Journal of Education Action Research
Volume 8, Number 3, Tahun Terbit 2024, pp. 531-539
P-ISSN: 2580-4790 E-ISSN: 2549-3272
Open Access: https://doi.org/10.23887/jear.v8i3.84516

Index Card Match Learning Model with Cooperative Setting Think Pair Share Type Improves Early Mathematics Skills and Cooperation of Early Age Children

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ARTICLE INFO

Article history:
Received June 07, 2024
Accepted August 08, 2024
Available online August 25, 2024

Kata Kunci:
Model Pembelajaran, Index Card Match, Think Pair Share, Kemampuan Matematika Awal, Kerjasama

Keywords:
Learning Model, Index Card Match, Think Pair Share, Early Math Skills, Cooperation

ABSTRAK

Beberapa anak mengalami permasalahan dalam hal kemampuan matematika awal dan sikap kerjasama. Berdasarkan hal tersebut tujuan penelitian ini yaitu untuk menganalisis pengaruh model pembelajaran index card match dengan setting kooperatif tipe think pair share dalam meningkatkan kemampuan matematika awal dan kerjasama anak usia dini. Penelitian ini merupakan penelitian eksperimen semu dengan rancangan non-equivalent post-test only control group design. Populasi pada penelitian ini adalah anak TK B1 yang berjumlah 184 anak. Teknik pemilihan sampel yang digunakan pada penelitian ini adalah teknik simple random sampling. Jumlah sampel penelitian ini yaitu 46 anak TK B. Metode yang digunakan dalam mengumpulkan data yaitu dan kuesioner. Instrumen yang digunakan dalam mengumpulkan data yaitu lembar kuesioner. Teknik analisis data penelitian ini yaitu statistik inferensial. Hasil penelitian yaitu terdapat perbedaan kemampuan matematika dan kerjasama anak yang mengikuti model pembelajaran Index Card Match dengan setting kooperatif tipe Think Pair Share dengan anak yang dibelajarkan menggunakan model konvensional di TK B. disimpulkan bahwa model pembelajaran Index Card Match dengan setting kooperatif tipe Think Pair Share dapat meningkatkan kemampuan matematika awal dan kerjasama pada anak usia dini. Implikasi penelitian yaitu penggunaan model pembelajaran Index Card Match dengan setting kooperatif tipe Think Pair Share memberikan pengalaman yang menarik sehingga dapat digunakan oleh guru dalam upaya menciptakan kegiatan pembelajaran yang bermakna.

ABSTRACT

Early mathematics and cooperative attitudes. Based on this, this study aims to analyze the effect of the index card match learning model with a cooperative setting of the think pair share type in improving early mathematics and cooperation skills in early childhood. This study is quasi-experimental with a non-equivalent post-test-only control group design. The population in this study were 184 children of Kindergarten B1. The sample selection technique used in this study was simple random sampling. The number of participants in this study was 46 children from kindergarten B. The method used in collecting data was a questionnaire. The instrument used in collecting data was a questionnaire sheet. The data analysis technique in this study was inferential statistics. The study results showed differences in the mathematics and cooperation skills of children who followed the Index Card Match learning model with a cooperative setting of the Think Pair Share type with children compared to those taught using the conventional model in Kindergarten B. It was concluded that the Index Card Match learning model with a cooperative setting of the Think Pair Share type can improve early mathematics and cooperation skills in early childhood. The research implies that using the Index Card Match learning model with a cooperative setting of the Think Pair Share type provides an exciting experience that teachers can use to create meaningful learning activities.

