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Enhancing K2 Students' Skills With Loose Parts at Kindergarten XYZ

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ABSTRAK. *Penelitian quasi-eksperimen ini bertujuan mengukur efektivitas penggunaan media loose parts dalam meningkatkan keterampilan pemecahan masalah, berpikir kritis, dan kreativitas siswa TK B di Kindergarten XYZ Jakarta. Penelitian melibatkan kelompok kontrol dengan 26 siswa dan kelompok eksperimen dengan 25 siswa, menggunakan penilaian pretest dan posttest untuk mengukur perkembangan. Kelompok eksperimen mengintegrasikan loose parts dalam kegiatan kelas, sementara kelompok kontrol mengikuti kurikulum standar. Selanjutnya, data pretest dan posttest dianalisis nilai n-Gainnya untuk mendapatkan perbedaan antara kedua kelompok. N-Gain digunakan untuk mengukur seberapa efektif suatu intervensi atau pendekatan pembelajaran dengan membandingkan peningkatan skor antara pretest dan posttest, memberikan gambaran tentang sejauh mana peningkatan penggunaan loose part pada kelompok eksperimen. Semakin tinggi nilai n-Gain, semakin besar peningkatan yang dicapai oleh kelompok tersebut. Hasil menunjukkan peningkatan skor rata-rata dalam pemecahan masalah dan kreativitas pada kelompok eksperimen dibanding kelompok kontrol baik pada pretest maupun posttest. Namun, skor berpikir kritis tidak menunjukkan perbedaan signifikan antara kedua kelompok. Ini menunjukkan bahwa penggunaan loose parts berdampak positif pada pemecahan masalah dan kreativitas pada siswa taman kanak-kanak, namun meningkatkan berpikir kritis mungkin memerlukan penyelidikan lebih lanjut atau strategi alternatif.*

Kata Kunci : *Loose Parts; Problem-Solving; Citical Thinking; Creativity*

ABSTRACT. *This quasi-experimental study aims to measure the effectiveness of using loose parts as a media to enhance problem-solving, critical thinking, and creativity skills among K2 students at Kindergarten XYZ Jakarta. The research involved a control group of 26 students and an experimental group of 25 students, using pretest and posttest assessments to measure progress. The experimental group integrated loose parts into classroom activities, while the control group followed the standard curriculum. Next, the pretest and posttest data are analyzed for their n-Gain values to obtain the difference between the two groups. N-Gain is used to measure the effectiveness of an intervention or learning approach by comparing score improvements between pretest and posttest, providing an overview of the extent of improvement in the use of loose parts in the experimental group. The higher the n-Gain value, the greater the improvement achieved by that group. The results showed an increased average score in problem-solving and creativity for the experimental group compared to the control group in both pretest and posttest. However, critical thinking scores showed no significant difference between the two groups. This suggests that the use of loose parts positively impacts problem-solving and creativity in kindergarten students, but improving critical thinking may require further investigation or alternative strategies.*

Keyword : *Loose Parts; Problem-Solving; Citical Thinking; Creativity*

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INTRODUCTION

Education is one of the basic human needs besides food and clothing, needed by all ages from an early age to adulthood. Education in early childhood (ECE) is intended so early childhood is facilitated to be able to know their surrounding environment and as the preparation for entering the next level of education. The recent curriculum used in Indonesia, Kurikulum Merdeka, covers some learning goals that are essentials to child development, those are Religious and Moral Values, Self-identity and Fundamentals of Literacy, Mathematics, Science, Technology, Engineering and Arts. The overall achievement of these developments is carried out through various forms of play activities that are fun, so that early childhood student can gain much information for their development. While playing, early childhood must be facilitated with various objects that can support the child's imagination and thinking ability by using their senses. Children starting preschool brings a sense of wonder and curiosity about the world. Because they are ready to learn about the everyday world, young children are highly engaged when they can explore [1]. Early childhood students must experience things using their senses as activating their senses makes them learn more and better.

On the observation day, students are expected to be able to make a project to solve specific problems given by the teacher at the end of the learning period related to the learning theme. The data found from the observation are students' projects were same one to the other, students did not show enthusiasm in making the projects because the materials were not varied, and did not ask further questions while making the projects to the teacher. This shows that student abilities in problem-solving skill, critical thinking and creativity skills have to be developed in order to be able to make a final project. The tools that are used and support early childhood learning can also be referred to as learning media. Selection of appropriate learning media can motivate the emergence of the desire of early childhood to find out and be involved in learning activity.

