Journal of Primary Education
10 (3) (2021) : 373–380

https://journal.unnes.ac.id/sju/index.php/jpe

The Influence of Snake-Ladder Game toward Early Childhood Children's Mathematics Skills

Nur Chayati ✉, Sugiyo Sugiyo, Sri Sulistiyorini

Pascasarjana, Universitas Negeri Semarang, Indonesia

Article Info

History Articles
Received:
12 Juny 2020
Accepted:
21 July 2020
Published:
30 September 2021

Keywords:
Snake-ladder game, Mathematics skills, Early Childhood Children

Abstract

Low learning media and conventional method implementations made less maximum learning to improve children's mathematics skills. This research aims to analyze the cooperative learning model with snake-ladder game media toward early childhood children's mathematics skills. The applied method was the experimental method with a pretest-posttest group control design. The population consisted of 135 children aged 5-6 years old and by the applying purposive sampling 30 Children were chosen as samples. This research used mathematics skill observation with a 1-4 Likert scale to collect the data. By employing t-test is used the effect of the snake and ladder game on math skills was analyzed. The results showed that there was a sig value of 0.00 < 0.05, which means that there was a difference in the increase of the math abilities of children aged 5-6 years by implementing snake and ladder media. The results showed that the cooperative learning model assisted by the snake-ladder game was effective to improve learners' mathematics skill outcomes. It proved that a cooperative learning method assisted by a snake-ladder game could improve the mathematics skills of learners aged 5-6 years old.

✉ Correspondence address:
Early Childhood Education Program, Postgraduate School of Universitas Negeri Semarang Kelud Utara III, Semarang, Jawa Tengah, Indonesia 50237
E-mail: noerkhali@gmail.com

p-ISSN 2252-6404
e-ISSN 2502-4515

INTRODUCTION

Early childhood mathematics skills are a crucial predictor of academic success. Once early childhood children are introduced and stimulated to think mathematically, they will have better development in the future (Claessens et al., 2009). Cohrssen & Page (2016) stated that mathematics skills influenced the child-transition period while schooling. This skill is an important aspect of a child's cognitive skills and is also important to develop carefulness and to process the learning acquisition. Children could find problem-solving alternatives, assist their mathematics logical development, group, and prepare the carefulness of thinking (Hartini, 2012).

The developmental scopes to achieve at the given developmental period are science conceptual knowledge, concepts of forms, colors, sizes, and patterns, and the concept of numbers and symbols of numbers. This skill could be seen from the children's knowledge to recognize the concepts of numbers, calculate until a certain limit, recognize the addition and subtraction modestly (Rekysika & Haranto, 2019).

Early childhood children should be introduced to mathematics that is oriented in playing. It is important to support their participation and develop their mathematics and calculating skills (Cohrssen & Niklas, 2019). Children will not feel bored when playing the game while learning. Deans & Chorssen (2015) argued that mathematics introductory with concrete objects were important to facilitate their mathematics understanding. The given mathematics concept for children is such as introductions of numbers, and algebra (grouping, comparing, and arranging). Pattern recognition, geometry recognition, and measurement are also included in the introduction to mathematics given to early childhood.

Children would obtain their mathematics language and understood the concepts when they had chances to participate in an interaction with full of languages (Tayler et al., 2014). They could also obtain it by training their mathematics thinking with playing a game with proper contingent interaction supports and conceptual acquisition facilitation of mathematics language. The participation of children in joyful learning influenced their attitudes and qualities to reveal important information about thoughts and reasoning (Knowles, 2009). High early childhood pedagogy was also correlated to higher learning achievement (Niklas & Tayler, 2018).

Based on the results of the observations made, the mathematics skills of the early childhood children aged 5-6 years old of Muslimat Nurul Huda Early Childhood Education Program were low. Most of them were still in the developmental stage and there were still lack of learning media implementation to improve the mathematics skill. The method used by the teacher in early mathematics learning was still use conventional mode which tends to make children feel bored.

Wu & Lin (2016) argued that learning mathematics at early age should involve the learners playing games with a plot. Thus, they would be more enthusiastic and active in the processes of learning, experiencing, observing, categorizing, and expressing the skills for them. They also could accept other individuals during the process so that they could solve problems and master the basic knowledge.

It is in line with Lehri et al. (2016), who argued about the importance of preschool teachers to provide qualified mathematics learning with great ideas for children and the playing-game pedagogical skill based on learners' developments. Based on this findng, one of the efforts to improve the mathematics skill is an appropriate stimulation with media and the appropriate method with the age and characteristics of 5-6-year-old children.