1. INTRODUCTION

Early childhood is when an individual undergoes a rapid development process and mental objects for the child's future life. During this period, the growth and development of children in various aspects undergo rapid changes (Citra, 2017; Erviana & Faisal, 2022; Suryana & Hijriani, 2022). Learning activities

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must provide stimulation to improve children's development and growth towards a better direction. Early childhood education must emphasize laying the foundation for physical growth and development (fine and gross motor coordination), intelligence (thinking power, creativity, emotional intelligence, spiritual intelligence), socio-emotional (attitudes and behaviour and religion), language and communication, according to the uniqueness and stages of development (Antariani et al., 2021; Cahyaningrum et al., 2017). The best approach to learning activities for early childhood is through play. This play activity will accelerate the process of brain maturity in children (Holis, 2016; Novitawati & Anggraeni, 2022). A good network of children's brain cells is a brain that is rich in connections due to the stimulation of children's enjoyable activities. Fun learning activities will certainly improve children's brain performance, especially in the right and left brain. Children's left brain is related to memory, grammar, logic, numbers, and ratios, while the right brain is related to creativity, colour, imagination, and music (Fitria & Refnadi, 2017). This is what causes teachers to be able to design fun learning activities for early childhood so that learning activities can run optimally (Rahmatia et al., 2021; Widiyanti, D. & Darmiyanti, 2021).

However, the problem that is often encountered is the less-than-optimal learning activities in schools. The research findings revealed that many teachers still need exciting activities to stimulate children's learning (Handayani & Sinaga, 2022; Ma'viyah, 2021). Other research findings also revealed that monotonous learning activities cause children to be less motivated in learning, so children tend to be passive in learning (Nurwahidah et al., 2021; Wulandari & Suparno, 2020). Based on the results of observations conducted at Yudistira Batuan Kindergarten, several learning problems were also found. The problems found were that several children had problems regarding early mathematics skills and cooperative attitudes. The observations also found that the need for children's ability to socialize was due to learning activities only focusing on things related to writing, reading, and counting, so children's social development did not develop optimally. Another problem is that many children need to become more familiar with numbers. Some children seem uninterested in learning to recognize numbers, so children are just quiet when learning activities in the classroom occur.

The solution offered to overcome this problem is for teachers to be able to design fun learning activities that can improve mathematical abilities and cooperation skills in early childhood. Teachers are essential in developing students' understanding (Koedoes et al., 2020; Sintia et al., 2020). The ability to understand concepts is a fundamental thing that students must have to master the teaching material (Fahrudhin et al., 2018; Trianggono, 2017). In working on math problems, students must have a basic understanding of the concept. Understanding concepts is very important in the process of learning mathematics. Early mathematical abilities are essential in children because, first, they will help children understand more complex basic mathematical concepts in the future (Maharani et al., 2020; Pangestu et al., 2019). Second, children accustomed to learning mathematics will have an excellent opportunity to develop problem-solving skills. Third, mathematical abilities help children develop critical thinking skills (Lider, 2022; Maharani et al., 2020). The importance of cooperation skills in children is that, first, teaching children to work together helps them understand the value of teamwork.

One of the learning models that teachers can apply to improve children's mathematics and collaboration skills is the index card match learning model. The Index Card Match (ICM) learning model is fun and can improve children's collaboration skills (Wahyuningtyas & Zulherman, 2022; Yatini, 2021). Previous research findings revealed that Index Card Match is a fun learning model that teachers can use in learning (Devi et al., 2020; Sirait & Apriyani, 2020; Yatini, 2021). The ICM (Index Card Match) Active Learning Strategy can improve students' mathematics learning outcomes. Index Card Match is looking for pairs of cards that will be used to repeat learning materials that the previous teacher has given. Index Card Match is a form of learning activity that can overcome learning problems in children by matching or looking for pairs of cards containing questions with their answers. The Index Card Match learning model is a fun and active learning model that involves playing cards to make learning activities more enjoyable (Annisa & Marlina, 2019; Rambe, 2018).

