child in a total learning experience, enhancing the child's ability to think critically. Therefore, it is evident, therefore that any teaching strategy that is skilled towards this direction can be seen as an activity-oriented teaching method. This was supported by Obanya (2012) that learning by lecture has a retention rate of 5%, but practising by doing, which is activity-oriented, has a retention rate of approximately 75%. It can be observed that the retention rate rises when more interactive and activity-oriented teaching approaches are used. In line with NPSC that identified the learning through play approach as an effective teaching and learning method for meaningful early learning experiences rather than a formal method (Ministry of Education Malaysia, 2017).

Challenges in Conducting Hands-on Lessons During the Pandemic

It was found that numeracy skills of these four preschools showed the same level of numeracy skills by using the same approaches in teaching and learning. For further understanding of the results and the challenges faced by the teachers and how they handle the lessons were figured out via the interviews conducted. There are different challenges in conducting lessons online and face to face during the pandemic. Analysis of the transcripts identified three main themes relating to challenges of hands-on teaching during pandemic, i) student's attention ii) internet connection and iii) teacher's creativity. Most of the teachers mentioned that maintaining children's attention is the key challenge because the children quickly get distracted.

> *"To grab the children attention is the main challenge because some children can pay attention but some can't pay attention on screen. Their attention span is different..."* *(Teacher B)*

Hence, the lesson needs to be interesting to ensure they stay in front of the camera during an online class. The teacher also mentioned the difficulty when they need to show or demonstrate something; they need to adjust the laptop screen so that the children can see clearly. If the connection is poor, they need to explain a few times to make sure the children understand the concept (e.g., handling and using the *Rekenrek* to do addition and subtraction).

"If the internet is unstable then it is quite tough to teach online. Those technical issues are out of my power to change…" *(Teacher D)*

This result was supported by Gurung (2021), who found that the problem related to electricity and internet connectivity during online teaching is one of the major problems that are unable to control. The problem, such as sudden cut down of electricity and a low internet connection, causes unclear voice and video that make the students lose interest during learning. Aside from that, past studies also mentioned that the situation becomes more challenging when the children may not have access to the internet or have limited experience with online learning tools like computers. Another constraint to consider is that online learning for children and online access necessitates adult supervision. Thus, adult availability and involvement are also required (Wedenoja, 2020).

Teachers were unable to assist the children in person, therefore children's attention is vital during this time. Teachers also have limited access to keep tracking their progress. They generally rely on observing and responding to children's overt behaviours as evidence of their attention in face-to-face settings. However, in an online setting, teachers may be able to see only a child's head and shoulders at most, limiting the information available. In this situation, teachers must turn to other sources of input. Similar to the study by Gurung (2021) that it is challenging to teach and trace whether the child is understanding during numerical subject online learning. Children are unable to respond immediately to the teacher if they have any doubt about the contents. Aside from that, teachers have a constraint to check each children's understanding. To overcome the challenges, teachers mentioned that they need to be more creative in delivering the lesson. It was a personal challenge to them.

> *I need to spend time to think and explore the online activity or any interesting activity that children can do, or they can do together with their parents at home."*
>
> *(Teacher B)*

Before starting the class, they organized the lesson in a planned way to make sure all the children understood the content. Besides a hands-on approach in teaching and doing workbooks or worksheets, the teachers added some multimedia, online activities, and quizzes to make sure the children can understand the lesson. In addition, they put extra effort into learning and exploring new online platforms to facilitate learning. Teachers also mentioned that conducting some games and quizzes with the children can enhance their engagement with the lesson.

However, the use of appropriate and relevant pedagogy for online education may be dependent on both instructors and learner's knowledge and exposure to ICT (Jalongo, 2021). Past study from Timmons et al (2021) mentioned that teachers are required to develop creative initiatives to help overcome the constraints of online education. Teachers can actively collaborate at a local level to improve online teaching methods. There are incomparable opportunities for cooperation, creative solutions and willingness to learn from others (Doucet et al., 2020). This effort is for the sake of the children life-long learning. However, in the case of Teacher A, who taught face to face for more than 20 years, used less of an online platform than other teachers. She focuses on the exercise by converting the worksheet into digital and create a task for the children. She mentioned that:

