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# Cooperative Games and Problem Solving Abilities in Preschool Children

Riza N. Khoirunnisa[1,*]

[1]*Faculty of Education, Universitas Negeri Surabaya, Indonesia*
[*]*Corresponding author: rizakhoirunnisa@unesa.ac.id*

**ABSTRACT**
The purpose of the research is to know the effectiveness of cooperative games to improve preschoolers' ability to problem-solving. The research is a quasi-experimental research with a non-randomized pretest-posttest control group design. The research subjects are fifteen children of five years old preschoolers in the experimental group and so does the control group. The instrument of the research is an observation checklist that is used to measure the ability of preschoolers' problem-solving. Analyzing data was done by statistical parametric using a t-test. Based on the result of analyzing data, the t-test was got 16,378 with 0,000 level of significance and level of significance which is lower from α= 0,05, and the effect size is 32,85 which is categorized as too big showing the effectiveness cooperative games for improving preschoolers' ability of problem-solving. Based on this result, cooperative games are effective to improve preschoolers' ability to problem-solving.

***Keywords:*** *Preschoolers, Problem-solving ability, Cooperative games*

## 1. INTRODUCTION

The child period is one of the periods in the developmental stage that supports the child is going through the next. In his childhood, the child gets various experiences that become provisions for his future life [1]. The ability of a child who gets appropriate stimuli during his developmental stages in preschool will develop optimally [2]. This is consistent with the results of brain research which stated that up to 85% of all neurological pathways that one acquired, is developed during the first six years of his life [3].

Preschool education also has notes from educators and parents on the expected results so that the educational materials and learning methods applied to students are not following the child's development stage [4]. Children must learn skills such as cooperation, sharing, helping, and problem management [5]. These skills become experiences and early learning for children that will be used in the next developmental periods. Based on some of the descriptions above, the ability to manage problems and communicate with peers is one of the skill aspects to improve preschool children's readiness for school.

Observations on kindergarten X students showed that learning activities in kindergarten were focused on the ability to recognize letters and numbers, being able to read and count simply, and writing as preparation for primary school entry. The high standard of demands on children when they enter primary school makes kindergarten X teachers also pursue targets so that their students do not lag and have these basic abilities. The learning model given to students is teacher-centered. The kindergarten students seem to be lacking in talking with friends in completing assignments given by the teachers even though their seats have been made into groups. Students only pay attention to what the teachers teach and order. Some are silent or immediately ask the teacher when they find difficulties with friends. Kindergarten A students wait for the teacher to solve the problems they face so that the teacher becomes very active and students become passive during the learning process. Based on this description, it is revealed that problem management and peer communication in kindergarten X students are less than optimal.

The results of interviews with several kindergarten teachers in Surabaya indicated that the learning activities carried out were in the form of reading, coloring, drawing, and supporting activities such as computers, English, religious guidance, drawing, dancing, and cooking. These activities do help the children developing thinking skills which include problem-solving abilities, but the teacher's awareness to

 

exercise the problem-solving skills in the children itself and communicate with their peers are still low and that causes students not to have enough space for expression so that they become passive and dependent to the teacher. This is because all needs and the difficulties felt by the students are solved by asking the teachers instead of being solved through communication and teamwork among them. The teachers who provide the solution to the problem is said to be solving it by taking a shortcut because it does not require too much time since the teacher's invitation to other students to jointly solve the problem will require a lot of time.

Problem-solving skills are needed and need to be trained from an early age. Haberlandt states that the success of a person's life depends on his ability to solve problems and problem-solving abilities can develop if individuals have experience in solving problems [5].

Research on problem-solving abilities in preschool children that problem-solving abilities develop through the preschool years, and that cooperative problem solving appropriate to the children's early age is such an effective arrangement for promoting and investigating cooperative behavior and cooperative learning of the children [6]. Preschool children have many of the skills necessary for successful cooperative problem solving [7]–[9].