Index Card Match in this study uses a cooperative setting of the Think Pair Share (TPS) type. Other studies state that the Think Pair Share cooperative learning model teaches students to work independently on questions that can increase self-confidence and cooperation (Nuraeni & Rosyid, 2019; Wahyuningtyas & Zulherman, 2022). The Think Pair Share (TPS) cooperative learning model allows students to think about finding their ideas and collaborate with other students (pairs). Students are allowed to present the correct answers from the results of discussions with other students, which can encourage students' enthusiasm for working together (Annisa & Marlina, 2019; Prabowo et al., 2020). Think Pair Share cooperative learning can train and develop students' thinking skills and activities because students build knowledge through their exploration, and students' knowledge can also develop through the transfer of thought patterns with other students so that students can combine and compare their patterns with the thought patterns of other students. However, there has been no study on the index card match learning model with a cooperative

setting of the think pair share type to improve early mathematics skills and cooperation in early childhood. Based on this, this study aims to analyze the effect of the index card match learning model with a cooperative setting of the think pair share type in improving early mathematics skills and cooperation in early childhood.

2. METHOD

This study is quasi-experimental with a non-equivalent post-test-only control group design; one is given treatment while the other class is designated as a control class (Dantes, 2012). In this study, the experimental class was given treatment using the Index Card Match learning model with a cooperative setting of the Think Pair Share type. In contrast, the control class used a conventional learning model. The population in this study were 184 TK B1 children in Cluster II PAUD Sukawati. The results of the population data distribution met the requirements, namely normal and homogeneous, and then an equivalence test was carried out with Anova. Based on the results of the data analysis, the significant value was 0.437, so that 0.437> 0.05, so there was no difference in the value of mathematical ability in all classes in the population; in other words, all classes in the population have the same mathematical ability. The sample selection technique used in this study was simple random sampling. The number of samples in this study was 46 TK B children. This study was conducted at TK Cluster II PAUD Sukawati.

The method used to collect data is a questionnaire. Observation aims to conduct direct observation of things that have a relationship with the problem being studied and to find out directly how the Index Card Match learning model influences the cooperative setting of the Think Pair Share type on early childhood cooperation. The questionnaire method is used to obtain and collect data that will be processed in this study. The questionnaire collects data on children's cooperation and early mathematical abilities. The questionnaire was distributed to the research subjects, namely kindergarten B1 children, who would be assisted in filling out the questionnaire by the teacher. The instrument used in collecting data was a questionnaire sheet. The questionnaire grid is presented in Table 1.

Table 1. Early Childhood Mathematics Ability Instrument Grid

Variables	Dimensions	Indicator
Math Ability	Pattern	Making simple patterns
		Determining the next pattern sequence
	Classification	Grouping objects based on similarities in color, size, and shape
		Grouping objects based on differences in color, size, and shape
	Basic Arithmetic Skills	Making a sequence of numbers 1-10 with objects
		Combining the number of objects with number symbols
	Geometric Shapes	Mentioning the results of addition with objects up to 10
	Pattern	Mentioning and showing geometric shapes
		Making Geometric Shapes

(Pujiastuti et al., 2012)

Table 2. Early Childhood Collaboration Instrument Grid

Variables	Dimensions	Indicator
Cooperation	Communicate Help Each Other	Children interact with their friends.
		Children are able to speak first using greeting sentences.
		Children are able to ask first about their friends' conditions/news
		Closing the conversation with a farewell sentence
		Children are able to offer help to their friends well
		Children are able to offer help to teachers with greeting words.
	Be Responsible Communicate	Children are able to complete tasks given by the teacher well and correctly.
		Children are able to tidy up the tools and materials that have been used well.
		Children are able to take care of the play equipment used while in the classroom
		Children are able to follow the rules during activities well and correctly

(Hadaina & Astawan, 2021)

The data analysis technique of this study is inferential statistics. This study will investigate the effect of one independent variable on two dependent variables. Hypothesis testing can be done if the prerequisite tests, which consist of normality and homogeneity tests, are met. Normality tests are carried out to analyze normally distributed data. Data normality tests are carried out using SPSS-26.00 for Windows Kolmogorov-Smirnov statistical tests at a significance level of 5%. The homogeneity test aims to determine whether the differences in the hypothesis test are caused by differences in variance between groups, not as a result of differences in groups (Agung, 2013). The criteria for testing homogeneous data if the significance produced in the Box's M test is more than 0.05 and the data does not come from a homogeneous population if the significance produced in the Box's M test is less than 0.05. Homogeneity tests are carried out with the help of the SPSS 26 for Windows program. In this study, Manova was used to conduct hypothesis testing.

