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A STUDY OF EFFECT OF THE USE GAMES TOWARDS MATHEMATICS PERFORMANCE OF PRESCHOOLERS

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ABSTRACT

This study aims to investigate if there a significant different in pre and post of Early Mathematics performance. A single group pre-test and post-test with intervening Early Mathematics based games was used in this research. This involved assessment on the early Mathematics abilities (Ginsburg & Baroody, 2003). This program was conducted among preschoolers (aged 5-6 years old) in one selected rural preschool in Menggatal district, Sabah. The school has 4 classes of 25 students each, with a total of 100 preschoolers. One sample t-test was conducted to compare mathematics ability of children before and after intervention. Mean score for pre-test is 15, while mean score for post-test is 22.32. There was a significant difference in the scores for mathematic ability in pre-test (M=15.78, SD=.99) and post-test (M=22.32, SD=.78), t (86) (=-28.52, p = 0.000). The results show, that the use of games developed by authors are effective in improving preschoolers early Mathematics performance.

Keywords: preschoolers, early mathematics, games

INTRODUCTION

According to Noraini et al. (2011), culture of Science, Technology, Engineering and Mathematics (STEM) education in school should be established in order to promote critical and creative thinking skills in line with the 21st century among students since young. To be precise, STEM education creates critical thinkers, increases Science literacy, and enables the next generation of innovators. STEM education plays a crucial role in producing high quality students who are problem solvers, innovative, creative, independent, logical thinkers and Technology savvy (Morrison, 2006). By exposing children to STEM and giving them opportunities to explore STEM-related concepts, they will develop a passion for it and pursue a job in a STEM field. Aminah et al. (2015) argue that STEM education should be started from the early stages of childhood because children at this stage are more likely to ask questions about everything to adults in their environment especially to their parents and teachers.

Malaysia is among the countries in the lowest position, especially in Mathematics and Science as stated in the analysis of the Program for International Student Assessment (PISA) 2015. Therefore, STEM Education will be given attention by all parties in an effort to produce a society with STEM literacy and high skills" contained in the text of the speech of the Most Honorable Former Prime Minister of Malaysia, Tun Dr. Mahathir Mohamad, Acting Minister of Education in the Honorary Prime Minister's Mandate and Aspirations Ceremony and Acting Minister of Education with Citizens of the Ministry of Education Malaysia 2020. In line with the keynote that addressed by the Most Honorable Prime Minister of Malaysia, Muhyiddin Hj. Mohd. Yassin In conjunction with Teacher's Day Celebration 2020 “However, the achievement of our country as a whole is still below the average achievement level of OECD countries. This requires our teachers to redouble their efforts to boost the quality of education in our country to be on par with the quality of education at the international level. I know this effort will take time”.

While the intellectual health of a country begins in the home, prior-to-school experiences play an essential role in ensuring that all children particularly those regarded as being ‘at risk’ have a sound beginning. This situation calls for serious steps to be taken by early childhood practitioner to strengthen STEM education since early years.

Today, the implementation of STEM can be seen in the second wave in Malaysia education blue print (2013-2025) when government, statuary bodies, associations, non-governmental organizations (NGOs) and external agencies collaborate together in promoting STEM to the local community. Through this collaboration, STEM education produces young generation who have high capacity in Science and Technology. This is also capable for driving the country’s economy and develops Malaysia as a high-income nation. STEM education has been considered as something that needs to be taught and mastered by students especially starting at an early stage to prepare the generation in the face of 21st century competition (McClure et al., 2017).

Children are naturally curious in their first five years, and this is the best time to introduce Science, Mathematics and reading skills. Noraini underlined the importance of nurturing greater interest in Science and Mathematics among young learners through experiments, quizzes and other innovative teaching approaches to help them develop the passion for STEM. For instance, if the teacher always teaches the children by infusing fun while playing games with their peers, the children will learn Mathematics and more social skills like sharing, taking turns, empathy and cooperation. They become more motivated in pursuing STEM education when it is introduced in the early stages of childhood (Sobey, 2019). While the intellectual health of a country begins in the home, prior-to-school experiences play an essential role in ensuring that all children particularly those regarded as being ‘at risk’ have a sound beginning. This situation calls for serious steps to be taken by early childhood practitioner to strengthen STEM education since early years. Mathematics is the crucial in STEM learning since human use Mathematics to make sense of the world. Parralel to Volmert et al. (2013, p. 5), Science as important but secondary, and Technology and Engineering as supplementary add-ons that are only appropriate ‘later’ and for ‘some students but Math as part of the basics. Education in Malaysia is an on-going effort towards further developing the potential of individuals in a holistic and integrated manner, to produce individuals who are intellectually, spiritually, emotionally and physically balanced and harmonious (Kementerian Pendidikan Malaysia, 1997). Therefore, young learners need Science and Mathematics to be taught in a more interactive, fun-filled learning environment from an early age is the key foundation for success in their formal schooling years (Noraini, 2018).

