Aṭfālunā
Journal of Islamic Early Childhood Education

The effect of using make-a-match cooperative learning model on children's early numeracy skills

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http://dx.doi.org/10.32505/atfaluna.v2i1.3666

Submission: January 3, 2022
Revision : Mei 17, 2022
Accepted : June 16, 2022

Keywords

cooperative learning model; early numeracy skills; make-a-match

Abstract

This study aims to determine the effect of using the make-a-match cooperative learning model on children's numeracy skills. This quasi-experimental research was conducted at Fadnur Aisyah Islamic Kindergarten, North Sumatra, Indonesia. Researchers took 30 students aged 5-6 years with a specific purpose as a sample. We were collecting data using observation sheets to assess children's numeracy skills. The research instruments include mentioning numbers, counting pictures, connecting with symbols, and adding simplicity. The data analysis technique used is the one-way ANOVA test. The results showed that the average numeracy ability of children using the make-a-match learning model was higher than the expository learning model. Therefore, the implications of the make-a-match cooperative learning model can support numeracy skills in early childhood.

A. INTRODUCTION

Teachers in early childhood education need to develop children's aspects of development such as religious and moral values, cognitive, physical motoric, language, social-emotional, and art so that children are ready to enter the following education (Syarfina et al., 2018; Veryawan, Tan, et al., 2021). The development of cognitive abilities becomes a strategic point to be developed in early childhood. It is because this ability is closely related to the development of other skills (Suryaningsih & Rimpiati, 2018). The cognitive development of children in the age range of 3 to 6 years has characteristics that belong to the category of preoperative thinking development. In this age range, the child has a selfish

nature. The child begins to have a different perspective from other people around him. Piaget mentioned (Kasumayanti & Elina, 2018) that cognitive development is divided into four phases, namely: 1) the sensorimotor phase (age 0-2 years), which is characterized by sensory activity (seeing, groping, feeling, smelling, and hearing), 2) the preoperative phase (age 2-7 years), that is, the phase of a child begins to realize that understanding is not only through sensorimotor activities but can also be through activities of a symbolic nature, 3) a concrete operational phase (age 7-12 years) characterized by the development of the child's ability to think in a way logical, but on the condition that the object that is the source of such logical thinking is present concretely, and 4) the phase of formal operation (12 years-adult) is characterized by a shift from a concrete way of thinking to an abstract way of thinking.

The psychic changes were affected children's thinking ability will be interpreted as cognitive development in early childhood. They gain knowledge from the things around them by exploring themselves using their thinking skills. The Children's cognitive abilities can develop gradually and be in the nerve centre. This cognitive ability plays a significant role in helping the child to solve problems. One part of cognitive development is the ability to count. According to Seefeldt & Wasik (Mutiara & Agustin, 2017) that the understanding of numbers is closely related to the learning of mathematics. Children will become more and more interested in counting activities. When children's sensitivity to numbers develops, numbers become the basis for children's activities in counting. The child's interest in counting is the basis for developing his abilities in the activities necessary in subsequent education. The field of cognitive development is one of the materials that are difficult for children to understand, especially in numbering activities. Recognizing the importance of cognitive development in early childhood, among other aspects of development, so cognitive aspects such as learning to count or number become very important in everyday life. Therefore, the activity of numbering or recognition of numbers has begun early (Elyana & Latief, 2018)

According to (Susanto, 2011) that the ability possessed by each child to develop his abilities is the ability to count. The characteristics of the development of numeracy ability start from things in the child's immediate environment. Furthermore, the result of numeracy ability is adjusted for each child to increase the understanding of the meaning of introduction to addition and subtraction. Knowing numbers, mentioning numbers, calculating objects, imitating, knowing simple sets with different values, addition, subtraction, multiplication, and division using concepts to the abstract, connecting number symbols and number concepts, and creating the shape of objects according to the concept of numbers is an ability related to the concept of counting (Wahyuningsih, 2008). Counting activities for early childhood include mentioning the sequence of numbers or blinding. (Asmar & Hasnawati, 2019).