Media has a meaning of representing, presenting, disseminating, and storing information in a variety of formats, which may be digital and non-digital [2]. The selection of learning media that is not appropriate can affect the achievement of the learning objectives themselves. Therefore, teachers need to continue to update themselves and try other types of learning media so that the effectiveness of learning increases. One example of learning media is loose parts. Loose parts refer to play objects and materials that are open ended and manageable [3] that can be found in the surrounding environment which functions and uses can be varied depending on the purpose for which the media is used. Children can engage in unstructured play with loose parts that are not dominated or supervised by adults or older siblings [4]. The examples of loose parts media are shirt buttons, used tissue rolls, old can, pins, newspaper, old tire, wooden twigs, or even stones.

Problem solving the process of using previously gained knowledge, skills, and understanding to meet the needs of an unknown situation [5]. Critical thinking includes skills such as questioning, estimating, investigating, developing a hypothesis, analyzing, reflecting, reviewing, comparing, evaluating and presenting an opinion. Those skills are

some of main skills in independent curriculum that needs to be develop for children. The objective of this study is to improve students' problem-solving, critical thinking and creativity skills using loose parts media.

Loose Parts, A great way to learn about the outside world and hone social and emotional skills is to consider fun play that is best for the formation of self-identity and self-worth. Young children's growth depends heavily on play. Children need useful and meaningful facilities to support their growth and development that can be provided in the family or school, through the surrounding environment and game tools. Through playing with suitable media, children can have many kinds of interaction to acquire new skills and knowledge. The Ministry of Education in Indonesia mentions that there are some arrangements that must be carefully set in ECE, that are student-centered, inclusive, safe and comfort, rich in open materials (loose parts), and involving families and communities in the learning process [6].

The word "Loose Part" was first used by an architect named Simon Nicholson who discovered the theory of loose parts through his book entitled "The Theory of Loose Parts" in 1971[3]. His theory describes loose parts as any open-ended materials which encourage creativity and exploration in children. Objects that are loose, using natural components, repurposed materials, and discovered artifacts are just a few examples of the unstructured materials that may be used in play. It inspires kids to construct, explore, and create by letting them utilize their imaginations. Children will naturally manipulate and use loose parts during investigative play experiences. 'When children interact with loose parts, they enter a world of "what if" that promotes the type of thinking that leads to problem solving and theoretical reasoning. Loose parts enhance children's ability to think imaginatively and see solutions, and they bring a sense of adventure and excitement to children's play [7].

There are countless ways to use loose parts, and there is no right or wrong way to do it. Loose parts can be found indoor or outdoor and it can spark children's imagination by building up any materials they have. They are flexible materials that can be rearranged, merged, disassembled, redesigned, lined up, and in many other ways. Loose parts have way more pleasure to children because they do not limit children for free playing like toys which already given the rules to play. Children must initially gain trust before playing with loose parts. To gain the function well, there are steps in learning using loose parts media [8]: exploration stage; experimental stage; creative stage; building meaning and purpose of play stage. Children are encouraged to employ their imagination, creativity, and problem-solving abilities via the engaging and enjoyable activity of loose parts play. It is a fantastic method to provide young children with practical learning experiences and assist the development of a variety of abilities.

There are seven types of loose parts [3]. 1. nature-based (rocks, sand, dirt, cinnamon sticks, etc.) 2. wood reuse (corks, wood scraps, thread spools, etc.). 3. plastic (bottles, beads, hair roller, straws, etc.). 4. metal (nuts and bolts, tinfoil, old gadgets, etc.). 5. ceramic/glass (mirrors, ceramic tiles, etc.). 6. fabric/ribbon (cotton, patchwork, carpet, etc.). 7. packaging (cardboard boxes, tissue rolls, snack packaging, etc.). Some loose parts may be large or small and inappropriate for certain ages. Giving little beads, rings, or

delicate objects like ceramic tiles, for instance, to toddlers under the age of three is risky. They risk choking or being hurt due to the delicate materials. Because of this, educators or parents should consider what kinds of loose parts are suitable for their students' ages.

Problem-solving, Young children can begin to solve problems at a very young age. They can use a process of trial and error, learning from their failures, and creative thinking to come up with solutions to evaluate and work through challenges. Through a variety of learning activities, early childhood gaining and absorbing existing information, processing it, and producing new information that can be seen both orally and in action. As a part of 21st century education, ECE also focuses on various activities to develop problem solving, critical thinking, and creativity skills. Not only do adults need problem-solving skills, but it's also crucial to young children since doing so helps them develop their capacity for logical, critical, and systematic thought.