Games and Early Mathematics Performance

Studies on the early achievement of early Mathematics in Malaysia are still new. To date, only one study identified the early achievement level of Mathematics that involved young children as respondents. For example, Rohaty (2012) has conducted a study on six national preschools in Selangor urban areas which involving 138 preschool children. The results showed that the achievement level of children was above average. Thus, Fischetti (2013) states that many children go through difficult experiences in early mathematics because the methods of teaching to help children learn are not clearly known. In producing first-class human capital in the future, early childhood education is very important to be implemented. The study of Sharifah Nor et al. (2009) in Sharifah and Alizah (2011) who looked at the approach of play activities in terms of cognitive development found that children are excited about play activities, actively involved, feel fun and creative.

The contributions given by the involved figures in the field of early childhood education had indeed coloured the teaching and learning sessions in the world of children. Some past researchers highlighted the use of games in helping kids with their Mathematics subject (Baroody, 1989; Baroody & Coslick 1998; Baroody & Wilkins, 1999). Thus, using games in mathematics learning can help students develop a better understanding of mathematical concepts and applications (Sayed Yusoff et al., 2014). In addition, using games in mathematics learning can help students develop a better understanding of mathematical concepts and applications (Sayed Yusoff et al., 2014). This helps to dispel the notion of parents who see the game as unprofitable as stated by Bulotsky-Shearer et al. (2016) that parents have a view that play is unimportant and wasteful.

In short, a lot of researchers agreed that the utilization of games would definitely increase children's achievements in Mathematics subject (Azila et al., 2011; Zakiah et al., 2013). Chen and McNamee (2011) stated that games were actually a positive method in enhancing one's performance. According to them, children who were given the chance to play had clearer aims, better skills to use materials in order to solve problems as well as take actions in reaching a goal, better probability in connecting game materials and so on. This gave room to children to have their own imaginations while they were into the games. Compared this to a study done by Thorell et al. (2009), when they observed the effects of practice and transfered of executive functions in preschool children, they found that repeated games do enhanced the children's memory. In addition, play activities have advantages in stimulating children's development in terms of cognitive, social development, and interpersonal children. This is related because at an early age, before entering school, children begin to develop mathematical skills (Fuson, 1992; Gasteiger, 2012; Ramani & Siegler, 2011).

Thus, most researchers agree that the use of games can improve the achievement of mathematics subjects among children (Stannard et al., 2001; Ramani & Siegler, 2008). This is supported by Kamii (1985) who explains that play activities are better than teaching through the use of drills and worksheets given to children. This is in line with the National

Research Council, (2012) in Nurdiyana and Kamariah (2018) which states that play activities are necessary in children's lives.

METHODOLOGY

This methodology used in the study began with an overview of, and rationale for, the research design.

Research Design and Sample

A single group pre-test and post-test with intervening Early Mathematics based games was used in this research. This involved assessment on the early Mathematics abilities (Ginsburg & Baroody, 2003). This program was conducted among preschoolers (aged 5-6 years old) in one selected rural preschool in Menggatal district, Sabah. The school has 4 classes of 25 students each, with a total of 100 preschoolers. All the preschoolers participated in the program within the same week but according to different class schedules over a period of three months from February to April 2019.

Instruments

Based on the research objective of the study, the instrument was adapted by the researchers, namely instrument 1 – Test of Mathematics Ability (Ginsburd & Barrody, 2003).

Validity and Reliability of the Instruments

Best and Khan (1998) stated that the content validity of an instrument refers to the extent to which the instrument is able to gather the necessary data for a study. Mohd Majid (2005) noted that the content validity of an instrument refers to the extent to which the data collection tools include the contents of a particular field of study. An instrument is said to have high content validity if it is able to measure all the content and the content of the studies areas effectively. If not, then the instrument does not have a high validity.