3. RESULT AND DISCUSSION

Result

First, the results of this study will describe the comparison, average value, and standard deviation between the experimental group using the Index Card Match learning model with a cooperative setting of the Think Pair Share type and the control group using the conventional model. Information on the post-test results of the children's mathematical abilities in the experimental and control groups is presented in the form of minimum values, maximum values, averages, and standard deviations (SD). In the experimental group, the average value of mathematical ability was 47.86. The minimum value of the child was 44, and the maximum value of the child was 54. The standard deviation was 2.748. In the control group, the average value of the child's mathematical ability was 42.83. The minimum value of the child was 38, and the maximum value of the child was 48. The standard deviation was 2.426. The results of the data analysis showed that the average value of the child's mathematical ability in the experimental class was more significant than the value of the child's mathematical ability in the control class. This shows that the experimental group tends to have higher values than the control group.

Second, the results of this study will describe the comparison, average value, and standard deviation between the experimental group using the Index Card Match learning model with a cooperative setting of the Think Pair Share type and the control group using the conventional model. Information on the results of the post-test of cooperation in the experimental and control groups is presented in the form of minimum values, maximum values, averages, and standard deviations (SD). The general description of children's cooperation was analyzed using SPSS 16. In the experimental group, the average value of cooperation was 49.91. The minimum value of the child was 45, and the maximum value of the child was 56. The standard deviation was 3.637. The average value of children's cooperation in the control group was 40.00. The minimum value of the child was 34, and the maximum value of the child was 46. The standard deviation was 3.244. The results of the data analysis showed that the average value of children's cooperation in the experimental class was more significant than the value of children's cooperation in the control class. This shows that the experimental group tends to have higher values than the control group.

The normality test was conducted on four groups of data, namely: (1) Children's Mathematical Ability following the Index Card Match learning model with a cooperative setting of the Think Pair Share type, (2) Children's Mathematical Ability following the conventional learning model, (3) Children's Cooperation following the Index Card Match learning model with a cooperative setting of the Think Pair Share type, and (4) Children's Cooperation following the conventional learning model. The normality test of data distribution in this study was conducted using the assistance of SPSS Statistics 26. The results of the normality test of children's mathematical ability are presented in Table 3.

Table 3. Results of the Normality Test of Children's Mathematics Ability Data

	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Mathematical Ability	Experiment	0.162	22	0.138	0.947	22	0.275
	Control	0.176	24	0.053	0.968	24	0.611

The results of the data analysis of the normality test of mathematical ability in the Shapiro-Wilk column in the experimental group obtained a value of 0.275, namely 0.275> 0.05 so that the data was normally distributed. The results of the data analysis of the normality test of children's language ability in the control group in the Shapiro-Wilk column in the control group obtained a value of 0.611, namely 0.611> 0.05 so that the data was normally distributed. It can be concluded that children's mathematical abilities in

the experimental and control groups were normally distributed. The results of the normality test of children's cooperation are presented in Table 4.

Table 4. Results of the Normality Test of Children's Cooperation Data

	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Cooperation	Experiment	0.144	22	0.200*	0.925	22	0.096
	Control	0.125	24	0.200*	0.971	24	0.703

The results of the data analysis of the children's cooperation test in the Shapiro-Wilk column in the experimental group obtained a value of 0.096, namely 0.096> 0.05 so that the data was normally distributed. The results of the data analysis of the normality test of children's cooperation in the control group in the Shapiro-Wilk column in the control group obtained a value of 0.703, namely 0.703> 0.05 so that the data was normally distributed. It can be concluded that children's cooperation in the experimental and control groups was normally distributed.

