

# The Effect of Cooperative Learning Methods and Interest in Learning to the Ability Sort the Mathematical Pattern

(Eksperimental Studies in Children Kindergarten Group B in the Kulon Progo Regency Yogyakarta)

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**Abstract**—The purpose of this research to determine the effect of cooperative learning and interest in learning the ability to sort the mathematical pattern. This research used experimental methods and design treatment by the level of 2x2. This research conducted in children Kindergarten Group B in Kulon Progo Regency, Yogyakarta. This research used sampling technique was conducted stratified random sampling technique, with a total sample of 40 children. The data were collected through questionnaire interest in learning and the ability to sort the mathematical pattern test. Data analysis techniques in this research using two way ANOVA to see the main effects and interactions, further using the Tukey test to see simple effects. The results of this research are as follows: 1) Overall ability to sort the patterns of mathematics using cooperative learning STAD higher effect of cooperative learning methods TPS ( $F_{hitung} = 5,19 > F_{tabel (a=0,05)} = 4,11$ ). 2) There is interaction between cooperative learning method with interest in learning ( $F_{hitung} = 13,02 > F_{tabel (a=0,05)} = 4,11$ ). 3) Ability to sort the mathematical patterns who learn a high level a high level of interest in higher value with the given method the type STAD cooperative learning ability than abilities to sort mathematical pattern with the type TPS cooperative learning methods ( $Q_{hitung} = 4,24 > Q_{tabel (a=0,05)} = 3,15$ ). 4) Ability to sort the mathematical patterns that have a low learning interest granted TPS cooperative learning methods have the effect of higher value than the ability to sort given mathematical patterns STAD cooperative learning methods STAD ( $Q_{hitung} = -2,30 > Q_{tabel (a=0,05)} = -3,15$ ).

**Keywords**—Cooperative learning methods, Interest to learn, the ability to sort of mathematical patterns  
**Introduction**

## I. INTRODUCTION

The general phenomenon that develops in society about mathematics, especially in school age is that mathematics is still often considered a frightening specter, only a small proportion of children who like to learn mathematics, especially the ability to count. This is due to the low basic ability. OECD Secretary General Angel Gurría on the OECD website also stated that 32 percent of children taking the test could not solve the easiest counting questions. Counting is very important for every child to learn [1]. Without the most

basic skills, he is worried that it is likely that the children will drop out of school or will have difficulty facing real life in the future. "Children need skills to face reality and contribute to solutions in this era of globalization," Gurría said at the launch of the 2012 PISA results in Washington DC, USA [2].

Problems with basic skills were found in Group B, Kindergarten in Kulon Progo, Yogyakarta, about the ability to construct mathematical patterns. In Group B children are still having difficulty in composing patterns because they are confused in differentiating and arranging them in a sequence of patterns based on objects, colors, shapes, numbers, and sizes. This is because the learning process used is conventional learning such as the lecture method, teacher center, the use of media that is less varied during learning where the child only sees what the teacher makes and writes or draws patterns according to what the teacher makes and uses the Child Worksheet for learning resource media so that children are not creative in developing the ability to sort patterns, children are more passive when answering questions raised by the teacher. It was concluded that the ability to sort mathematical patterns in Kulon Progo DIY Kindergarten was still low. The ability to compose mathematical patterns is the ability to arrange a sequence of objects that are interconnected with each other, the relationship that occurs can be based on the order of colors, shapes, and sizes.

Based on the Republic of Indonesia Minister of Education and Culture Regulation No. 137 of 2013 concerning the National Standards for Early Childhood Education, on the Standard of Content on the Achievement Level of Development for Ages 4–6 Years Scope Development ages 5–6 years is one of the levels of achievement of child development in the developmental environment cognitive logical thinking is the ability to recognize ABCD-ABCD patterns [3].

In pre-school children, even elementary school, the early grades of their learning activities are still playing, so the researchers designed a game to improve the ability to recognize children's patterns by using 2 types of cooperative learning methods namely the cooperative learning method Student Team Achievement Division (STAD) type and

method Think Pair Share (TPS) type cooperative learning. With the cooperative learning method, it is expected to influence the ability to sort mathematical patterns.