Problem solving refers to finding innovative solutions to solve a problem going beyond the simple application of previous experiences and learned rules [9]. In this skill, students are expected to be able to find new solutions to the problems presented at the beginning of learning and be able to apply them both through works and descriptions through words. Finding a solution is not always in the form of words, but also possible in the form of a project. Children acquire this talent via play and discovery, and it aids in the formation of their resilience and growth mentality. Every young child should acquire problem-solving techniques because they may help them deal with some of life's most challenging situations and help them build self-confidence and self-esteem.

Critical Thinking, Children need critical thinking skills because they promote all facets of growth. It aids in their decision-making, conflict resolution, and problem-solving. Critical thinking includes analysis, evaluation, inference, and reasoning to make informed and rational judgments [10]. Children can learn to ask questions, listen to opposing viewpoints, consider other viewpoints, and form reasonable arguments or choices based on the facts in kindergarten. Children learn to think critically via play, education, and experience. They get the ability to analyze a problem logically and draw conclusions from the available data. Children who use critical thinking also learn about themselves and how their emotions and experiences affect their reasoning processes. In other words, critical thinking means the ability to apply the cognitive abilities or tactics that raise the likelihood of a desired outcome about something. It is a crucial ability that will aid kids in developing throughout their lives and continue to benefit them as they mature and discover how to operate in the outside world. Children must have critical thinking as it is one of the important skills that is very useful starts from knowing what the problem is, the way to solve the problem and making suitable reasoning. In Kurikulum Merdeka, critical thinking skill is also one important skill needed which is also related to Pancasila Profile.

Creativity, To have creativity, a person should be creative first. Creativity defined as the ability to see things differently, think differently, create something unique, and solve problems. It entails the ability to create something new or combine things in novel but meaningful ways [7]. Children need to express themselves and become

independent, and creativity fosters these qualities while also encouraging the kind of inquiry and curiosity that helps them grow. Creativity can be seen and observed when kids are doing something with materials. As they explore the environment and identify their individual strengths and skills, young children are naturally creative.

The act of creating anything new, whether it be an idea or an item, is known as creativity [11]. It is crucial to foster children's creativity, especially in their early years. When describing students' creativity, it is also related to the ability of someone to produce something new and valuable as their project on learning. Children need to express themselves and become independent, and creativity fosters these qualities while also encouraging the kind of inquiry and curiosity that helps them grow. Children who are creative are more resilient and self-assured in the face of difficulties, and they form stronger bonds with others. There are some indicators that refer to child's developmental which should appear to note that their creativity is growing.

METHOD

The focus of this study is to improve students' problem-solving, critical thinking and creativity using loose parts media. This research is designed as Quasi-Experimental Research. This research was undertaken at Kindergarten XYZ School in Jakarta. The population of this study comprises only Kindergarten 2 students in K2A and K2B classes (for control and experiment groups). The study population was 51 students and uses total sampling for the sample because there was no possibility to divide students into different groups.

To examine students' problem-solving, critical thinking and creativity skills, data collection will be using a daily assessment form. After that, a mean difference test, correlation test and regression test were carried out to find out the difference between the abilities of students who used loose parts media in experiment groups and those who did not use loose parts media in control group, it is stated in Table 1. The daily assessment form has four categories, which is shown in Table 2.

Table 1. Research Design

	Pre-test	Treatment	Post-test
Control	O1	X1	O2
Experiment	O3	X2	O4

Description:

O1 : pre-test control group
O2 : post-test control group
O3 : pre-test experimental group
O4 : post-test experimental group
X1 : treatment using traditional method.
X2 : treatment using loose parts media.

Table 2. Marking Category

Mark	Category
1	Not yet developed (NYD)
2	Began to develop (BTD)
3	Developed as expected (DAE)
4	Developed beyond expectation (DBE)

To get findings, conclusions are analyzed and interpreted from the data processing outcomes. The results of this study were to provide evaluation material for the implementation of further learning.

The instrument used is an observation sheet because, if it refers to the learning of ECE, then observation is the right way. This suggests that observation is always unbiased since it sees kids for who they really are. Researchers study young children to better understand their behavior or to measure the appropriateness of the experiences that are provided for them, and she also stated that one of the most available ways to be aware of the individual characteristics of children is through observation [12].

Before carrying out data collection, the variable assessment instrument used must be tested first to determine the validity and consistency of the assessment instrument. The quality of experimental research is usually considered in terms of its reliability and validity. Validity refers to the extent to which a measuring instrument can measure precisely what is to be measured. Validity is not only used to measure test accuracy, but also research instruments.