> *I converted the worksheets and exercises into digital [format] and shared it with [the] children. I also created activities that children can conduct together with their parents at home*
>
> *(Teacher A)*

Based on the interviews, teachers need to be creative and put extra effort to ensure the children remain engaged with the lesson. Despite the challenges associated with limited knowledge of technology and allocation of resources, teachers were aware of initiatives to improve access and equip students with the necessary resources (Doucet et al., 2020). Aside from that, opportunities to learn how to educate children through online programmes effectively have not been a significant concern in teacher education courses. However, COVID-19 has drawn a change line that more consideration should be paid to develop suitable techniques and procedures. Aside from that, the traditional way to deliver the lesson to the teachers needs to be reconsidered with the new methods, skills, and knowledge, so that future early childhood educators have some insight to teach online (Sailin & Mahmor, 2018). Therefore, a well-designed programme that may boost instructors' enthusiasm and encourage them to adopt new technologies (Ghavifekr & Wan Athirah, 2015; Kalogiannakis 2010; Chen and Chang 2006) need to be done.

During the face-to-face classes or in-person teaching, there exist different challenges as compared to the online classes. The most obvious challenge is that everyone in the preschool needs to practice the 'new norm'. The children need to maintain a one-meter distance from each other all the time. It became a challenge to the teacher when the children did not want to stay at their place during the lesson, and at times, they could not see the teacher demonstrating in front of the class. To ensure social distancing is implemented and practised, the teacher had to review the lesson first and carefully organize and plan the activities conducted in the class. In addition, the materials for the lesson also need to be sanitized after being used. However, Teachers B and C mentioned that each child in their centres has an individual kit for the mathematic lesson that eradicated the additional task to sanitize the whole materials. This is because the mathematics program they used already comes together with the student's materials (e.g., Euler Maths). Most of the teachers agreed that adapting the 'new norm' in their centres takes time. But they have tried their best to make learning more fun and effective for the children while protecting them from the pandemic.

> Children learn best via play and concentrate best when they can be active and participate in hands-on activities. Mathematics skills in the early primary level are frequently fostered through guided play-based activities and hands-on approach whereby students can develop numeracy skills, create patterns, sort items, estimate, etc. (Ginsberg, 2006). For rich learning to take place, however, purposeful interactions between teacher and children also need to take place (De Vries et al. 2010; Ginsberg et al., 2008), where teachers may apply differentiated instruction to the children with different abilities and interests (Hedges et al., 2011; Hachey, 2013). These enable teachers to assist students in consolidating and applying their knowledge in appropriate situations.

Thus, effective mathematics instruction requires teachers to attentively engage with the child to cater to individual needs (Muthukrishnan et al., 2019). This becomes increasingly challenging to do when teaching and learning during the pandemic, but it should not be a

barrier for the teachers to deliver quality teaching. We may not be able to return to teaching and learning in the same ways we did before COVID-19, nor will we be able to provide the same types of environments and activities that we can in a classroom (Kim, 2020). Therefore, it is essential to think ahead so that we can plan for and anticipate potential constraints in the future. It is vital to support teachers with knowledge and skills for online teaching, including communicating with children through this medium. Nevertheless, by making this approach in learning, the interaction and experience of the children with the lesson continue to be positive.

Conclusion

Basic numeracy skills are essential to the children for primary school readiness. Without a good foundation in these skills, children will continue to struggle with higher mathematical concepts. In addition, children need to learn how to solve problems which is one of the basic early mathematic skills and significant to all areas of academics and life outside of school. The presence of COVID-19 in the world may directly and permanently change education in the future, and we must be able to adapt. However, the excitement to learn mathematics should not be stopped by any circumstances and adopting a practical learning approach is crucial, especially during this pandemic. This study also captures teachers' perspectives on the challenges and unexpected successes associated with online teaching and learning while providing specific recommendations for supporting learning during the COVID-19 and post COVID-19 eras. Yet, the challenges do not restrain the teachers from continuing to deliver the best education to the children. In this situation, all stakeholders such as schools, parents, teachers, and government should make an extra effort and work collaboratively to combat this crisis and alleviate the educational challenges resulting from the pandemic for the future generation. It is critical to think ahead to plan and consider limitations that we may face in the future.

Acknowledgment

This research received no specific grant from any funding agency in the public, commercial, or not-for profit sectors.

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