The homogeneity test was conducted on the variance of pairs between the experimental group and the control group. The homogeneity test was conducted using SPSS Statistics 26. The results of the homogeneity test of mathematical ability in the experimental group and the control group obtained a value of 0.614, namely 0.614> 0.05 so that the variance of the two groups was homogeneous. The results of the Homogeneity Test of Children's Mathematical Ability are presented in Table 5.

Table 5. Results of the Homogeneity Test of Children's Mathematical Abilities

		Levene Statistic	df1	df2	Sig.
Mathematical Ability	Based on Mean	0.258	1	44	0.614
	Based on Median	0.350	1	44	0.557
	Based on Median and with adjusted df	0.350	1	43.955	0.557
	Based on trimmed mean	0.261	1	44	0.612

The results of the data analysis of the homogeneity test of children's cooperation in the experimental group and the control group obtained a value of 0.220, namely 0.220> 0.05 so that the variance of the two groups is homogeneous. It is concluded that the data on children's mathematical abilities and cooperation in the experimental group and the control group are homogeneous. The results of the Homogeneity Test of Cooperation in the Experimental Group and the Control Group are presented in Table 6.

Table 6. Results of the Homogeneity Test of Children's Cooperation

		Levene Statistic	df1	df2	Sig.
Cooperation	Based on Mean	1.546	1	44	0.220
	Based on Median	0.992	1	44	0.325
	Based on Median and with adjusted df	0.992	1	43.995	0.325
	Based on trimmed mean	1.509	1	44	0.226

The third hypothesis test uses the Manova (Multivariate Analysis of Variance) formula with the help of SPSS Statistics 26. The testing criteria for hypothesis III are if the F value for Pillai's Trade, Wik Lamda, Hotelling Trance, Roy's Large Root analysis is significant <0.05 then H0 is rejected and H1 is accepted. The results of the data analysis show that the significance value in the Pillai's Trade, Wik Lamda, Hotelling Trance, Roy's Large Root column is 0.000. This shows that 0.000 <0.05, so there is a difference in the mathematical abilities and cooperation of children who follow the Index Card Match learning model with the cooperative setting of the Think Pair Share type with children who are taught using the conventional model at TK B Gugus II PAUD Sukawati. The results of the Hypothesis III test are presented in Table 7.

Table 7. Hypothesis Testing Results

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	0.998	13016.143[b]	2.000	43.000	0.000	0.998

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Model pembelajaran	Wilks' Lambda	0.002	13016.143[b]	2.000	43.000	0.000	0.998
	Hotelling's Trace	605.402	13016.143[b]	2.000	43.000	0.000	0.998
	Roy's Largest Root	605.402	13016.143[b]	2.000	43.000	0.000	0.998
	Pillai's Trace	0.792	81.821[b]	2.000	43.000	0.000	0.792
	Wilks' Lambda	0.208	81.821[b]	2.000	43.000	0.000	0.792
	Hotelling's Trace	3.806	81.821[b]	2.000	43.000	0.000	0.792
	Roy's Largest Root	3.806	81.821[b]	2.000	43.000	0.000	0.792

Discussion

Based on the results of the research that has been conducted, descriptively, the mathematical and cooperation abilities of children in Kindergarten B Gugus II PAUD Sukawati using the Index Card Match learning model with a cooperative setting of the Think Pair Share type have an average score of mathematical and cooperation abilities that are higher than the average score of mathematical and cooperation abilities of children who are taught using conventional learning models. First, the increase in children's mathematical and cooperation abilities is due to applying the Index Card Match learning model with a cooperative setting of the Think Pair Share type building interaction between students. The Index Card Match model also builds students' communication skills, including effectively sharing ideas and ideas (Wahyuningtyas & Zulherman, 2022; Yatini, 2021). Thus, children build their ability to interact. In the Index Card Match model, children use cards containing questions and answers (Ma'rifah et al., 2015; Yatini, 2021). Thus, children must interact with other cards to find the appropriate answer, thereby increasing children's interaction. This is supported by previous research findings, which revealed that students who build deeper interactions have an impact on increased communication skills (Siregar, 2017; Wahyuningtyas & Zulherman, 2022). Thus, the Index Card Match learning model with a cooperative setting of the Think Pair Share type builds positive student interactions.