Counting for early childhood is expected to be not only related to cognitive abilities but also to mental, social, and emotional readiness. So that in its implementation, it must be conducted in an interesting, varied, and fun manner (Farihah, 2017). Learning numeracy in institutions is only taught early counting, namely mentioning, counting objects, sorting, imitating, connecting objects, comparing two sets of objects with the concept of more, less, equal or not the same in number. Therefore, in its implementation, counting in institutions is carried out interestingly and variedly. In various ways, the ability to count can be applied. A wide variety of models, methods, and learning media suitable for numeracy learning can be chosen by a teacher (Soetjiningsih, 2013).

According to (Suyanto, 2005), Counting is carried out gradually according to the mental development of children learning to number, recognize numbers, and count. The child can learn to relate natural objects with mathematical symbols. The method of counting is part of mathematics that is indispensable in everyday life, especially the concept of numbers which is the basis for the development of mathematical abilities and readiness to attend further education (Simanjuntak & Siahaan, 2018). According to Cockroft (Kusmanto & Marliyana, 2014) explaining that mathematics needs to be applied to children because it is used in all aspects of life; mathematical skills are required in all areas of study; it is a powerful, concise, and explicit means of communication; it can be used to present information in a variety of ways; can improve logical thinking ability, accuracy, and spatial awareness; and provide satisfaction with efforts to solve challenging problems.

The ability to count is an aspect of development that will be measured in this study. The concept of numbers and number symbols that are the basis for the development of numeracy skills is a necessary part of mathematics to cultivate numeracy skills that are very useful for everyday life. Children's numeracy learning at RA Fadnur Aisyah Medan is only taught early counting, such as mentioning, numbering, imitating, counting objects, pairing number symbols. In accordance with the opinion of Daniel and David (2008), The ability to count is the ability to use reasoning, logic, and numbers. Counting skill is an ability possessed by every child in mathematics, such as sorting numbers or numbering and knowing numbers. The ability to count in early childhood is necessary to develop the basic concept of mathematics, such as introducing the concept of numbers, number symbols, colors, shapes, sizes, spaces, and positions. Then, it can form logical, critical, careful, and creative attitudes in children (Khan & Yuliani, 2016).

Based on observations through the collection of children's worksheet results in the form of data analysis of learning activities in the development of low child numeracy (49.45%), information was obtained that out of 62 children, there were 29 children still classified as undeveloped. It can be seen when learning numeracy activities that children are still less active and have not been able to mention or recognize the numbers shown by the teacher. There are 22 children in the category of children starting to develop (MB) who can recognize only the numbers 1-5 but still need a teacher guidance process. There are 11 children in the category of children developing as expected (BSH) who can already recognize the symbol of numbers. Based on the observations, no children fall into well-developed (BSB) or cannot recognize the number symbol correctly.

There are so many innovative learning methods that teachers can use, for instance, the cooperative learning model. In this model, the child can work with his friends because the child will often interact with his friend at school. If the child is uncomfortable with his friend will have an impact on the child's learning process (Yeti & Mulya, 2018). One alternative to increase children's interest in learning is to use the make a match learning model (looking for a partner). Make a match is one of the cooperative learning developed by Lena Curran with the technique of finding a partner while learning about concepts in a pleasant atmosphere. This learning model prioritizes the cultivation of the ability to work together, the ability to interact, and the ability to think through a game of finding a partner with picture cards (Pista et al., 2016). The right model for the material of numeracy activities is the make a match learning model (looking for a partner) (Mukhtar, 2018). Counting is often seen as something complicated and even scary. On the other side of the child's world is the world of play. According to Mayesty (Kemendikbud, 2014), play activities are a means

of socialization that is expected to provide opportunities for children to explore, discover, express feelings, create, and learn in a fun way. The make a match learning model can be modified through games so that teachers can observe the extent of children's interest in participating in counting activities. The make a match learning model is teaching by looking for a partner of cards that have been owned and a partner, but it can also be in the form of an individual.