In addition to cooperative learning methods, this study also examines research subjects who have a high interest in learning and research subjects who have low interest in learning, to find out the level of participation in cooperative learning methods that have different levels of learning interest. The success of recognizing the order of patterns (patterns) in children results also by factors such as interest. To further develop this research, it is arranged in a research title, namely "The Effect of Cooperative Learning Methods and Interest in Learning on the Ability to Sort Mathematical Patterns".

Charlesworth explained that: Ordering, or putting things into a sequence, is basic to patterning. Patterning is the process of discovering auditory, visual, and motor regularities. There are many regularities in the number system that children must understand. During the primary years, children work with more complex problems with concrete materials, connect concrete patterns to symbols, and learn to recognize some of the patterns and higher level sequences in the number system [4].

According to Charlesworth's explanation above sorting, or placing something in order is the basis for patterns. The pattern is the process of discovering hearing, sight and motor regularity. There is a lot of order in the number system that children must understand. During the main years, children work with more complex problems with concrete objects, connect concrete patterns to symbols, and learn to recognize several higher-level patterns and sequences in a number system.

Smith and Price consider that "Pattern can be described as a systematic arrangement of numbers or shapes which follows a given rule" [5]. This opinion explains that the pattern can be described as a systematic arrangement of numbers or shapes that follow the rules given. Whereas Hilda L. Jackman defines that "Patterning is another way for children to see order in the world. A pattern is a sequence of number, colors, objects, sounds, shapes, or movements that repeat, in the same order arrangement, over and over again." [6]. The definition explains patterns are another way for children to see the order in the world. Patterns are sequences of numbers, colors, objects, sounds, shapes, or repetitive movements, in the same sequence.

Pattern are regular arrangements of objects, shapes, or numbers. Pattern recognition allows children to recognize relationships among objects and then to make generalizations about number combinations and to count [7]. A pattern is a regular arrangement of objects, shapes, or numbers. The introduction of patterns allows children to recognize relationships between objects and then generalize about number combinations and counting.

Based on the opinions above, it can be concluded that the notion of the ability to compose a mathematical pattern is the ability to arrange a sequence of objects that are interconnected with one another, relationships that occur can be based on the order of objects, colors, shapes, numbers, and sizes.

Cooperative learning methods have an understanding according to Slavin, namely teaching methods where

children work in small mixed ability groups [8]. Based on these opinions, cooperative learning is a group learning activity arranged in such a way that learning is based on social changes structured from information between students in groups that each student is responsible for self-learning and motivated to improve the learning of other children in the group. This study will use the cooperative learning method type STAD and TPS as independent variables.

Method (STAD - Students Teams Achievement Divisions), children are placed into study teams of four people mixed in with performance, gender, and ethnicity. The teacher presents the lesson and then the child works on their team to make sure all team members have mastered the lesson. Finally, all the children took their own small examinations about the material and at that time they were not allowed to help each other. STAD has been used in various types of subjects, ranging from mathematics, art, language, to social science, and has been used from the second grade to college [9]. The method developed by Slavin involves "competition" between groups. Children are grouped in various ways based on their abilities of gender, race, and ethnicity. First of all, children learn the material together with their group mates, then they are tested individually through quizzes [10].

Learning in the cooperative learning model type student teams achievement division (STAD), the teacher first explains or presents the material, then the team members study the material in the group. Students are equipped with worksheets and also given training, the tasks must be mastered by each group member. Each group member must give the group the best score by showing improved performance compared to before. Groups that without having members increase in value and produce imperfect scores will not win or not get prizes in the form of prizes or others. In the end, the teacher gave a quiz that was done individually by students. Learning with the cooperative model of the Student Team Achievement Division (STAD) type gives awards to groups that get the title of the super team. The award for group success is carried out by the teacher with the following stages: calculating individual scores, calculating group scores, and giving gifts and recognizing group score [11].