Test of Mathematics Ability (TEMA-3) developed by Ginsburg and Baroody (2003) used in the study. TEMA-3 is a norm-referenced parallel forms test intended to identify the level of mathematical ability for children aged 3 years through 8 years. The all new standardization sample was composed of 1,219 children and internal consistency reliabilities are all above .92. Pre-test and post-test were developed and analyzed in the standard process. The questions of TEMA-3 are as Table 1 below;

Table 1
Questions of TEMA-3

Code	Item
A1	Perception of small numbers (informal).
A2	Produce finger display: 1, 2, many (informal).
A3	Verbal counting by ones: 1 to 5 (informal).
A4	Perception of more: Up to 10 items (informal).
A5	Nonverbal production: 1 to 4 items (informal).
A6	Enumeration: 1 to 5 items (informal).
A7	Cardinality rule (informal).
A8	Nonverbal (concrete) addition and subtraction (informal).
A9	Number constancy (informal).
A10	Produce sets: Up to 5 items (informal).
A11	Produce finger displays to 5 (informal).
A12	Verbal counting by ones: 1 to 10 (informal).
A13	Number after: 1 to 9 (informal).
A14	Reading numerals: Single-digit numbers (formal).
A15	Writing numerals: Single-digit numbers (formal).
A16	Concretely modelling addition word problems: Sums up to 9 (informal).
A17	Part-whole concept (informal).
A18	Written representation of sets up to 5 (formal).
A19	Choosing the larger number: Number comparisons 1 to 5 (informal).
A20	Choosing the larger number: Number comparisons 5 to 10 (informal).
A21	Verbal counting by ones: To 21 (informal).
A22	Number after: Two-digit numbers to 40 (informal).
A23	Enumeration: 6 to 10 items (informal).
A24	Verbally count back from 10 (informal)
A25	Equal-partitioning: Fair-sharing of discrete quantities (informal).
A26	Mental addition: Sums 5 to 9 (informal).
A27	Mental number line: one-digit numbers (informal).
A28	Produce sets: Up to 19 items (informal).
A29	Reading numerals: Teen numbers (formal).
A30	Writing numerals: Two-digit numbers (formal)
A31	Verbal counting by ones: Up to 42 (informal).
A32	Verbal counting by tens: Up to 50 (informal).
A33	Symbolic additive commutatively (formal).
A34	Reading numerals: Two-digit numbers (formal)
A35	Mental number line: Two-digit numbers (informal).
A36	Subtraction Facts: N – N and N – 1 (Formal).
A37	Addition facts: Sums up to 9 (formal).
A38	Addition facts: Sums of 10 and small doubles (formal).
A39	Subtraction facts: 10 –N (formal).
A40	Counting by two.

Research Procedure

In general, the research general was conducted in 3 phases; (i) Phase 1:The first phase mostly involved bench marking activities which consisted of reviewing related literature, documents and module for preschoolers. The pre-test was implemented to the mentees; (ii) Phase 2: In the second phase, intervention program was implemented'; and (iii) Phase 3: In this phase, the post test was implemented to the mentees.

The Intervention

Intervention in Early Mathematics

The Early Mathematics learning module was developed and utilized in the program. The learning module was administered in 65 separate activities in three months, with 5 to 10 minutes for each activity. In this program, each mentor act as a facilitator, monitor a group of 5 preschoolers and intervene to provide task assistance. A total of 55 teacher trainees from Early Child Education program, Faculty of Psychology and Education, UMS participated as mentors and observers. They were trained to carry out the mentoring and observation prior to the program.