The implication obtained from the lack of problem-solving skills in preschool children is that children have difficulties with solving the problems that they encounter, both academic and social ones. The children would find it difficult to identify problems related to tasks, organizing plans, and carry out solutions. Problem-solving in preschool children which shows that problem-solving skills develop through the preschool years and that cooperative problem-solving at an early age is effective for investigating cooperative behavior and cooperative learning in children [6]. Preschool children in this study demonstrated many cooperative skills and abilities such as coordinating their behavior, explaining their actions, and asking their peers [10]–[12].

Reviewing the problems occurred in kindergarten X that the provision of teacher-centered learning methods made students less able to solve problems encountered by themselves in learning and did not communicate with peers in learning activities, it seems that the application of student-centered learning model in the form of cooperative games in Kindergarten X is required to improve problem-solving and peer communication skills in preschool children, especially kindergarten A. Problem-solving abilities are fundamental to the language, social and cognitive development of preschool children who will persist into adulthood and influence the success of the children through the next stage of development. Based on the findings above, children of kindergarten A need an improvement in their problem-solving and peer communication skills that are appropriate to their age.

The phenomenon occurs above is one of the many phenomena which is related to the improvement of problem-solving skills and communications with peers. This phenomenon motivates the need for research on games that can improve problem-solving and peer communication skills in preschool children so that some cooperative games will be implemented to improve problem-solving and peer-to-peer communication skills in preschool children.

This study aims to test and analyze the effectiveness of cooperative games to improve problem-solving abilities in preschool children.

## 2. METHOD

The type of research used in this research is experimental research. Experimental research is research that allows the researcher to provide treatment or intervention to research subjects and then the effects of these treatments are observed and measured [13]. The research subjects in this study are endowed with two kinds of measurements. The first measurement is carried out before giving cooperative games (pre-test) and the second measurement is carried out after giving the cooperative games (post-test) to the research subjects in the experimental group and no treatment is given to the control group.

This study uses a quasi-experimental research design with a non-randomized pre-experimental design (non-randomized pre-test post-test control group design) which is an experimental design that is carried out with pre-test before treatment is given and post-test afterward, there is also a treatment and control group and the samples are not random [14]. The treatment is carried out by applying cooperative games, while the measurement is carried out before and after giving cooperative games, namely by comparing the pre-test and post-test results that are given to the research subjects.

The research subjects in this study are children who study at Kindergarten A in Kindergarten X. The

population of this research subject is 40 students who are divided into two classes. The sample used in this study are 30 students with a total division of the experimental class with 15 class students and the control class with 15 students while the other 10 students were the trial subjects of the research.

Problem solving in preschool children is a thing that is done when they have set a goal but do not know how to achieve it [15]. New problem solving is also a challenging intellectual task that encourages children to re-evaluate their efforts, finding new concepts and strategies to solve the problems they face. This instrument is measured by a scale made by the researcher concerning the Guttman Scale, namely by using only two intervals, "yes" and "no" statements to reveal the clarity of an attitude or trait. Children who can do the expected will get a score 1 while children who cannot get a score 0. Data processing in this study is done with the help of the statistical program SPSS for windows to see the effectiveness of cooperative games to improve problem-solving and communication skills with peers, and it will be analysed using statistical technique t-test.

## 3. RESULTS AND DISCUSSION

The result of problem-solving abilities post-test in the experimental group shows an increase relative to the pre-test result. while in the control group, most of the children have fixed scores, some also experience a decrease.

**Table 1.** The mean of problem-solving in the experimental and control groups

| Group | The Mean of Problem Solving | |
|---|---|---|
| | ***Pre-test mean*** | ***Post-test mean*** |
| Experimental (n=15) | 7.13 | 20.27 |
| Control (n=15) | 7.27 | 7.20 |

Based on the analysis above, it can be concluded that there is a significant difference between the pre-test and post-test results of problem-solving abilities in the experimental group. This very significant difference in pre-test and post-test confirms that cooperative games improve problem-solving abilities in preschool children. Hypothesis testing in this study is carried out by using a t-test.