In applying the make a match model, media is needed in the form of cards containing questions and answers to each question. Students in groups will pair the cards of the question and the answer exactly. One of the advantages of this technique is that children look for a partner while learning about a concept or topic in a pleasant atmosphere (Pudjawan et al., 2019). Active students will be interested in learning, so it is hoped that their learning outcomes will also increase. Several inhibiting factors need to be considered in the learning process, namely, the media used is still simple such as numeracy books as a learning resource, and the learning model used by teachers in numeracy activities is not appropriate and monotonous. Children's interest in learning is low. Meanwhile, two factors that are predicted to affect the numeracy ability of children aged 5-6 years, namely the learning model and the child's interest in learning.

Based on the explanation above, previous research has been carried out by (Anggraini et al., 2015) showed that there is a significant influence in the application of the make a match method on the ability to count in children. Thus, the application of the make a match method can be used as one of the methods in the process of teaching and learning activities to improve the ability to count early in children to prepare children to have readiness for the next education. Almost the same research has also been conducted by (Purwasih, 2015) that also supports this with the results of the child's cognitive development has improved in terms of the accuracy and speed at which the child connects the image with the symbol of the number. The achievement of children's cognitive abilities in the accuracy of connecting images with the symbol of numbers in cycle I only reached 35%, but in cycle II, it increased to 95%, so it was seen classically that there was a significant increase in the improvement of children's cognitive abilities.As well as research conducted by (Siti Komariah et al., 2021) showed the results of the analysis on the make a match play activity obtained an average value of 80.95. Such values are at intervals of 80-100 (excellent). Meanwhile, the ability to count early childhood obtained an average score of 78.6. The value is at intervals of 70-79 (good). The relationship between play make a match activities and early childhood numeracy ability obtained a correlation coefficient of 0.937. The value of this correlation coefficient belongs to the category of very strong because it is in the interval 0.800-1.000. Significance test results obtained $t_{count} = 10{,}04 > t_{table} = 2{,}14$. This make a match learning method is mostly only applied at the primary to secondary education levels. It is rarely applied at the early childhood level, so researchers are interested in applying this make a match learning method in early childhood. The difference in the application of the make a match learning method that the researcher did with the previous research is that the researcher uses engaging media by following the theme and abilities of the child so that learning activities will be more active. Children are more enthusiastic about participating in learning activities. In addition, in delivering learning materials, teachers use language that is easy for children to understand and organize the classroom to be more flexible so that children can interact with each other and cooperate during learning activities.

B. METHOD

This research uses quasi-experimental design methods. The research was conducted at Fadnur Aisyah Islamic Kindergarten, North Sumatra, Indonesia. Researchers took 30 students aged 5-6 years with a specific purpose as a sample. We were collecting data using observation sheets to assess children's numeracy skills. The research instruments include mentioning numbers, counting pictures, connecting with symbols, and adding simplicity. The implementation of the research will give the two classes different treatments. The dependent variable in this study is early numeracy skill (Y), then the free variable (independent variable) is a learning model as an experimental variable (X) as an attribute variable. Following the design used in this study, hypothesis testing was carried out using a one-way analysis of variance (ANOVA) test. The data collection technique in this study used observation guidelines and assessment of children's numeracy skills. Data analysis techniques in this study are needed to describe the research data in general and to test research hypotheses.

The test will determine the difference in numeracy skills between children who learn using the make-a-match learning model and the expository learning model. The normality test in this study used the Lilliefors test. Data analysis techniques in this study are needed to describe the research data in general and to test research hypotheses. The normality test in this study used the Lilie fors test. The normality test is intended to determine whether or not the distribution of research data is standard so that it can show whether the distribution of data in the population is normal or not. The data is said to be normally distributed if $Sig > 0{,}05$.This study used the Fisher test to test the homogeneity of the data. The homogeneity test aims to find out whether the distribution of data in the population is homogeneous.Homogeneous data if $Sig > 0{,}05$ (Sudjana & Ibrahim, 2007). As for testing the research hypothesis used two-pathway anava.Hypothesis test results are said to be significant if a value is obtained $P < 0{,}05$and insignificant if the value $P > 0{,}05$. Testing the correlation hypothesis in this study used the Barllett test correlation. If the hypothesis is significant, the Scheffe test is then carried out. All data analysis will be carried out with a significant level used is 95 % $(P < 0{,}05)$.