Table 2
Intervention based Games

Day	Items	Name of Games
1	7.1 recognize number 1-10 A1 and B1 Perception small numerosity (informal)	How many do you see? *Berapa banyak yang kamu nampak?*
2	7.1 recognize number 1-10 A2 and B2 Display fingers: 1,2, many (informal)	Show me your finger. *Tunjukkan saya jari.*
3	7.1 recognize number 1-10 A3 and B3 Counting verbally: 1 hingga 5 (informal)	How many fingers do you see? *Berapa jari yang kamu nampak?*
4	A4 and B4 Perception of many: Till 10 item (informal)	Which one is more? *Mana yang lebih banyak?*
5	7.1 recognize number 1-10 A5 and B5 Written: 1 to 4 Item (informal)	Follow me *Buat macam saya.*
6	7.1 Recognize number 1-10 A6 and B6 Counting: 1 hingga 5 item (informal)	Roll the dice and give me the wooden block. *Lambung dadu dan beri saya blok kayu.*
7	7.1 recognize number 1-10 A7 and B7 Cardinal rule (informal)	How many are missing? *Berapa yang hilang?*

8	8.1 addition within 10 8.2 subtraction within 10 A8 and B8 Addition and subtraction nonverbal (concrete) (informal)	Follow me. *Buat seperti saya.*
9	7.1 recognize number 1-10 A9 and B9 Conservation of number (informal)	Far and near still the same. *Jauh dan dekat tetap sama.*
10	7.1 Recognize number 1-10 A10 and B10 Set: up to 5 Item (informal)	Give me the lego. *Beri saya lego.*
11	7.1 recognize number 1-10 A11 and B11 Display fingers till 5 (informal)	Show me fingers. *Tunjukkan saya jari.*
12	7.1 recognize number 1-10 A12 and B12 Counting verbally: 1 to 10 (informal)	Say the number *Sebut nombor*
13	7.1 recognize number 1-10 A13 and B13 Number- after: 1 hingga 9 (informal)	Number after that. *Nombor selepas.*
14	7.1 recognize number 1-10 A14 and B14 Reading digit: one digit number (Formal)	What is the number? *Apa nombor itu?*
15-25	7.1 recognize number 1-10 A15 and B15 Writing number: one digit number (Formal)	What number do you see? *Apa nombor yang anda lihat?*
26	8.1 addition within 10 A16 and B16 Example for addition problem using precise word: Total till 9 (informal)	How many children in the train? *Berapa ramai kanak-kanak dalam keretapi?*
27	8.2 subtraction within 10 A17 and B17 One whole -part concept (informal)	How many are missing? *Berapa yang hilang?*
28	7.1 recognize number 1-10 A18 and B18 Set Representasi Bertulis Sehingga 5 (Formal) 7.1 recognize number 1-10	Show me how many. *Tunjukkan kepada saya berapa banyak.*
29	7.1 recognize number 1-10 A19 and B19 Memilih nombor yang lebih besar: Perbandingan nombor 1 hingga 5 (informal)	Bigger numbers (1 to 5) *Nombor yang lebih besar (1 hingga 5).*

30	7.1 recognize number 1-10 A20 and B20 Choosing the larger number: compare 5 till 10 (informal)	Bigger numbers (6-10) *Nombor yang lebih besar (6-10).*
31	7.3 recognize number 10-20 A21 and B21 Counting verbally: up to 20 (informal)	Count from 1 to 20. *Kira 1 hingga 20.*
32	7.3 recognize number10-20 A22 and B22 Number- after: two digit number (informal)	Bigger numbers (10-20) *Nombor yang lebih besar (10-20)*
33	7.1 recognize number 1-10 A23 and B23: counting: 6 to 10 Item (informal)	Spots on body of animals. *Bintik badan haiwan.*
34	7.1 Understand number 1-10 A24 and B24 Coutning backward verbally from 10 (informal)	Count in decending order. *Kira menurun*
35	6.2 comparing quantities A25 and B25 Sharing equally: sharing equally for discrete quantities (informal)	Equal sharing. *Perkongsian sama rata*
36	8.1 addition within 10 A26 and B26 Mental arithmetic: total 5 to 9 (informal)	How much is all of them? *Berapa kesemuanya?*
37	7.1 recognize number 1-10 A27 and B27 Mental number representation: one-digit number (informal)	Which one nearer? *Mana yang lebih dekat?*
38	7.3 recognize number10-20 A28 and B28 reading digit: number 10 to 20(Formal)	What is the number? *Apa nombor itu?*
39-49	7.3 recognize number10-20 A29 and B29 writing digit: two-digit number (Formal)	What is the number do you see? *Apa nombor yang anda lihat?*
50	7.3 recognize number10-20 A30 and 30 Counting one by one verbally :10 to 20 (informal)	Count 10, 10. *Kira 10, 10*
51	8.1 addition within 20 A31 and B31 Addition includes bigger numbers (informal)	How many is all of them? *Berapa banyak kesemuanya?*