Based on the stages described above in the Students Teams Achievement Divisions (STAD) cooperative learning method, it can be concluded that the Child Team Achievement Division or also called Students Teams Achievement Division (STAD), children are placed into study teams of four to five children. mixed with performance, gender, and ethnicity. There are four stages in this method, namely teaching, study team, test, and recognition. In this first stage, children should be taught what they will learn and why the lesson is important. The second stage of group members works cooperatively to complete the assignments given by the teacher. The third stage is the test phase, each child individually completes the quiz, the results of individual quizzes will be accumulated for their team scores. The fourth stage is that each team receives an award or reward depending on the average score of the team.

The Think Pair Share (TPS) was the first time this method was introduced by Frank Lyman and his colleagues at the University of Maryland as Arends cited, stating that think pair share is an effective way to vary the atmosphere of class discussion. Assuming that all recitation and the

procedures used in think pair share can give children more time to think, to respond and help each other. The teacher estimates that only completes a short presentation or the child reads the assignment or the situation that is a question mark [12].

As research conducted by Nurindah Lestari and DessyRizkiSuryani, states that interest greatly influences student learning outcomes[13].Interest is the attraction of an object that comes from the heart, not because of pressure from other people. This shows that the interest possessed by a person is the result of a process of thought, emotion, and learning that gives rise to a desire to explore objects or maybe a particular activity. Therefore the interest in each person can be different even though they are in the same environment [14]. Based on these opinions, interest is a tendency to be attracted to activities or objects and enjoy some activities or objects. Interest means a feeling of wanting to pay attention and be curious about something [14]. Whereas Crow and Crow mengatakanInterest may refer to the motivating force that impels us to attend to a person, a thing, or an activity or it may be the effective experience that has been stimulated by the activity itself. In other words, interest can be the cause of an activity and the result of participation of that activity [15]. Based on this opinion it can be defined that interest can refer to the power of motivation that encourages us to pay attention to people, objects, or activities or perhaps effective experiences that have been stimulated by the activity itself. In other words, interest can be the cause of activity and the outcome of the activity.

The interest in learning kindergarten is an encouragement that allows children to survive to pay attention, enjoy activities, engage in activities, and have curiosity. Interest in children's learning can be identified through several elements which include: (1) attention; (2) interested in activities; (3) involved in activities / active in activities; (4) have curiosity. In the learning process recognize the sequence of patterns, children need a high motivation and desire to be able to develop the ability to sort mathematical patterns well.

## II. RESEARCH METHODS

This study aims to determine the effect of cooperative learning methods and interest in learning about the ability to sort mathematical patterns (pattern). This research was conducted at TK Pertiwi Puspayoga and TK ABA Bendungan, Wates Subdistrict, Kulon Progo Regency, Special Region of Yogyakarta with a total sample of 40 children. The research design that will be used is the Treatment by Level 2x2 design. The sampling technique was carried out by a stratified cluster random sampling technique. Data analysis techniques used two-way ANOVA to see the main effects and interactions, then using the Tukey test to see simple effects.

## III. RESEARCH RESULTS AND DISCUSSION

In accordance with the purpose of the research is to determine the effect of the STAD type cooperative learning method on the ability to sort mathematical patterns in kindergarten children, done by comparing the results of measurements with the control variables given treatment with TPS type cooperative learning methods. Statistically, to test whether there are significant differences between several data groups using Analysis of variance.

TABLE I. ANALYSIS OF DATA VARIANCE SKILLS ABILITY TO ADJUST MATHEMATICAL PATTERNS CHILDREN KINDERGARTEN

Source of Variance	JK	DB	RJK	$F_{count}$	$F_{table}$ ( $\alpha=0,05$ )	Information
Between A	66,6	1	66,6	5,19	4,11	Significant
Between B	57,5	1	57,5	4,48	4,11	Significant
AxB Interaction	166,9	1	166,9	13,02	4,11	Significant
In	461,6	36	12,8			
Total		39				

From the results of the analysis of variance (ANOVA) of the two paths above, there are interactions, it is necessary to do further testing with the Tukey test.