Second, the increase in children's mathematical and cooperative abilities is due to applying the Index Card Match learning model with a cooperative setting of the Think Pair Share type, which can build students' self-confidence. The interaction that occurs between children causes children's self-confidence to increase (Fitrianis & Yaswinda., 2020; Handayani, 2021). In addition, in this model, children must build self-confidence by working together and sharing ideas to achieve goals. Previous research findings revealed that self-confidence in early childhood is essential because it affects children's psychological, social, and emotional development (Fransisca et al., 2020; Umri et al., 2020). Self-confidence allows children to develop other potentials they have (Ardhiana et al., 2022; Nuraeni et al., 2019; Nurlaili, 2018). By having self-confidence, children can improve their critical thinking skills, dare to make decisions and overcome failure better. Applying the Index Card Match learning model with a cooperative setting of the Think Pair Share type can build self-confidence in children.

Third, the increase in children's mathematical and cooperation skills is due to applying the Index Card Match learning model with a cooperative setting of the Think Pair Share type, making the learning atmosphere meaningful. The Index Card Match model invites children to think critically and analytically by finding the correct answers through paired cards (Wahyuningtyas & Zulherman, 2022; Yatini, 2021). Thus, students can improve their critical thinking skills and have a sense of satisfaction in learning (Jannah, 2020; Kurjum et al., 2020). Other findings also state that the Index Card Match learning model makes the learning atmosphere meaningful by presenting material in a fun way, improving critical thinking skills, communicating, and improving learning outcomes (Mulyono et al., 2021; Wahyuningtyas & Zulherman, 2022). The advantages of the Index Card Match learning model with a cooperative setting of the Think Pair Share type are that it increases students' reasoning power by giving them more time to think, answer, and help each other. This certainly impacts children's mathematical and cooperation skills to increase.

Previous findings stated that cooperative learning of the Think Pair Share type can increase student motivation by providing more time to think, answer, and help each other (Rivai & Mohamad, 2021; Zulfantry et al., 2021). This differs from conventional learning models that invite students to be calm and listen to the teacher's explanation. Passive learning activities will make students feel bored and do not train children's thinking skills. This is not good for learning, especially in early childhood, because it does not stimulate children's growth and development. This is reinforced by research stating that children need fun learning to stimulate their growth and development (Anggreni et al., 2017; Hasbi et al., 2020; Tela et al., 2019). Based on the results of research that has been conducted and reinforced by several other studies, applying the Index Card Match learning model with a cooperative setting of the Think Pair Share type can improve mathematics and cooperation skills in early childhood.

The limitation of this study is that it only analyzes the ability of cooperation and mathematics in early childhood by applying the Index Card Match learning model with a cooperative setting of the Think Pair Share type. The study implies that for children, the application of the Index Card Match learning model with a cooperative setting of the Think Pair Share type has a positive impact on the ability of mathematics and cooperation in early childhood. In learning activities, children become more enthusiastic and active. For teachers, using the Index Card Match learning model with a cooperative setting of the Think Pair Share type provides teachers with an exciting experience that teachers can use to create meaningful learning activities.

4. CONLUSION

The results of the data analysis showed that there was a significant difference in the Index Card Match learning model with the cooperative setting of the Think Pair Share type in the experimental group, the children's mathematical and cooperation abilities were higher when compared to the control group. It was concluded that the Index Card Match learning model with the cooperative setting of the Think Pair Share type had an effect on mathematical and cooperation abilities in Kindergarten B Gugus II PAUD Sukawati.

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