C. RESULT AND DISCUSSION

1. RESULT

After the study was carried out, the results of the descriptive analysis were obtained as follows:

a. The numeracy ability of children who learn with a make a match learning model.

Based on the data from the study, the information was obtained that the numeracy ability of children with the make a match model had the lowest score of 11 and the highest score of 20, the average score was 14.7, the variance was 4.3, and the standard deviation was 2.1. To see children's scores, interval classes (intermediate scores), frequency (number of children who have numeracy ability scores), and relative frequency (number of percent of numeracy ability scores) are used). The following is a frequency distribution table that explains the numeracy ability of children who learn with the make a match learning model.

Table 1. Frequency Distribution of Numeracy Ability Children who learn with the make a match learning model

Interval Class	F	Percentage
11-12	2	13,3
13-14	6	40
15-16	4	26,7
17-18	2	13,3
19-20	1	6,7
Sum	15	100

From the distribution list in Table 1, it was found that 4 children (26.7%) were in the average class, 8 people (53.3%) were below the average, and 3 people (20%) were above average.

b. Numeracy ability of children who learn with expository learning models

Based on the data from the study, information was obtained that children's numeracy ability with expository learning models had the lowest score of 11, the highest score of 18, the average score was 13.5, the variance was 3.4, and the standard deviation was 1.8. The interval class (intermediate score), absolute frequency (the number of children who have numeracy ability), and relative frequency (number of percent of the numeracy ability score) are used to see the score. The following is a frequency distribution table that explains the numeracy ability of children who learn with expository learning models.

Table 2. Frequency Distribution of Numeracy Ability Children who learn with expository learning models

Interval Class	F	Percentage
11-12	5	33,3
13-14	6	40
15-16	3	20
17-18	1	6,7
Sum	15	100

From the distribution list in Table 2, it was found that 9 children (60%) were in the average class, 5 children (33.3%) were below average, and 1 child (6.7%) was above average.

Data normality testing is used to determine whether the sample is from a normally distributed population. Normality testing is performed with the Lilliefors test.

Table 3. Summary of calculations with the Lilliefors formula

No.	Group	L-count	L-table	Information
1.	Children's numeracy ability using the make a match learning model	0,162	0,220	Usual
2.	Children's numeracy ability using expository learning models	0,139	0,220	Usual

Based on the results of the normality test of children's numeracy ability data with the make a match learning model, a calculated Lilliefors value of 0.162 was obtained while the Lilliefors table value was 0.220 at $\alpha = 0.05$.Thus, it is known that the value of Lilliefors is calculated to be smaller than the value of Lilliefors table, which is $0.162 < 0.220$ so it can be concluded that the data on children's numeracy ability with the make a match learning model are normally distributed.The normality test of children's numeracy ability data with an expository learning model obtained a calculated Lilliefors value of 0.139 while the Lilliefors table value was 0.220 at $\alpha = 0.05$. Thus, it is

known that the value of Lilliefors is calculated to be smaller than the value of Lilliefors table, which is 0.139 < 0.220 so that it can be concluded that the data on children's numeracy ability with the expository learning model are normally distributed.

The next requirement test after the normality test is the variance homogeneity test. This homogeneity test determines whether the research sample is homogeneous or inhomogeneous. The homogeneity test carried out was to compare the variance of children's numeracy ability data between treatment and the make a match learning model and expository learning model. The following table explains the results of the homogeneity test analysis of the sample group of make a match learning model and expository learning model.

Table 4 Homogeneity Test Analysis Of Sample Learning Model *Make a match* and Expository Learning Model

Sample Group	F-count	F-table	Information
Children who learn with make a match learning model and expository learning model	1,26	2,48	Homogeneous

Based on the table above, the results of the homogeneity test of children's numeracy ability data with a make a match learning model and expository learning models with values $F_{count} = 1{,}26$ while the value of $F_{table} = 2{,}48$ a t$\alpha = 0{,}05$. Value dk numerator 14 and dk denominator 14. So that information is obtained that the value F_{count} less than the value F_{table} that is $1{,}26 < 2{,}48$. It can therefore be concluded that both groups of samples have relatively the same (homogeneous) variance.