To get good data in a study, a test instrument must first be prepared which must also go through a validity test process so that following the test, the variable can be clearly illustrated. Validity is the most basic test and includes several considerations as criteria for reliability. If a test or instrument accurately and completely measures the desired characteristics, it is said to be valid. This study was using content validity and construct validity as its validity tests. To know the validation of the instrument, three validators were chosen based on their competence toward early childhood learning. . The validators chosen were not in an even number so that it is not difficult to draw conclusions if there are two different opinions there can be an intermediary.

Content validity is used to measure the extent to which the test reflects what will be measured from students' abilities in relation to the learning objectives to be achieved. Content validity is validity evidence which is based on a judgment of the degree to which the items, tasks, or questions on a test adequately represent the construct domain of interest [13]. Content validity measures more on the cognitive domain of students as stated in the curriculum while construct validity is about how accurately a test assesses the idea it was intended to assess. Construct validity as a determination of the significance, meaning, purpose, and use of scores from an instrument [14].

For this study, three instruments were developed. They are instruments for measuring problem-solving, critical thinking and creativity skills. Indicators of each instrument are depicted in Table 3. [15], Table 4., and Table 5. [16]

Table 3. Problem Solving Instrument (X1)

Children show exploratory and probing activities (e.g.: what happens when water is spilled)
Children solve simple problems in everyday life in ways that are flexible and socially acceptable
Children apply knowledge or experience in new contexts
Children show a creative attitude in solving problems (ideas, ideas out of the ordinary)

Table 4: Critical Thinking Instrument (X2)

Children express information from the results of their search activities about how to play/themes/tasks/projects being worked on.
Children show interest by asking questions
Children express predictions to solve problems based on information or experience
Children show differences, for example between what is good and bad, right, and wrong, some things, etc.
Children reveal a causal relationship.
Children make simple conclusions about the activities/games/projects they are working on.
Children evaluate the activities/games/projects they are working on.

Table 5: Creativity Instrument (X3)

Children express various solutions to problems.
Children have many ideas about new ways/approaches to a problem/game.
Children combine several materials/things/resources
Children give various answers
Children state/correct mistakes
Children discover other functions of an object while playing

To calculate the data, some tests were used to gain information in using loose parts in improving student's problem solving, critical thinking and creativity skill. The data will be analyzed via data triangulation (normality distribution test, homogeneity test, then the mean test).

Normality distribution test needs to be done to be able to determine for further data analysis testing. In this research, to compare the value of pretest and posttest of each group, a Normal Gain formula can be used by subtracting the value of the posttest to the pretest. Homogeneity test should be taken so later a test to compare the mean of both control and experiment group can be followed using the t test hypothesis, but if the data is not normally distributed, to test the hypothesis, a Mann-Whitney U test can be used.

Results of testing the validity of research instruments can be seen in Table 6., 7., and 8.

Table 6. Validity of Problem-solving Instrument (X1)

Indicator	r_{count}	r_{table}	Description
X1-1	0.74	0.37	Valid
X1-2	0.59	0.37	Valid
X1-3	0.75	0.37	Valid
X1-4	0.64	0.37	Valid

The value of rtable for variable X1 is 0.37 and rcount for X1-1 is 0.74, X1-2 is 0.59, X1-3 is 0.75, and X1-4 is 0.64 which all of them are valued higher than the rtable, so it can be concluded that the instrument used to measure the problem-solving variable (X1) is valid because rcount is greater than rtable.

Table 7. Validity of Critical Thinking Instrument (X2)

Indicator	r_{count}	r_{table}	Description
X2-1	0.43	0.37	Valid
X2-2	0.49	0.37	Valid
X2-3	0.59	0.37	Valid
X2-4	0.39	0.37	Valid
X2-5	0.43	0.37	Valid
X2-6	0.49	0.37	Valid
X2-7	0.57	0.37	Valid

The value of rtable for variable X2 is 0.37 and rcount for X2-1 is 0.43, X2-2 is 0.49, X2-3 is 0.59, X2-4 is 0.39, X2-5 is 0.43, X2-6 is 0.49, and X2-7 is 0.57 which all of them are valued higher than the rtable, so it can be concluded that the instrument used to measure the critical thinking variable (X2) is valid because rcount is greater than rtable.