The calculation of the Independent Sample T-test t = 17.481 and p = 0.00 are obtained, and because $p < 0.05$, Ha is accepted, that is, there is an effect of cooperative games on improving problem solving abilities in preschool children. The difference in the influence of these two groups can also be seen from the difference in the mean of the control group of 7.20 and the experimental group which is 20.27. There is a significant difference in the average gain score of problem-solving abilities in the experimental group. The difference in gain score is very significant. This emphasizes that cooperative games improve problem solving skills in preschool children.

**Table 2.** T test gains score of problem-solving abilities in the experimental and control groups

| Score | T Test Gains Score of Problem-Solving Abilities in the Experimental and Control Groups | |
|---|---|---|
| | ***T*** | ***P*** |
| *Gain* | 16.007 | .000 |

Based on the results of the paired sample t-test calculation, there is a very significant increase in problem-solving abilities in the experimental group with a t value of 16.007 and a significance of 0.000. The significance value is smaller than $\alpha = 0.05$, therefore it states that the hypothesis is accepted. Thus it is concluded that cooperative games are effective for improving problem-solving abilities in preschool children. The *effect size* of cooperative games on problem solving abilities is 32.85. The effective contribution of the treatment in form of giving cooperative games to the increase of the experimental group score is large, namely 32.85.

The process of problem-solving abilities in preschool children is based on the fact that the children know there are problems in the game they encounter. They watch the game, hold it, then they talk to their peers about what they have to do to solve the problems in the group. The problems faced by children can be observed from facial expressions and what they say to their peers. In the next stage, they plan what they want to do with the problems. Here the children discuss with their peers how to solve them, some give their opinions and some try the game to solve the problems. They listen well to the teacher's commands in solving the problems, then they also listen to their friends who give their opinions for solving them. At this stage, the children understand the information available and use it to get strategies and ideas for solving the problems. The process of selecting ideas obtained is different from adults who have higher cognitive abilities and are more experienced than preschool children. The preschool children try the game many times so that they choose a

focused strategy that is considered capable of solving the problems, but when the children have found a way to solve them, they will continue to modify it so that they get better results and eventually new, different strategies. Those who have chosen one of the existing problem-solving strategies, they begin to finish the game with the agreement that has been made, but not infrequently some members of the group are busy playing with their own game or talking about other things outside the game. The group leader in each group reprimanded them several times and reminded them to help each other to complete the game according to what the teacher has ordered at the beginning of the game.

The increase in problem-solving abilities is obtained from observations made by paying attention to what they are doing and what is discussed with their peers within the group. Children's way of solving problems is by paying attention to the activity patterns they do and listening to what they express to analyze their actions in solving problems. Logic will develop gradually depending on what individuals experience or skills acquired from childhood to adulthood so that we can form concepts about the development of their problem-solving abilities, test these concepts by seeing or predicting what they will do in new situations they had never experienced before [15].

Cooperative games can promote the problem-solving abilities of preschool children by sharing goods, making rules, resolving disputes, helping each other, and exchanging roles [16]. Experiences of playing for children will help to expand their natural curiosity, help their ability to solve problems, and encourage spontaneity [17].

The analysis concluded that after giving cooperative games all research subjects experienced changes, namely an increase in the score of problem-solving abilities since cooperative games were given in their class which made them playing cooperatively with groups so that they helped each other in solving problems and communicating well between peers so that they not solving problems alone or depending on the teacher. The increase is caused by the provision of treatment in the form of cooperative games in 3 sessions, namely session 1 giving the game of pairing pictures with words, session 2 of designing pictures, and session 3 of lego games. These cooperative games are conducted for 3 days with aim of building relationships with other children and groups, working together to solve the problems, and communicating verbally with other children and groups. These cooperative games allow children to find problems, then they look for solutions and problem-solving strategies, select and choose the best problem-solving strategies. The problem-solving process is carried out with all members of the group. Cooperative problem-solving in experimental settings and games require a kind of cooperative, socio-cognitive, and communicative skills, and during the games, the preschool children must divide labors, assign roles, and coordinate their behavior. They must also negotiate conflicts, discuss, and reach a solution they agree on [6]. The children organize set plans and set goals together in a social game.