The results of the hypothesis explain that the numeracy ability of children who learn with the make a match learning model is higher than the numeracy ability of children who learn with expository learning models. Based on the calculation of anava obtained $F_{hitung} = 5{,}4$ while, score of $F_{tabel} = 2{,}48$ to $dk\ (1)$ to a real extent $\alpha = 0{,}05$. Based on the data it can be seen that the value of $F_{hitung} > F_{tabel}$ so that hypothesis testing declines H_o and H_a accepted. Thus it can be concluded that there is a significant difference in influence between the make a match learning model with the expository learning model on children's counting ability. This can be seen from the average counting ability of children taught with the make a match learning model ($\bar{x}$ = 28,1) higher than the ability taught by expository learning models ($\bar{x}$= 26,8).

2. DISCUSSION

Based on the results of this study, it is found that the numeracy ability of children who learned with the make a match learning model obtained an average score of 14.7 while children who learned with an expository learning model obtained an average score of 13.5. The numeracy ability of children taught with a make a match learning model is better. It is because the make a match learning model is a variation of the learning. The syntax starts from the facts in accordance with the teaching material through oral question and answer, identification of problems and focus of choice, and processing thoughts so that original ideas arise to determine solutions, presentations, and discussions. It is reasonable because the child's learning ability will continue to improve rapidly. Children learn to gain something by exploring and experimenting with the world around them in order to build their own

knowledge (self-knowledge). It includes cognitive development involving how the child thinks, how they see the world, and how to use what they learn. One of the characteristics of early childhood cognitive development is the ability to use imagination and creative thinking (Novita, 2018).

Principles in numeracy activities with a make a match learning model to children as active learners. The teacher allowed children to do numeracy and explore activities by playing the make a match game. The game of pairing (make a match) is also an activity of concretizing numbers that are abstract initially for children into concrete things using the help of concrete objects or cards with pictures. Learning activities using make a match learning model that is fun and interesting for children can cause children's interest, enthusiasm, and enthusiasm to do pairing games on counting activities. According to Huda (Taruddin, 2021), the advantages of make a match method are 1) increasing children's learning activities, both cognitively and physically; 2) it is fun; 3) increasing children's understanding of the material being studied and can increase children's interest in learning; 4) effective as a means of training children's courage to make presentations; 5) effectively train the discipline of children appreciating time to learn. If it is associated with numeracy learning activities, the make a match learning model applied by various methods can form a series of learning activities.

The results of this study can provide information that one way to improve numeracy skills is through make a match learning model. The game of pairing (make a match) can improve understanding of the concept of child numbers. After being given treatment, children who initially feel bored with counting activities become excited by given counting activities. In addition, increasing the understanding of the concept of numbers, the pairing game (make a match) can facilitate children's interaction by providing opportunities to become active learners. At first, the child does not know the numbers, but after being given the treatment becomes acquainted with the numbers and can mention and show the numbers 1-20. At first, children do not understand numbers and the relationship of numbers with objects. Still, after being given treatment, they can understand and have experience in connecting numbers with number symbols, sorting objects from the smallest to the most significant order, pairing the number of objects with numbers, comparing, mentioning, showing differences, and determining the number of objects. Through the treatment of activities to recognize the symbol of numbers that children do repeatedly, most children experience rapid progress in abilities. So that they can carry out counting activities at a relatively young age, which is around 4-5 years, without being burdened (Rahayu, 2018).

The make a match learning model is not just about improving children's numeracy ability in recognizing numbers, understanding numbers, and the relationship of numbers with objects. Based on field notes, documentation notes, and interview notes, it can be found that children begin to creatively develop their logic, improve their ability to count more objects, get to know the addition of objects and numbers, attach geometric shapes to objects around them, and group objects according to their shape, colour, and number. In addition, applying this learning model gives children a sense of pleasure when doing a pairing game (make a match) and training children's accuracy, patience, and dexterity. Pairing games not only improve the child's cognitive, but also the child's motor and social physique. It is because the child can move actively, interact and cooperate with friends. The learning media used has been able to attract attention and motivation students, the use of learning time has become more efficient, and the teacher has succeeded in developing suitable learning methods and media (Veryawan, Hasibuan, et al., 2021). Play activities that children often carry out can improve early childhood

development because play is one of the activities children like that can stimulate creativity in children. When playing, children can also learn various things, including developing knowledge, experimenting, and exploring to stimulate children's imaginative thoughts (Tursina, 2018).