Table 8. Validity of Creativity Instrument (X3)

Indicator	r_{count}	r_{table}	Description
X3-1	0.56	0.37	Valid
X3-2	0.64	0.37	Valid
X3-3	0.59	0.37	Valid
X3-4	0.39	0.37	Valid
X3-5	0.74	0.37	Valid
X3-6	0.49	0.37	Valid

The value of rtable for variable X3 is 0.37 and rcount for X3-1 is 0.56, X3-2 is 0.64, X3-3 is 0.59, X3-4 is 0.39, X3-5 is 0.74, and X3-6 is 0.49 which all of them are valued higher than the rtable, so it can be concluded that the instrument used to measure the creativity (X3) variable is valid because rcount is greater than rtable.

Reliability is also one criterion that must be fulfilled to have a good research instrument. A set of tests is said to be good and correct if it has a high degree of reliability—that is, it will give the same results if given to the same subject in the same circumstances—but it can only be done on things that are unlikely to change. There are many factors affecting reliability of a test, such as test time, heterogeneity of the group of participants, test difficulty and the objectivity of the assessment. An experimental study's reliability may be compromised by a variety of random measurement errors, such as those caused by participant idiosyncrasies, the context, data collection procedures, instrument characteristics, analytical procedures, and other factors (Norris & Ortega in Long, 2003).

As for decision making for reliability testing, namely a construct or variable is said to be reliable if it gives a value of Cronbach's Alpha > 0.70[17]. The basis for decision making is as follows: a) A construct or variable is said to be reliable if it gives a Cronbach Alpha value > 0.70. b) A construct or variable is said to be unreliable if it gives a Cronbach Alpha value of < 0.70 [17].

The results of the reliability analysis with the Cronbach's Alpha formula on the problem-solving, critical thinking, and creativity instruments show that they have a reliability coefficient 0.83, 073, and 075 and are greater than 0.70. Based on these values,

it can be concluded that all items are good and can be used in data collection. The overall Cronbach's Alpha is 0.772. It is categorized as acceptable by most standards.

RESULTS AND DISCUSSIONS

In this research, the scheme of using loose parts was started by introducing the students to the loose parts served by the researcher. Introducing students to the concept of loose parts can be a valuable and enriching experience within an educational setting. Figure 1 shows exploration stage in this research.

Figure 1. Exploration Stage

Unlike traditional toys or fixed materials, loose parts provide flexibility and autonomy for students to engage in open-ended play and learning experiences. To effectively introduce students to loose parts, educators can create dedicated spaces or centers where these materials are readily accessible. This is categorized as the first stage out of four stages in learning using loose parts.

The experimental stage comes after the exploration stage. Loose parts offer a rich sensory experience for students. They manipulate, combine, and transform the materials to test hypotheses, solve challenges, and create unique outcomes. This stage encourages students to apply their knowledge, refine their skills, and deepen their understanding through hands-on experimentation.

The next stage is the creative stage. In the creative stage, students unleash their imagination and tap into their creative potential. They use the skills and knowledge acquired in the previous stages to express themselves freely and innovatively. Students generate unique ideas, explore new possibilities, and create original artworks, designs, structures, or stories using the loose parts as their medium of expression. This stage fosters self-expression, artistic exploration, and the development of individual creative identities.

Figure 2. Creative Stage

The last stage is the building meaning and purpose of play stage. In this final stage, students delve into the deeper meaning and purpose of their play with loose parts. They reflect on their experiences, make connections to real-world concepts, and explore

the significance of their creations. This stage encourages students to think critically about the purpose behind their play, how it relates to their lives, and how it connects to broader themes or concepts, or the initial questions given by the teachers. It promotes a deeper understanding, personal meaning-making, and the application of their learning beyond the immediate play context.

Figure 3. Building Meaning Stage

The data of this research is tabulated in Table 9. Pretest and posttest data are shown for both the experimental group and the control group.