52	7.4 series 10, 20, 30, 40 and 50 A32 and B32 Counting 10 by 10 verbally: up to 50 (informal)	Count 10, 10. *Kira 10, 10*
53-54	8.1 addition A33 and B33 Addition using symbols (Formal)	Write a number sentence. *Tulis ayat nombor.*
55	7.4 series 10, 20, 30, 40 and 50 A34 and B34 reading digit: two digit number (Formal)	Apa nombor itu? *What is the number?*
56	7.3 recognize number10-20 A35 and B35 mental number representation: two-digit number (informal)	Nearer number. *Nombor yang lebih dekat.*
57-58	8.2 subtraction within 10 A36 and B36 Subtraction fact: N – N and N – 1 (Formal)	Minus *Tolak*
59-60	8.1 addition within 10 A37 and B37 Addition fact: total up to 9 (Formal)	Add *Tambah*
61-62	8.1 addtion within 10 A38 and B38 addtion facts: total up to10 and small multiples (Formal)	Add. *Tambah*
63-64	8.2 subtraction within 10 A39 and B39 subtraction facts: 10 – N (Formal)	Minus. Tolak
65	7.1 recognize number1-10 8.1 addtion within 10 A40 and B40 Counting 2 by 2 verbally: up tp 10 (informal)	Count 2,2 Kira 2, 2

Data Collection Procedures

In Early Mathematics, preschoolers had taken a pre-test for the baseline on comparison, before the start of intervention program (Learning Mathematics through games). The post-test were given at the end of the intervention program. The significance of difference mean score between pre-test and post-test were used to measure students' learning during the intervention and helped determined whether the games had improved preschoolers' achievement in early Mathematics.

Data analysis

The difference in the mean scores between the pre- and post-test is computed as a measure of change in the preschoolers' early Mathematics ability. Meanwhile, inferential analysis involves paired sample t-test was used to identify the significant difference between the pre- and post-test.

RESULTS

Preschoolers Demographic Data

The demographic data of the preschoolers are illustrated in Figure 1.

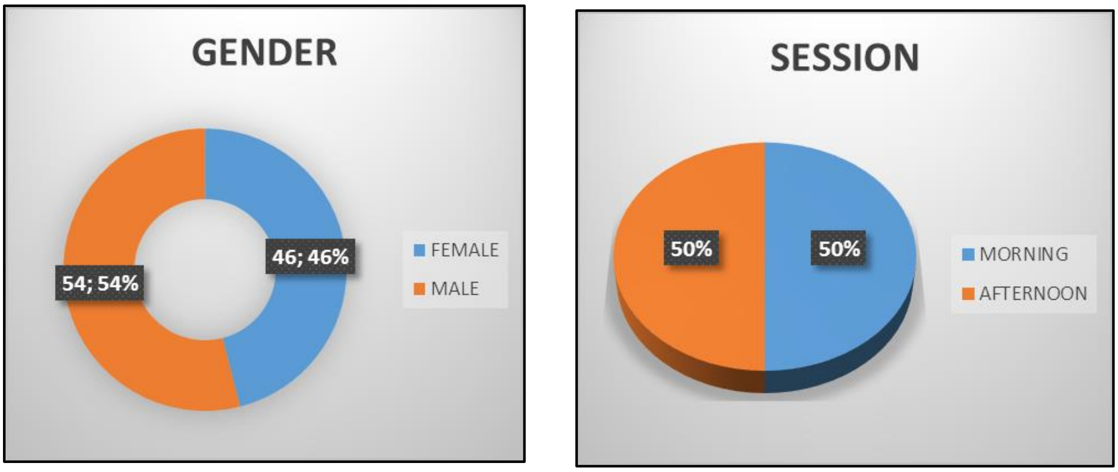

Figure 1. Demographic Data for Mentees

Assessment of STEM Mentees

Level of Generic Competency for Mentees after Joining the Program

At the end of the mentor mentee session, the mentees were provided with Early Math Achievement Test (*Ujian Pencapaian Awal Matematik - UPAM*) (Ginsburg & Baroody, 2003) to test their knowledge, understanding and application in mathematic. The questions were purposely developed based on the cognitive level as shown in Figure 2.