The condition is in accordance with the opinion of Lie, 2003 (Rahyuni et al., 2014) that the make a match learning model is based on the philosophy of homo hominisocius. This philosophy emphasizes that human beings are social beings. The use of the make a match learning model in numeracy activities also gradually gives children knowledge and skills from concrete to abstract, easy to difficult, and simple to more complex according to the characteristics and age level of the child. In addition, the application of this model can also provide opportunities for children to be directly involved, create a pleasant, exciting atmosphere, and provide a sense of security and freedom for children. This is in accordance with research (Weni et al., 2016) that the application of the make a match type of cooperative learning model has an effect and is very effective on cognitive development in early childhood. It is because make a match learning model can make learning fun, so children actively participate in learning. In addition, direct involvement of children in learning can make learning more meaningful so that children's number concept skills can develop as expected (Laksmi et al., 2017).

The results of this study are also in accordance with the research conducted by (Saputri, 2016) in which the results of the study showing that the ability to recognize numbers can be improved through the cooperative learning type of looking for a partner. After the implementation of the cycle I, the ability of children to recognize numbers increased by a percentage of 59.88% on the criteria of developing as expected (BSH), and after cycle II achieved the success of 83.33% in the criteria of excellent development (BSB). This research is also in line with the research that has been carried out by (Kurniasih, 2020) with the results of the research analysis showing that there is an increase in cognitive development using the make a match learning model. The average percentage of cognitive development of recognizing numbers through make a match model got an improvement result, which initially had a percentage of 44.45%, but after applying the make a match learning model, the percentage became 85.37%, with an average value of 35.25% increase, so it can be concluded that the make a match learning model can increase the ability to recognize numbers. Research conducted by (Laka et al., 2019) also showed that the average value of initial reading ability at the time of pre-test was 8,200 and at the time of post-test was 10,933 with a significant value of 0.000<0.05. Based on these results, it can be seen that there are significant differences before being given treatment and after make a match learning model treatment is aplied; thus it can be concluded that there is an influence of the make a match cooperative learning model on the ability to read early to children. The use of the make a match learning model greatly encourages the improvement of children's cognitive abilities and improves children's numeracy skills at RA Fadnur Aisyah Medan.

D. CONCLUSION

Children can build their own knowledge by playing pictures and numbers with groups through make a match learning model. Teachers must also be able to pay attention to the situation and conditions of the implementation, facilitate, and motivate children to develop learning outcomes. The make a match learning model can be one of the teachers' choices in improving children's numeracy skills. Learning will be more meaningful if the use of learning models can follow the characteristics of children so that it has attractiveness and is more effective and efficient.

However, it should be noted that no learning model is most suitable for each characteristic possessed by each child or the characteristics of learning. But the results of this study can be input for teachers to choose make a match learning model in numeracy activities.

The results of this study also showed the interaction between the make a match learning model and the numeracy ability of group B children in RA Fadnur Aisyah Medan. It is illustrated that there is a relationship between the learning model used by teachers and children's numeracy skills. Using learning models can maximize children's numeracy ability, which is beneficial in achieving learning goals. Thus, teachers not only pay attention to learning models as the right way or technique in improving children's numeracy ability but children as one of the influencing factors in acquiring children's numeracy ability properly.

In addition, the use of appropriate techniques in improving children's numeracy skills, determining themes and sub-themes, and the media used by teachers are also one of the success determinations in applying the make a match cooperative learning model so that teachers must pay attention in applying it. In this study, teachers used themes and sub-themes, as well as media that appropriate to the development and characteristics of children, so that the application of the make a match cooperative learning model can be said to have improved.

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