Table 9. Pretest and posttest data for both groups

No	Control Goup						Experiment Goup					
	Pretest			Posttest			Pretest			Posttest		
	X_1	X_2	X_3	X_1	X_2	X_3	X_1	X_2	X_3	X_1	X_2	X_3
1	12	21	18	10	19	18	10	18	18	14	21	21
2	8	17	15	8	17	18	10	15	15	16	28	22
3	8	21	13	13	25	12	12	20	13	13	21	21
4	8	14	13	10	14	18	9	14	13	11	21	19
5	12	21	16	16	26	24	10	19	16	15	28	22
6	9	21	18	10	21	18	12	20	18	15	21	20
7	12	14	15	15	25	12	9	14	15	13	21	18
8	9	21	17	16	20	18	12	21	17	12	21	22
9	8	17	15	14	19	24	10	15	15	14	21	22
10	9	13	11	9	14	18	8	11	11	11	28	16
11	12	17	15	11	28	24	9	17	15	14	21	24
12	11	18	16	9	22	18	12	19	16	15	21	23
13	11	20	16	10	28	18	10	18	16	15	21	21
14	12	17	15	13	24	18	10	17	15	12	21	21
15	8	18	14	11	24	24	10	18	14	13	28	21
16	12	17	13	12	16	18	12	16	13	14	21	23
17	8	14	13	12	20	18	10	14	13	16	28	24
18	12	14	14	10	22	18	8	14	14	13	21	21
19	12	14	14	10	20	24	10	17	14	14	21	24
20	11	20	15	11	21	18	12	20	15	14	21	18
21	12	18	14	9	20	18	10	17	14	13	21	17
22	9	17	13	10	18	18	8	15	13	13	14	19
23	9	17	16	8	15	12	12	19	16	15	28	20
24	9	20	17	16	26	12	11	18	17	14	21	19
25	12	14	16	15	17	12	10	16	16	13	22	21
26	9	18	16	14	19	24						

From the data above, the overall score for the pretest in the experimental group is 1050 and for the control group is 1105. For the overall result of the posttest in the experimental group is 1422 and the control group is 1316.

After getting the data through pretest and posttest, a descriptive statistic which is a normality test was followed. First by calculating the gain value for each variable then continued by calculating the N-gain value. Gain value is calculated by subtracting the

pretest score to the posttest score. N-gain value is obtained with the aim of identifying the effectiveness of using a particular treatment. N-gain is the ratio between the average gain obtained and the average gain maximum possible. The normalized gain, introduced by Hake "as a rough measure of the effectiveness of a course in promoting conceptual understanding," has become the standard measure for reporting scores on research-based concept inventories.

The N-gain of each variables of both experimental and control groups is depicted in Table 10.

Table 10. N-gain of the Experimental and Control Groups

Gain Control Group			N-gain Control Group			Gain Experimental Group			N-gain Experimental Group		
X1	X2	X3	X1	X2	X3	X1	X2	X3	X1	X2	X3
-2	-2	0	-0.50	-0.29	0.00	4	3	3	0.67	0.30	0.50
0	0	3	0.00	0.00	0.33	6	13	7	1.00	1.00	0.78
5	4	-1	0.63	0.57	-0.09	1	1	8	0.25	0.13	0.73
2	0	5	0.25	0.00	0.45	2	7	6	0.29	0.50	0.55
4	5	8	1.00	0.71	1.00	5	9	6	0.83	1.00	0.75
1	0	0	0.14	0.00	0.00	3	1	2	0.75	0.13	0.33
3	11	-3	0.75	0.79	-0.33	4	7	3	0.57	0.50	0.33
7	-1	1	1.00	-0.14	0.14	0	0	5	0.00	0.00	0.71
6	2	9	0.75	0.18	1.00	4	6	7	0.67	0.46	0.78
0	1	7	0.00	0.07	0.54	3	17	5	0.38	1.00	0.38
-1	11	9	-0.25	1.00	1.00	5	4	9	0.71	0.36	1.00
-2	4	2	-0.40	0.40	0.25	3	2	7	0.75	0.22	0.88
-1	8	2	-0.20	1.00	0.25	5	3	5	0.83	0.30	0.63
1	7	3	0.25	0.64	0.33	2	4	6	0.33	0.36	0.67
3	6	10	0.38	0.60	1.00	3	10	7	0.50	1.00	0.70
0	-1	5	0.00	-0.09	0.45	2	5	10	0.50	0.42	0.91
4	6	5	0.50	0.43	0.45	6	14	11	1.00	1.00	1.00
-2	8	4	-0.50	0.57	0.40	5	7	7	0.63	0.50	0.70
-2	6	10	-0.50	0.43	1.00	4	4	10	0.67	0.36	1.00
0	1	3	0.00	0.13	0.33	2	1	3	0.50	0.13	0.33
-3	2	4	-0.75	0.20	0.40	3	4	3	0.50	0.36	0.30
1	1	5	0.14	0.09	0.45	5	-1	6	0.63	-0.08	0.55
-1	-2	-4	-0.14	-0.18	-0.50	3	9	4	0.75	1.00	0.50
7	6	-5	1.00	0.75	-0.71	3	3	2	0.60	0.30	0.29
3	3	-4	0.75	0.21	-0.50	3	6	5	0.50	0.50	0.63
5	1	8	0.71	0.10	1.00						

After getting the N-gain for the control and experiment groups, maximum value, minimum value, average mean, range, and standard deviation in the control group can be seen in the Table 11. And 12. below.