Teachers must provide applicative media to facilitate the material delivery concretely (Nurritta, 2018). The applied media has functions to pack the learning materials to be more attractive and joyful. Thus, the media could trigger the interest, thought, and feelings of the learners during the learning process.

Research conducted by Dewi (2016) shows that the game of snakes and ladders can make it easier to stimulate children's cognitive abilities. Learning activities carried out by playing will stimulate children's thinking skills very well if they are done with a happy feeling so that all learning activities carried out by children are easily accepted into their minds. Swastrini et al. (2016), stated that the application of playing snakes and ladders increases the ability to work together in early childhood. Based on the problems and findings of trdahlu research, this study will explore the impact of the game of snakes and ladders on math skills in early childhood.

This research aims to analyze the cooperative learning method effectiveness toward mathematics skills at early childhood education at Muslimat Nurul Huda, Karangtalok. The applied cooperative learning was done with snake-ladder as the media to realize joyful and courageous learning for early childhood learners' mathematics skills.

METHODS

The applied method was the experimental method with a pretest-posttest group control design. The research population consisted of 135 children of the Muslimat Nurul Huda Early Childhood Education Program, Karangtalok, Pemalang. The sampling technique was purposive sampling by considering the children aged 5-6 years old. They were also in the transition period from preschool into preliminary school. Sixty childrens participated in this research. Each group of class B1 and B2, consisted of 30 childrens. The group B1 as the control group and B2 as the experimental group.

This research was carried out in eight sessions. The first session consisted of a pretest as the replacement of intervention for both groups, experimental and control groups. The pretest was given with the most frequently used application media, the non-media model. The second until the sixth sessions consisted of intervention for an experimental group with the cooperative learning method mediated by snake-ladder media. On the other hand, the control group was taught without a non-media learning model. The posttest was given on each session for both groups. The experimental group was intervened by snake-ladder while the control group was taught by a non-media learning model.

The data collection technique was a mathematics skill observation sheet in the form of a checklist with a 1-4 Liker scale. The observation sheet validity test used expert validation to test the content or construct validity. The instrument was arranged based on the measured aspects in a certain theory. Then, the instrument was consulted with the experts, the lecturer of early childhood education.

The result showed the instrument was valid. It was taken from the early childhood development achievement level standards for 5-6 years old children as applied by the Ministerial Regulation of Education and Culture of Republic of Indonesia, Number 137 the Year 2014. The instrument consisted of eleven items about of recognizing the surrounding objects and mentioning the surrounding objects.

During the observation, the obtained checklist scores were used as observation guidance. The data of this research were analyzed statistically with a t-test. Before examining the hypotheses, the classical assumption test was done, consisting of normality and homogeneity tests. Before conducting the normality test, the obtained scores of each class were $\alpha > 0.05$. The homogeneity test was $\alpha > 0.05$ for each group, both the experimental and control groups.

Table 1 consists of early childhood mathematics skill indicators. Based on Table 1, the mathematics indicator measured are about recognizing the learner surrounding objects and named them to investigate their understanding about their environment as well as their basic mathematics skills. It is in line with Berkowitz et al. (2016), that learning mathematics immediately required the same development as children learn basic mathematics vocabularies, how they recognize the surrounding world of

mathematics, and how they express the more complex mathematics concept, such as measurement, geometry, and reasoning.

Early childhood children must have frequent access and interaction. Thus, they will have an algebra concept to develop, including classifying, ordering, comparing, contradicting, arranging objects, and identifying patterns. Yuliantina et al. (2017), argued that basic geometry is a part of the mathematics curriculum in the early years, including identifying various objects and communicating the spatial directions.

Table 1 early childhood skill indicators for 5-6 years old aged children

Aspects	Indicators
Recognizing the surrounding objects (names, colors, shapes, sizes, patterns, properties, sounds, textures, functions, etc.)	Mentioning the symbols of numbers
	Recognizing the objects based on sizes
	Connecting the objects based on the shapes
	Matching the numbers of the objects with the symbols of numbers
	Imitating the symbols of numbers
Mentioning the surrounding objects (names, colors, shapes, sizes, patterns, properties, sounds, textures, functions, etc.) through masterpieces or works	Putting the color patterns in order
	Completing the missing patterns
	Comparing the objects based on the quantities
	Comparing the objects based on the sizes

RESULTS AND DISCUSSION

The early childhood children's skill improvements in Muslimat Nurul Huda ECEP, Karangtalok, for B1 and B2 groups, could be seen based on the research observation toward the learners' mathematics skills. The obtained data from observation activity Based on the learners' mathematics skill average scores, the pre and post intervened skills of the early childhood learners can be observed. The mathematics skill improvements on the pre- and post-intervention, Table 2.