The results of observations at the time of treatment, problem-solving abilities can be achieved by the objectives of the game. Problem-solving abilities develop through the preschool years, and that cooperative problem solving that appropriate to the children's playing stage such as effective management to promote and examine the cooperative behavior and learning in them [6], [15]. Preschool children have many of the skills necessary for successful cooperative problem solving [7]–[9], [11]. The types of cooperative games applied to Kindergarten X students are pairing pictures with words, designing pictures, and playing lego. The skills that can be achieved by the subjects are recognizing peers, working together in groups, being active in groups, being patient in playing with friends, being able to help friends, being responsible for themselves and their group, communicating the need to solve problems and making mutual agreements with the peers in the group. The most prominent game models at the age of four to seven are cooperative games, where children can interact with each other for a relatively long period while sharing goods, making rules, resolving disputes, helping each other, and exchanging roles [16]. A cooperative game is a type of social game because in this game there are social interaction and cooperation in groups and during the games, children are involved in effective cooperative problem solving [6]. Preschool children's social games are based on the ability to engage in cooperative behavior and the ability to solve problems as well as set plans with others.

Based on the results of observations made during the treatment process in the experimental group, in session I, which is playing pairing pictures with words, 2 students quarreled with their friends within the group, because as they guess the answer for the teacher's third question, namely "candy", they fought each other over the pictures of a candy they see. They then beat each other and one of them cries. The teacher neutralized the

atmosphere for about 15 minutes and finally, they shake hands to apologize, the activity is resumed. Session I is playing to pair pictures with words, students seem to have great curiosity, this showed by them focusing on the questions described by the teacher. They immediately searched for the picture in question and this causes a small argument between the group members. Students have interest and enthusiasm with this game tool because it has various colors in the picture. They interact well in this session and the cooperation also ran smoothly even though there is a small quarrel within one of the groups.

Playing pairing pictures with words in session II is controlled well, with no quarrel during the activity. Students communicate with their peers in completing the game. One of the group members asked the color of the cloud to the other group members, some answered blue, some answered white "you see, the clouds are white outside", some answered, "gray can also be if it is cloudy". They communicate effectively without asking the class teacher what color the clouds are. The same thing happened when they colored mushrooms, some answered "the correct answer is that mushrooms are brown", some answered "I ate white mushrooms, so it is white", and some answered, "mushrooms are variously colored. There is a brown one, and there is a white one". They interact with all group members. Competition is also seen when the opposing group had almost finished the game "let's not color it for too long, you know Rara's group is about to finish".

Playing lego in session III goes without a hitch and there are no fights within the group. They mutually disclose the buildings they made and decisions were made by mutual agreement. The first group, one student suggested to make a car "let's just make a car, there is a little man, you know", another friend responded "just make a fence, we can put a coconut tree and it will be nice", another friend agreed "yes, please make a fence, it will be decorated again nicely". The friend who suggested to make the car answered, "Yes, then someone will give it to make it neat." Another friend replied "So be it, let's put the little man as well" and the other answers "yep. put the little man beside the fence". Group two create a multi-storey building. Initially, one of the member suggests to make a plane, "hey, let's just make a plane" another replies "yes, a plane, and this is for its propeller" then another friend responded "hey, just make a multi-storey building, like that mall" another friend replies, "yes, let's just make a mall, the mall will be veeery tall" then another friend agree to build a multi-storey building. The third group make a house. One of the members heard the conversation of the secon group, then he suggested "uh let's just build a mall", then his friend replies "Ah, this kid... how come you copy Maya's group, eh". Another friend replies, "don't be like that. Let's just build a house. Do not copy Maya's group," then another friend agree to build a house. Based on these conversations, the problem-solving abilities of each group run smoothly even though there are discussions to determine what kind of building they are going to build at the beginning of the activity process. Students have greater enthusiasm for this game tool than both of the previous ones, it can be seen from their facial expressions and gestures during the process. They also immediately held the lego when the teacher had just distributed it. Lego game tools come in various forms, this makes them having their creations in making buildings together with groups.