Table 11. Descriptive Testing of Control Group (N=26)

Variable	X1	X2	X3
Minimum	-0.75	-0.29	-0.71
Maximum	1.00	1.00	1.00
Average	0.19	0.31	0.33
Std. Deviation	0.52	0.37	0.50
Range	1.75	1.29	1.71
Interval	0.25	0.18	0.25

Table 12. Descriptive Testing of Control Group (N=26)

Variable	X1	X2	X3
Minimum	0.00	-0.08	0.29
Maximum	1.00	1.00	1.00

Average	0.59	0.47	0.64
Std. Deviation	0.23	0.34	0.23
Range	1.00	1.08	0.71
Interval	0.14	0.15	0.10

After conducting tests to obtain the minimum, maximum, average, standard deviation, range, and interval of the data, the subsequent step involves performing a testing requirement analysis. Problem-solving Hypothesis :

Ho: The mean of N-gain student's problem-solving skill control group is same as the mean of N-gain student's problem-solving skill experiment group.

H1: The mean of N-gain student's problem-solving skill control group is less than that of student's problem-solving skill experiment group.

Since both data are normally distributed than the test should be done by parametric technique. Firstly, it is checked whether the two groups of data are homogeneous. F test concludes that the two data are not homogeneous. It means they are difference in variance. After calculating the Sp = 0.11, with degree of freedom is 34.736, then tcount is -3.56, and ttable is -1.69 for α = 5%. It can be concluded that the mean of N-gain students' problem- solving skill control group is less than that of students' problem-solving skill experiment group. Furthermore, the mean of N-gain students' problem-solving skill experiment group is 0.59 with standard deviation 0.23 prove that it is greater than zero. It means the use of loose parts media in the experimental group increases students' problem-solving skill significantly. It can be seen in Table 13. and 14. below.

Table 13. N-Gain of Both Groups

Control Group			Experiment Group		
X_1	X_2	X_3	X_1	X_2	X_3
-0.500	-0.286	0.000	0.667	0.300	0.500
0.000	0.000	0.333	1.000	1.000	0.778
0.625	0.571	-0.091	0.250	0.125	0.727
0.250	0.000	0.455	0.286	0.500	0.545
1.000	0.714	1.000	0.833	1.000	0.750
0.143	0.000	0.000	0.750	0.125	0.333
0.750	0.786	-0.333	0.571	0.500	0.333
1.000	-0.143	0.143	0.000	0.000	0.714
0.750	0.182	1.000	0.667	0.462	0.778
0.000	0.067	0.538	0.375	1.000	0.385
-0.250	1.000	1.000	0.714	0.364	1.000
-0.400	0.400	0.250	0.750	0.222	0.875
-0.200	1.000	0.250	0.833	0.300	0.625
0.250	0.636	0.333	0.333	0.364	0.667
0.375	0.600	1.000	0.500	1.000	0.700
0.000	-0.091	0.455	0.500	0.417	0.909
0.500	0.429	0.455	1.000	1.000	1.000
-0.500	0.571	0.400	0.625	0.500	0.700
-0.500	0.429	1.000	0.667	0.364	1.000
0.000	0.125	0.333	0.500	0.125	0.333
-0.750	0.200	0.400	0.500	0.364	0.300
0.143	0.091	0.455	0.625	-0.077	0.545
-0.143	-0.182	-0.500	0.750	1.000	0.500
1.000	0.750	-0.714	0.600	0.300	0.286
0.750	0.214	-0.500	0.500	0.500	0.625

Control Group			Experiment Group		
X_1	X_2	X_3	X_1	X_2	X_3
0.714	0.100	1.000			

Table 14. N-Gain Normal Distributed Test

Control Group			Experiment Group		
X_1	X_2	X_3	X_1	X_2	X_3
-0.500	-0.286	0.000	0.667	0.300	0.500
Normal	Normal	Normal	Normal	Not Normal	Not Normal

Critical Thinking

Ho: The mean of N-gain students' critical thinking skill control group is same as the mean of N-gain students' critical thinking skill experiment group.

H1: The mean of N-gain students' critical thinking skill control group is less than that of students' critical thinking skill experiment group.