Table 2 Descriptive analysis results

	N	Mean	Std. Deviation
Pre intervention	30	33.17	4.434
Post intervention	30	50.37	5.242
Pre control	30	33.63	4.056
Post control	30	44.63	7.185

Table 2 shows the differences in learners' mathematics skill improvement during the pre and post-interventions. The average of the learners' mathematics skills for the experimental group gained improvement than that of the control group.

The pre-test result with the cooperative learning model through snake-ladder media without media for both groups proved the B1 and B2 mathematics learners' skills were categorized low. It was shown with the obtained score and category of undeveloped. The pretest showed that the cooperative model without media could not obtain the indicators optimally.

The findings were relevant to a study by Passolunghi & Costa (2016). They concluded that children would easily recognize the numbers and children would immediately understand the mathematics concepts when the learning activity involved direct observation and

children's sensors. It is in line with Kurniawan (2016). That the learning activity of kindergarten learners required media. It had an important role for them since they were in a concrete period.

Rahamah & Mukhtar (2017) stated that the playing game method and Fun-Tastic learning influenced their cognitive development and calculating skills. Other studies also proved that playing numerical board and having activities at preschool also improved the learners' numerical skills, such as measuring and understanding number skills. The numerical board game was also used to improve the ow of numbers, number calculation, comparing the values of numbers, and identifying numbers (Ramani & Siergler, 2008). Only by understanding the numbers and calculating skills, the mathematics skills could be improved with the numerical game.

Various programs specifically by targeting the mathematics skills appearing on the designed activities. It had a purpose to promote the important skills based on the literature. It included calculating, recognizing, writing numbers, one-correspondence, comparison, change in number operation, and understanding numbers and quantities (Bobis et al., 2004). Finally, the intervention for the preschool period to improve initial calculating skills became the crucial strategy to prevent lower achievement in the next period or stage.

To review whether the applied cooperative learning model could improve the mathematics skills of the learners, a t-test was applied. Table 3 shows t-test for both groups.

Table 3 The t-test results of experimental and control groups

	Mean	SD	95% Confidence Interval of the Difference		T	df	Sig
			Lower	Upper			
Pre-Ex - Post_Ex	-17.200	7.360	-19.948	-14.452	-12.801	29	.000
pre_Control - post_Control	-11.000	7.483	-13.794	-8.206	-8.051	29	.000

Table 3 shows the differences between the control and experimental groups. It is indicated by the sig score 0.000 < 0.05. It means there is a difference in applying snake-ladder media on the 5-6-year-old learners' mathematics skill improvement at Muslimat Nurul Huda Early Childhood Education Program, Karangtalok.

The hypothesis results were relevant to a study conducted by Nachiappan et al. (2014). They found that the use of snake-ladder media could improve the cognitive development of children with mathematics learning difficulties. By using this game, teachers could make a more effective and meaningful teaching-learning process. It also could guarantee the learners' participation during the activity.

Saraswati & Supriyanti (2016) that a huge snake-ladder game could attract learners' interest to learn with the media. Thus, it was effective and safe for learners. Shitiq & Mahmud (2010) found that the snake-ladder games interactively improved the learners' learning motivation and interests. They showed significant improvement in their findings. Therefore, there was a possibility to improve significantly and be motivated during recognizing the numbers and number operation when they played snake-ladder game.

The snake-ladder implementation could improve the children's cognition. It was due to the factors in playing the game that could improve the learning motivation. The interesting game could attract learners to be more determinant in learning. A game with such arranged content and adjustment based on the children's development could facilitate them to understand the material, especially to improve their cognitive skills in learning mathematics, numbers, and their operations.

In the snake-ladder game, each box had a number in it. Children could memorize the numbers (Tashim et al., 2017). It was also in line

with the research conducted by Muthmainnah et al. (2016). They explained that playing snake-ladder game required them to throw the dice. Then, when the learners got a five-point dice side, they had to move the pawn five times, and stop at the last point. This activity facilitated learners to memorize numbers. Each box on the snake-ladder boxes had numbers printed in order. If the board consisted of two boxes, it means there would be numbers from one until twenty. Then, the other remaining boxes were for start and finish lines (Kurniawati, 2013).