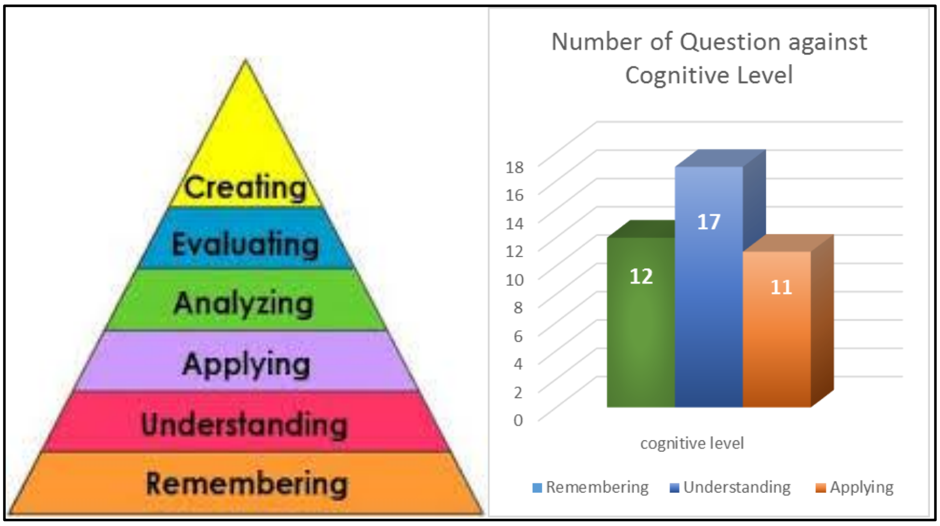

Figure 2. Cognitive Level for Early Math Achievement Test (Ujian Pencapaian Awal Matematik- UPAM)

Table 3
Item Classification in UPAM

Item	Item Classification		
	Knowledge	Understanding	Application
A1 dan B1	*		
A2 dan B2	*		
A3 dan B3	*		
A4 dan B4		*	
A5 dan B5	*		
A6 dan B6	*		
A7 dan B7		*	
A8 dan B8	*		
A9 dan B9		*	
A10 dan B10			*
A11 dan B11	*		
A12 dan B12			*
A13 dan B13		*	
A14 dan B14	*		
A15 dan B15	*		
A16 dan B16		*	
A17 dan B17		*	
A18 dan B18		*	
A19 dan B19		*	
A20 dan B20		*	
A21 dan B21			*
A22 dan B22		*	
A23 dan B23		*	
A24 dan B24			*
A25 dan B25		*	
A26 dan B26		*	

A27 dan B27		*	
A28 dan B28	*		
A29 dan B29	*		
A30 dan B30			*
A31 dan B31		*	
A32 dan B32			*
A33 dan B33		*	
A34 dan B34	*		
A35 dan B35		*	
A36 dan B36			*
A37 dan B37			*
A38 dan B38			*
A39 dan B39			*
A40 dan B40			*
Total	12	17	11

One Sample t-test

An one sample t-test was conducted to compare mathematics ability of children before and after intervention. Mean score for pre-test is 15.78 (Table 4), while mean score for post-test is 22.32. There was a significant difference in the scores for mathematic ability in pre-test (M=15.78, SD=.99) and post-test (M=22.32, SD=.78); t (86) (=-28.52, p = 0.000) (Table 5).

Table 4
Group Statistics

	test	N	Mean	Std. Deviation	Std. Error Mean
SUM	pre-test	87	15.7816	9.24653	.99133
	post-test	87	22.3218	7.30163	.78282

Table 5
One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Pasca_SUM	28.515	86	.000	22.32184	20.7657	23.8780
PRA_SUM	15.920	86	.000	15.78161	13.8109	17.7523

These results suggest that the intervention really does have an effect on mathematic ability of children. Specifically, our results suggest that after children participate in the intervention, their mathematics ability increases.