TABLE II. ADVANCED CALCULATION RESULTS WITH TUKEY TEST

Perbandingan	n	$Q_{hitung}$	$Q_{tabel}$	Kesimpulan
$A_1B_1$ dan $A_2B_1$	10	4,24	3,15	Signifikan
$A_1B_2$ dan $A_2B_2$	10	-2,30	-3,15	Signifikan

From the results of the above calculations it can be concluded that the results of this study are as follows:

- Overall the ability to sort mathematical patterns taught using the STAD cooperative learning method has a higher effect than the cooperative learning type TPS ( $F_{count} = 5.19 > F_{table} (\alpha = 0.05) = 4.11$ ).
- Interactions between cooperative learning methods given both the STAD and TPS type cooperative learning methods with a level of interest in learning, generally have a significant effect on the ability to sort the mathematical patterns of kindergarten children ( $F_{count} = 13.02 > F_{table} (\alpha = 0.05) = 4.11$ ).

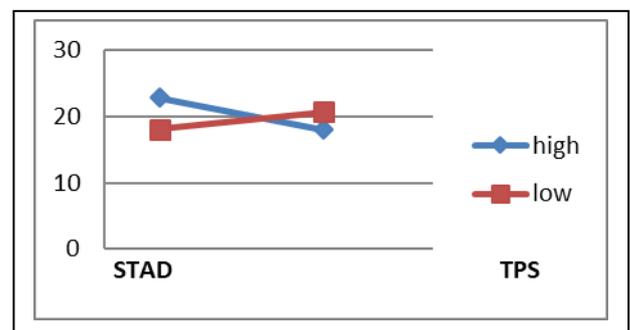


Fig. 1. Interaction Forms of Cooperative Learning Methods with Interest in Learning Against the Ability to Sort Mathematical Patterns

- The ability to rank the mathematical patterns of children who have a higher level of interest in learning is given the STAD type of cooperative learning method rather than the ability to sort mathematical patterns with TPS cooperative

learning methods ( $Q_{hitun} = 4.24 > Q_{table} (\alpha = 0.05) = 3.15$ ).

- The ability to sort mathematical patterns that have a low interest in learning given the TPS cooperative learning method has a higher value than the ability to sort mathematical patterns given the STAD type of cooperative learning method ( $count = -2.30 > Q_{table} (\alpha = 0.05) = -3.15$ ).

Some multidisciplinary and interdisciplinary sciences related to the influence of cooperative learning methods and interest in learning on the ability to sort mathematical patterns are as follows:

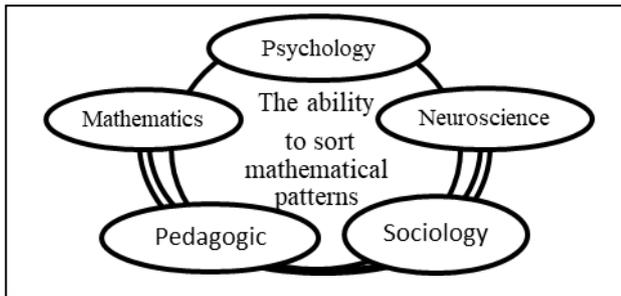


Fig. 2. Multidisciplinary and interdisciplinary relationships with research results

Various multidisciplinary and interdisciplinary foundations of science relating to variables and research results include practical, psychological, sociological, neuroscience, pedagogic and mathematical aspects. There is integration in learning activities according to Jacobs's view, which is multidisciplinary and interdisciplinary. Multidisciplinary is a form of learning a number of subjects separately through a theme. While interdisciplinary is a form of learning that combines a number of subjects in a theme. Learning activities take place at the same time [12].

Viewed from a practical foundation, it is necessary because the learning process required is planning. Where the practical basis of learning in kindergarten should be interrelated or integrative which is a form of learning that combines a concept to develop a number of developmental aspects in early childhood through the relationship of goals, content, skills, activities, and attitudes in a theme.

Next, to the study of the foundation of psychology, psychology is the science that studies human behavior, both as individuals and in relation to their environment. The behavior is in the form of visible and invisible behavior, conscious and unconscious behavior [16]. From the results of this study, it can be seen that implementing learning in kindergarten must be based on psychology as a reference in determining what and how each child's behavior should be developed. Kindergarten children are individuals who are in the process of development and growth. The development process includes cognitive, social, emotional and moral development while the growth process can be seen from the growth of the body (physical) of students.