Snake-ladder game facilitated children to calculate systematically or in order. Children that threw the dice naturally would rely on the boxes systematically (Fidrayani et al., 2012). While throwing the dice and the learner obtained a four-point side, then he had to move the pawn four times. The snake-ladder game allowed learners to be patient and to get in line waiting for their turns. Snake-ladder game required at least two players. If they played it in the group, they had to wait patiently until their turns.

Kroesbergen et al. (2014) and Farikha (2018) found that teachers and patterns should support the learners so they could understand and develop knowledge and skills to solve problems, reason, and calculate various contexts by exploring, observing, learning, practicing, and understanding their mathematics concepts.

Children should obtain opportunities to train their skills so they could apply their mathematics knowledge confidently. The environment (included at home, outside of the house, and socio-emotional) had a practical and important role to support mathematics learning for children. Alloway & Alloway (2010) explained that the best way to learn for children was the effective game and learning. Children required sensitive and supportive assistance from adults. It is widely believed that children will be successful in mathematics if they have excellent access and opportunities in exploring mathematics ideas and concepts logically. Children would do and experience more mathematics efforts while the surrounding people respected, interested, sensitive, and contributed toward the supportive activities of learners' mathematics skills.

CONCLUSION

Based on the findings, the applied learning model with cooperative learning model through snake-ladder media had a significant influence on early childhood learners' mathematics skills with a score of $p < 0.05$. There was an improved mathematics skill aged 5-6 years old. It was shown with the obtained average score of the mathematics skill indicators after being intervened, categorized as very excellent.

ACKNOWLEDGMENT

Thanks to the educational agency chief, the teachers, and all children at Muslimat Nurul Huda of the Childhood Education Program, Karangtalok, Pemalang, Karangtolak, Pemalang municipality.

REFERENCES

Alloway, P T., & Alloway Ross G. (2010) Investigating the predictive roles of working memory and IQ in academic attainment. *Journal of Experimental Child Psychology.* 106 *(2) :* 20–29.

Berkowitz, T., Schaeffer, M. W., Maloney, E. A., Peterson, L., Gregor, C., Levine, S. C., & Beilock, S. L. (2016). Math at home adds up to achievement in school. *Procceding Science*. 350 *(2)*: 196-198.

Bobis, J., B. Clarke, D. Clarke, G. Thomas, R. J. Wright, & J. Young-Loveridge. (2005). Supporting Teachers in the Development of Young Children's Mathematical Thinking: Three Large Scale Cases. *Mathematics Education Research Journal* 16 *(3)* : 27–57.

Claessens, A., G. Duncan, & M. Engel. (2009). Kindergarten Skills and Fifth-Grade Achievement: Evidence from the ECLS-K. *Economics of Education Review* 28 *(4)* : 415–427.

Cohrssen, Caroline & Niklas, Frank. (2019). Using mathematics games in preschool settings to support the development of children's numeracy skills. *International Journal Of Early Years Education*. 27 *(3)* : 322–339.

Cohrssen, C., & J. Page. (2016). Articulating a Rights-Based Argument for Mathematics Teaching and Learning in Early Childhood Education. *Australasian Journal of Early Childhood.* 41 *(3):* 104–108.

Deans, J., & C. Cohrssen. (2015). Young Children Dancing Mathematical Thinking. *Australasian Journal of Early Childhood.* 40 *(3):* 61–67.

Dewi, I. R. (2016). Penerapan Metode Bermain Melalui Permainan Ular Tangga Untuk Meningkatkan Perkembangan Kognitif Pada Anak Kelompok A. *Jurnal Pendidikan Anak Usia Dini Undiksa.* 4 *(2)*: 1-11.

Farikha, L. (2018). Pengaruh Model Pembelajaran Sentra peran Terhadap Kemampuan Berbicara Anak Usia 5-6 Tahun di TK Islam Al- Khalifa Solerejo Mojowarno Jombang. *Jurnal Pendidikan dan Pembelajaran Anak Usia Dini.* 5 *(1):* 45-55.

Fidrayani, Syafrida, R. & Melodyana, P A. (2020) Increased Numeracy Skills of Children with Snakes and Ladders Game. *Journal of Early Childhood Education*. 2 *(1)* : 62-72.

Hartini, P. (2012). Peningkatan Kemampuan Matematika Anak Melalui Media Permainan Memancing Angka Di Taman Kanak-Kanak Fathimah Bukareh Agam. *Jurnal Pesona PAUD*. 1 *(1):* 1 -10.