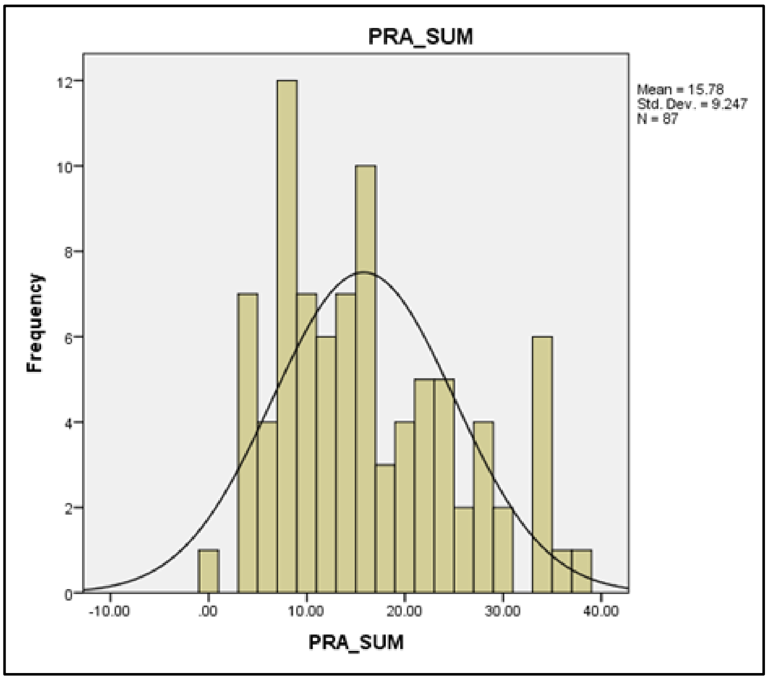

Figure 3. Histogram of Pre-test Achievement

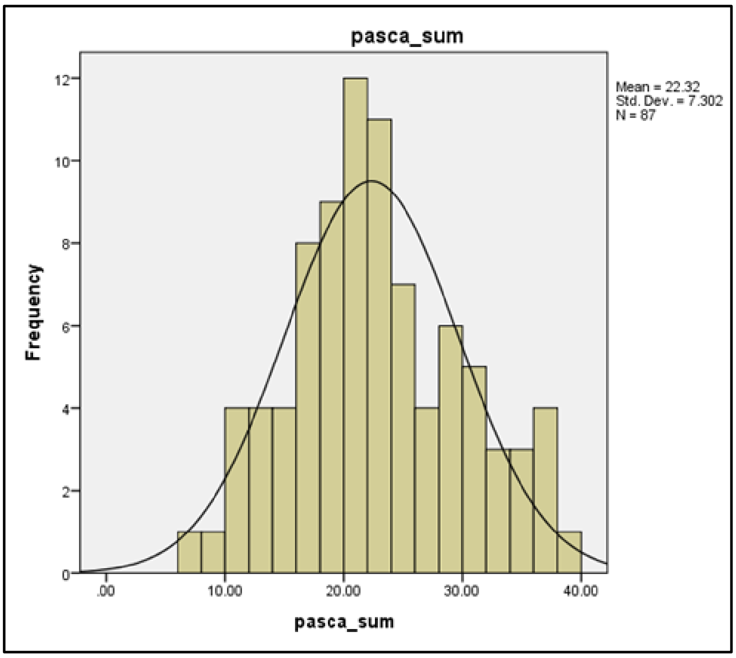

Figure 4. Histogram of Post-test Achievement

Stacked Analysis

The results show generally consistent improvement in early mathematical ability of children who learned using games during the intervention. The mean of pre-test achievement (Figure 5) was -0.68 logits (SE=1.49) and the mean of post-test achievement (Figure 6) was 0.61 logits (SE=1.30) which shows a mean difference of 1.29 logits.

```
SUMMARY OF 86 MEASURED (NON-EXTREME) PERSONS
-------------------------------------------------------------------------------
|          RAW                             MODEL         INFIT        OUTFIT    |
|         SCORE     COUNT     MEASURE    ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN      15.7      40.0        -.68      .44        .99     .0    .97     .0 |
| S.D.       8.9        .2        1.49      .07        .25    1.2    .55    1.1 |
| MAX.      36.0      40.0        2.82      .65       1.78    3.3   3.39    3.8 |
| MIN.       3.0      39.0       -3.33      .37        .49   -2.7    .23   -2.2 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .46  ADJ.SD    1.42  SEPARATION  3.06  PERSON RELIABILITY  .90 |
|MODEL RMSE    .44  ADJ.SD    1.42  SEPARATION  3.21  PERSON RELIABILITY  .91 |
| S.E. OF PERSON MEAN = .16                                                   |
-------------------------------------------------------------------------------
MINIMUM EXTREME SCORE:      1 PERSONS
VALID RESPONSES:  99.9%
```