Most of the subjects in this study used a trial and errors approach in solving the problems. They try and see the results first, if a failure occurs it will be fixed using other ways. Some other children can analyze in advance what to do before deciding. There are two approaches to solving problems in preschool children, namely trial and errors, and analyzing subgoals [15]. Babies have started to develop aspects of problem solving [18]. At age three to five years, an important aspect of problem solving, namely the ability to make plans, the ability to talk to oneself has already developed.

The problem solving ability in this study develops from the children's understanding of their environment. They get information that can come from their own experiences, group friends, and class teachers and use the information to understand the consequences of what they will do. The experimental group was given treatment in 3 sessions of cooperative games, namely in session 1 the game is to pair pictures with words to build relationships with other children and groups, in session 2 games of designing images are given to communicate verbally with other children and groups, and in session 3 a lego game is given aimed teamwork in solving problems together. In the experimental group, namely the group that is given treatment in the form of cooperative games, there is a change in their way of thinking from the old to the new one. Initially, when they had difficulties, they left the difficulty to the teacher who plays a role as the center of learning with the hope that he could answer it so that the problem is then solved, but when the children were given cooperative games that required the children to work in groups where they become active and the teacher serves

only as a facilitator, they try to find strategies or ways by themselves when they encounter problems. This enables them not to be always dependent on their teachers. Besides, the children's confidence in finding solutions is not the only reason for their capabilities to solve the problems they face, but it is because they work in groups. Children also observe their partner's actions and provide complementary actions or emulate them to solve the problems [7], [9]. Thus the preschool children become motivated by peers in solving problems.

This study provides cooperative games to improve problem solving abilities in preschool children. The increase in problem-solving abilities in preschool children in this study is caused by 2 factors. First, information or knowledge that is used to generate a new understanding of the problem. The information provided by the teacher can be a factor influencing the children in solving the problems. The teacher who provides direction only as a facilitator will make children active in solving problems with their group. The knowledge obtained by the preschoolers is not as much as adults, but even so, this limited knowledge is used by the children to the maximum extent possible to solve the problems and is combined with information obtained from their peers and teachers. Second, the environment that provides stimulation to the children. Such an environment will affect their ability to solve the problems. This cooperative game treatment also stimulates them to optimize problem-solving abilities within them.

These findings highlighted the lego game describes more problem-solving abilities than the previous games. They work together in solving the problems as they try to build certain buildings according to group decisions so that they find problems, solutions and problem-solving strategies, select the strategies and implement the best one together in group. The children also show effective communications with partners about tasks during cooperative interactions that use verbal and non-verbal to communicate and to help each other [7], [9].

## 4. CONCLUSION

Based on the results of data analysis that has been carried out in this study, the researcher generally concludes that there is effectiveness in cooperative games to improve problem solving abilities in preschool children.

This research produces a cooperative game module consisting of three sessions, namely (1) playing pairing pictures with writing, to build relationships with other children and groups so that children can interact with other children in the group, (2) designing a picture of a playground, to communicate verbally with other children and groups so that children can direct attention, ask questions, assign roles, provide explanations, narrative, negotiate, suggest or ideas, agree, disagree, experiment and provide other statements related to assignments with group friends, (3) play lego, to work together in solving common problems so that children can find problems, find solutions and problem solving strategies, select strategies and implement the best strategies with group friends.

Research on problem-solving and peer communication skills in preschool children is still limited, so further researchers are expected to look at problem-solving abilities more deeply. Parents are to provide opportunities for children to play together with peers in groups of 4-5 children which involve interactions, communications with peers, and problem solving skills when they are in the home environment to build problem-solving skills not only at school. This cooperative game is a game that is done in groups, each group consists of 4-5 children that involve interactions, communication with peers, problem solving skills in groups. Teachers are expected to design learning activities using cooperative games that can be done in groups. Cooperative games that can be used include puzzles, blocks, back chains, blind balls, "look for parts of my body", flag relay, etc.

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