Knowles, J. (2009).Building an Igloo: A Rich Source of Mathematics for Young Children. *Australian Primary Mathematics Classroom*. 14 (1): 28–32.

Kroesbergen, E. H., Van 't Noordende, J. E., & Kolkman, M. E. (2014). Training working memory in kindergarten children: Effects on working memory and early numeracy. *Child Neuropsychology: A Journal on Normal and Abnormal Development in Childhood and Adolescence*. 20 *(2)* :23–37.

Kurniawati, N. (2016). Pengaruh Metode Bercakap- cakap Berbasis Media Pop-Up Book Terhadap Kemampuan Berbicara Anak Kelompok A. *Jurnal PAUD Teratai*. 5 (3): 68-72.

Lehrl, S., K. Kluczniok, & H. G. Rossbach. (2016). Longer-Term Associations of Preschool Education: The Predictive Role of Preschool Quality for the Development of Mathematical Skills Through Elementary School. *Early Childhood Research Quarterly.* 36 *(3):* 475–488.

Muthmainnah, M., Maryatun, I. B., & Hayati, N. (2016). Pengembangan Ular Tangga Modifikasi (Ultamod) Untuk Mengoptimalkan Perkembangan Anak. *Jurnal Penelitian Ilmu Pendidikan*. 3 *(1*): *23-33.*

Niklas, F., C. Cohrssen, & C. Tayler. (2016). Improving Preschoolers' Numerical Abilities by Enhancing the Home Numeracy Environment. *Early Education and Development.* 27 *(3)*: 372–383.

Nachiappan, S., Rahman, N. A., Andi, H., & Zulkafaly, F. M. (2014). Snake and ladder games in cognition development on students with learning difficulties. *Review of Arts and Humanities*. *3 (2):* 217–229.

Nuritta, T .(2018). Pengembangan Media Pembelajaran Untuk Meningkatkan Hasil Belajar Siswa. *Jurnal Misykat.* 3 (1) : 171-187.

Passolunghi, M. C., & Costa, H. M. (2016). Working memory and early numeracy training in preschool children. *Child Neuropsychology.* 22 *(1)* : 81–98.

Ramani, G. B., Siegler, R. S., & Hitti, A. (2012). Taking it to the classroom: Number board games as a small group learning activity. *Journal of Educational Psychology*. 104 *(3):* 661–672.

Rekysika N. S, & Haryanto (2019) Media Pembelajaran Ular Tangga Bilangan Untuk Meningkatkan Kemampuan

Kognitif Anak Usia 5-6 Tahun. *Jurnal pendidikan anak usia dini.* 10 *(1) :* 56-61.

Rahaimah S.B A, & Farah B. M (2017) Case Study Of Fun Learning With Numeracy Of Preschoolers. *International Journal of Early Childhood Education Care.* 6 *(1)* 51-58.

Saraswati, M. A., & Supriyanti, N. (2016). Developing the giant speaking snake and ladders board game for the teaching of speaking to children Aged 9-11. *English Language Teaching Journal*. *5*(1): 9–12.

Swastrini C.K., Antara A.P., & Tirtayani A.L (2016). Penerapan Bermain Ular Tangga Untuk Meningkatkan Kemampuan Kerjasama Kelompok B1 Di Tk Widya Sesana Sangsit. *Jurnal Pendidikan Anak Usia Dini.* 4 (2): 1-11.

Shitiq, H.A.A.H., & Mahmud, R. (2010). Using an edutainment approach of a snake and ladder game for teaching Jawi Script. *International Conference on Education and Management Technology* 1 *(2):* 228-232.

Tashnim, A., Nowshin, S., Akter, F., & Das, A. K. (2017). Interactive interface design for learning numeracy and calculation for children with autism. *Information Technology and Electrical Engineering 2 (1) 63-71.*

Tayler, C., K. Ishimine, D. Cloney, G. Cleveland, & K. Thorpe. (2013). The Quality of Early Childhood Education and Care Services in Australia. *Australasian Journal of Early Childhood* 38 (2): 13–21.

Wu, S., & Lin, F. (2016). Inquiry-Based Mathematics Curriculum Design for Young Children-Teaching Experiment and Reflection. *Eurasia Journal of Mathematics, Science & Technology Education*. 12 (4): 843–860.

Yuliantina, I., Myrnawati CH & Yufiarti (2017) Early Mathematical Ability Of Children Aged Four To Five Years In The Province Of Banten, Indonesia. *International Journal of Education and Research. 5 (8*): 67-80.