Figure 5. Summary of Person Measures for Pre-test Achievement

```
                         SUMMARY OF 87 MEASURED PERSONS
-------------------------------------------------------------------------------
|          RAW                             MODEL         INFIT        OUTFIT    |
|         SCORE     COUNT     MEASURE    ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN      22.7      40.0         .61      .42       1.01     .0    .94     .0 |
| S.D.       7.5        .2        1.30      .10        .28    1.5    .56    1.0 |
| MAX.      39.0      40.0        4.49     1.03       2.43    5.3   4.78    5.8 |
| MIN.       7.0      39.0       -2.24      .38        .52   -2.9    .20   -2.1 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .45  ADJ.SD    1.21  SEPARATION  2.67  PERSON RELIABILITY  .88 |
|MODEL RMSE    .44  ADJ.SD    1.22  SEPARATION  2.80  PERSON RELIABILITY  .89 |
| S.E. OF PERSON MEAN = .14                                                   |
-------------------------------------------------------------------------------
                          VALID RESPONSES:  99.9%
PERSON RAW SCORE-TO-MEASURE CORRELATION = .99 (approximate due to missing data)
 CRONBACH ALPHA (KR-20) PERSON RAW SCORE RELIABILITY = .89 (approximate due to
                                  missing data)
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Figure 6. Summary of Person Measures for Post-test Achievement

From the analysis, on average, most students improved. 15 of children show significant increments in early mathematical ability greater than that average growth (Table 6). Many of those children's T1 logit values are negative, which indicates that their ability in mathematic was very low at the beginning. The reason of the great increment is likely to be due to the effectiveness of the intervention for those children in particular.

Table 6
Children show significant increments in post-test.

Children ID	Logit In Pre-Test	Logit In Post Test	Differences
084	-1.91	2.82	4.73
009	-5.86	-0.06	5.80
007	0.08	3.64	3.56
013	-1.91	1.89	3.80
082	-2.96	0.92	3.88

083	-1.7	1.7	3.40
004	0.22	3.17	2.95
060	-0.21	2.82	3.03
044	2.08	4.39	2.31
057	-2.38	0.64	3.02
031	-2.96	-0.06	2.90
012	-2.13	0.64	2.77
015	-2.65	0.08	2.73
056	-1.51	1.07	2.58
014	-2.13	0.5	2.63

On the other hand, 8 of 87 children (Table 7) grew measurably less than did the average. Although the intervention applied in this study, not all learning objectives are suitable to be taught by the intervention.

Table 7
Children show significant decrements in post-test.

Children Id	Logit In Pre-test	Logit In Post-test	Differences
066	0.06	-0.21	-0.27
011	0.92	0.08	-0.84
047	1.53	0.36	-1.17
010	0.92	-0.5	-1.42
058	2.82	1.37	-1.45
003	1.07	-1.32	-2.39
023	2.08	-0.35	-2.43
043	2.08	-0.35	-2.43

DISSCUSSION

The findings from this study confirmed other earlier findings that the intervention had improved the preschoolers' performance in early Mathematics highlighted the use of games in helping kids with their Mathematics subject (Baroody, 1989; Baroody & Coslick 1998; Baroody & Wilkins, 1999). The data indicates that the use of games as intervention can serve as an effective tool to improve the preschoolers' early Mathematics performance as well as to develop their interest learning through games. The results show, that the use of games are effective in improving preschoolers early Mathematics performance. According to the pre and post test results, it reconfirmed that this study parallel to past literature about games did help preschoolers to learn early Mathematics.

CONCLUSION

Recommendations for practice include quality in-service instruction pedagogy best practices and district support of collaboration time with peer teachers. Implementing teaching and learning of early Mathematics shows promising implications for the potential intervention for the preschoolers in Sabah. The findings from study have explored valid evidence that to a certain extent, the games is inevitable in helping mentees in early Mathematics. It would also be interesting to produce module which can beneficial to all educators. Although this was the success of Mathematics education story for preschoolers in Sabah, further research is essential to improve the nation STEM performance.

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