The study from the perspective of Galls Neuroscience in Margeret E Gredler introduces brain function, neuroscience issues, and cognitive learning and introduces the concept of a brain consisting of many organs and each responsible for

certain reactions [17]. The physical structure of the brain is divided into two parts or hemispheres, which is connected by a structure called the corpus colosum. Corpus Thiscolosum is formed by white matter, namely myelin, which envelops the axons of neurons. The optimum experience activates cells in both hemisphere parts and helps them work collectively. Each side has a region that specifically controls several functions such as breathing, crying, language skills, conversation, and even all things that are commonly done by humans [17]. The human brain is divided into two parts, the left hemisphere, and the right hemisphere. The left hemisphere of the brain functions to regulate the ability to think logically, such as abilities in the field of mathematics and language and find various theories. The brain's ability in this section is linear, meaning that it has a rule that runs in accordance with applicable rules. Therefore, the thought process that occurs in this part of the brain is convergent thinking [17].

Furthermore, this research is seen in terms of sociology, sociology is a science that focuses its study on relations in society [18]. Brinkerhoft and White argues that sausage is a systematic study of human social interactions. With this research which raises one of the variables namely interest in learning, here the social role is very important in relation to the interest in learning for children. The interest in learning will develop well if there is reinforcement or stimulus from the people around it such as the role of a teacher in the school in providing encouragement for children to learn.

This research can also be seen in terms of pedagogics. Pedagogic or the science of educating is a systematic science or theory of actual education for children or for children until it reaches maturity [18]. Pedagogic is a science that discusses education, namely the science of children's education. So pedagogically trying to explain about the ins and outs of children's education, pedagogics is the theory of children's education. pedagogic as a science is needed by teachers, especially kindergartens and elementary school teachers because they will deal with children who are not yet mature [19]. Pedagogic is a science that discusses education, namely the science of children's education. So pedagogically trying to explain about the ins and outs of children's education, pedagogics is the theory of children's education. pedagogic as science is needed by teachers, especially kindergartens and elementary school teachers because they will deal with children who are not yet mature

In terms of mathematics, sorting patterns shows that one part of mathematics is the beginning. Mathematics is one type of knowledge needed by humans in carrying out their daily lives. When we think of mathematics, we will talk about similarities and differences, the arrangement of information/data, understanding about numbers, numbers, patterns, spaces, shapes, estimates and comparisons. Knowledge about mathematics can actually be introduced to children from an early age (birth-6 years). In children under three years old, mathematical concepts are found every day through their playing experience [20]. According to National Council of Teachers of Mathematic (NCTM) Curriculum Standard, the scope of introducing mathematical concepts in early childhood includes number and operations, pattern, function, algebra, geometri and spatial sense, measurement, data analysis and probability and problem solving [6]. From the explanation above, it can be concluded that there is a relationship between mathematics and sorting mathematical

patterns because sorting patterns is included in the mathematics section and can be introduced to early childhood.

#### IV. CONCLUSION

Based on the results of research and discussion, conclusions can be taken as follows:

- Overall the ability to sort mathematical patterns in groups of children given the STAD cooperative learning method had a higher effect than the group of children given TPS-type cooperative learning methods.
- The interaction between the treatment of cooperative learning methods provided by the cooperative learning method type STAD and type of polling station with the level of interest in learning generally has a significant effect on the ability to sort the mathematical patterns of kindergarten children in group B.
- The ability to rank mathematical patterns in groups of children with a high level of interest in learning given the STAD type of cooperative learning method rather than the group of children given TPS cooperative learning methods.
- The ability to sort mathematical patterns in groups of children who have a low interest in learning given TPS cooperative learning methods has a higher value than the ability to sort mathematical patterns in groups of children given the STAD type cooperative learning method.
- In optimizing the ability to sort mathematical patterns, children who have a high interest in learning should use the STAD type of cooperative learning method, whereas, for children who have a low interest in learning, they should use TPS type cooperative learning methods.

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