Variable critical thinking (X2) for experiment group is not normally distributed, then the Mann-Whitney U test is used to calculate the mean difference of variable X2. It is tabulated in Table 15. From Table 15, it can be said that there is not enough data to conclude the mean of N-gain students' critical thinking skill control group is less than that of students' critical thinking skill experiment group. It means that H0 is accepted. The use of loose parts media in the experimental group does not have a relationship in improving N-gain critical thinking skills of students in kindergarten XYZ Jakarta. However, from the experiment group data, the mean of N-gain students' critical thinking skill experiment group is 0.47 with standard deviation 0.34 prove that it is greater than zero. It means the use of loose parts media in the experimental group increases students' critical thinking skill significantly.

Table 15. Variable X2 for Hypothesis Testing

N data	26	25
Weight	754.00	572.00
U	247	403
μ_U	325	325
σ_U	53.07	53.07
Z	-1.47	1.47
Ztable	-1.64	-1.64

Creativity :

Ho: The mean of N-gain students' creativity skill control group is same as the mean of N-gain students' creativity skill experiment group.

H1: The mean of N-gain students' creativity skill control group is less than that of students' creativity skill experiment group.

Variable creativity (X3) is not normally distributed, so the Mann-Whitney U test is used to calculate the mean difference of variable X3. It is tabulated in Table 16.

Table 16. Variable Creativity for Hypothesis Testing

N data	26	25
Weight	805.50	520.50
U	195.5	454.5
μ_U	325	325
σ_U	53.07	53.07
Z	-2.44	2.46
Ztable	-1.64	-1.64

From Table 16. It can be concluded that the mean of N-gain students' creativity skill control group is less than that of students' creativity skill experiment group.

Therefore, it can be concluded that the use of loose parts media in the experimental group has a relationship in improving creativity of students in kindergarten XYZ Jakarta. In addition, the mean of N-gain students' creativity skill experiment group is 0.64 with standard deviation 0.23. It proves that it is greater than zero. It means the use of loose parts media in the experimental group increases students' creativity skill significantly. By including more play activities with various tools in their teachings, teachers may aid students in strengthening their capacity for critical thought. Giving young children the chance to forecast the future and fostering teamwork are two ways to help them develop critical thinking abilities [18].

Many studies related to loose parts, including research conducted by Hamidah, concluded that learning with Utilizing loose parts in early childhood in Bandung Regency has been carried out through planning, organizing, implementing and evaluating according to management stages. The planned and organized learning program in its implementation has not run optimally, because it is still hampered by teacher competence, lack of support from parents and the mass learning system of the Covid-19 pandemic [19]. Research conducted by Ridwan concluded that loose part media is always used in the learning process. This is due to its flexibility in each lesson, its ease in using it in games, and it is liked by children. Apart from that, this loose part media also gives children the freedom to express their ideas, creativity and imagination into activities [20]. Research conducted by Setianingsih concluded that Loose parts learning media implemented at Hardikasiwi Sidomoro Kindergarten in the process of learning activities to develop aspects of children's fine motor development have developed well [21]. That through loose parts-based STEAM learning it is proven that it can increase not only creativity and critical thinking in early childhood, but also increase collaboration, communication, and children's imagination. This is because in the STEAM learning process based on loose parts, children explore materials and think creatively to maximize and create something from the loose parts provided [22].

CONCLUSION

Based on the result of this research through preparation, data collection, and data analysis, we can conclude that: 1) Loose parts can improve students' problem-solving, critical thinking and creativity skills in learning using loose parts media. 2) The mean different between posttest and pretest of experimental group displayed notable improvement higher than that of control group by using Loose parts media. These findings highlight key components that educators may use to build early childhood learning or lesson plans in schools to foster the growth of problem solving, critical thinking and creativity by using loose parts media. There are also some important things that need to be carefully noted by the teacher, to give open-ended questions to trigger students build their critical thinking skill. This research introduces a novel approach to enhancing kindergarten critical thinking, problem-solving, and creativity by incorporating loose parts, fostering open-ended exploration. However, limitations include context-specific findings, potential short-term focus, resource constraints for

implementation, challenges in assessing creativity in young children, and external factors that may influence outcomes. Addressing these limitations in future research can enhance the broader applicability and reliability of the proposed approach. Educators can implement activities using these loose parts media by considering the deficiencies in this study. This shows that additional investigation is required to discover if loose parts can also assist kids in growing their capacity for critical thought. How kids construct and assess their projects using loose parts may be another topic for research. Educators and policymakers should consider incorporating loose parts media as a valuable tool to foster problem-solving and creativity in young learners, while exploring additional interventions to strengthen critical thinking skills.

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