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Implementation of Project Based Learning to Increase Creativity And Critical Thinking Abilities of Early Childhood

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Abstract

This study addresses the issue of suboptimal development of children's creativity, often caused by limited opportunities for exploration. Teachers' restrictive approaches hinder children's creative problem-solving abilities. Using a quasi-experimental method, this research employs purposive sampling, involving two groups: experimental and control, each consisting of 20 children. The study was conducted at two schools, namely UNRI FKIP LAB Kindergarten and Pembina 2 Pekanbaru State Kindergarten. Data collection methods included observation and documentation, with analysis performed using a t-test through SPSS version 26.0 for Windows. The results reveal that project-based learning significantly enhances both creativity and critical thinking skills in young children. This research also highlights active participation and increased understanding among children through contextualized learning through project based learning. This research has limitations as it suggests that early childhood creativity and critical thinking abilities are influenced by more than just project-based learning methods. However, in this research we only looked at two variables, while there are still many other factors that can influence it. It is hoped that future research can examine more deeply the influencing factors, not just two variables.

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INTRODUCTION

Early childhood education is of utmost importance. This is because education is an effort to advance character, good ways of thinking, in order to improve oneself and the environment (Rakimahwati, 2018). Early childhood education offers educational services This refers to the

numerous facets of child growth and progress that are supported by various sources (Wandi & Mayar, 2019). It is hoped that early childhood education as a stimulus for children's development can stimulate the goal is to ensure optimal development in all aspects of children.

One aspect that needs to be stimulated since the golden age is cognitive development. Cognitive development in early childhood is a crucial aspect to develop (Suryana, 2018). Where with cognitive abilities, children will be able to explore their surroundings through the five senses so that the knowledge they have received will help children to live their lives and become complete human beings in the future (Angara, 2019). Part of the cognitive advancement is an essential component of children's growth and evolution allows them to analyze critically.

Early childhood skills in critical thinking include being able to solve problems by observing, reasoning and drawing conclusions. The research results support this statement (Yunita et al., 2019) that children can discover ways to address the challenges they encounter while facing the activity process, and at the end of learning children are able to draw conclusions regarding the activities carried out. Critical thinking involves reflective thinking, self-regulation, interpretation, analysis, evaluation, inference, and exposure to evidence, concepts, methodology, criteria, and decisions to make informed decisions (Siddin, 2021).

Critical thinking skills are about educating the program aims to enhance children's communication, thinking, problem-solving abilities, and the ability to select and draw conclusions from the obtained information (Yunita et al., 2019). Cognitive development requires children to think logically, critically, provide reasons, solve problems, and find cause-and-effect relationships (Yamin & Sanan, 2010).

Relevant studies that have been performed (Handayani & Sinaga, 2022) The Project Based Learning model significantly enhances the average achievement of critical thinking abilities in children between the ages of 5 and 6 years old, transitioning from pre-phase to phase I and phase II. Meanwhile, research is relevant (Kusadi et al., 2020); (Agustina, 2021) the Project Based Learning model of stimulating the development of children's creativity results in children being given the opportunity and freedom to express their thoughts or ideas in solving problems and completing the tasks given. Other results show that there are differences between groups of children who study with a project-based learning model and groups of children who study with conventional learning methods.

The project-based learning model is a method that focuses on students' practical experiences in real-life activities (Cahyadi et al., 2019). The project based learning model emphasizes contextual problems that children may experience directly, so that the project based learning model makes children able to recognize their environment in a real way (Anggraini & Wulandari, 2021). The project-based learning model encourages students to develop projects individually or in groups, resulting in the creation of a product (Akharraz, 2021).

Researchers have noted various phenomena via interviews and observations at the LAB FKIP UNRI Kindergarten and the Pembina 2 Pekanbaru State Kindergarten, it shows that the level of creativity and critical thinking abilities of children on July 18 2023 is still at the stage of starting to develop. When the topic of natural conditions (floods) is discussed, children are still confused about developing ideas, imagination and asking for help from teachers in creating flood markets, children also do not get the opportunity to complete activities and children tend to accept what is given by the teacher so that some children still find it difficult to conclude something in detail, for example when they have carried out an activity, the average child is still confused in explaining what activity they have done.

In the learning process there are several aspects of children's development that must be developed, one of which is the development of creativity (Fitri & Mayar, 2019). Creativity involves creating new ideas, works, or combinations of existing things, aiming to carry out amazing activities and innovate through innovative activities (Sari & Nofriyanti, 2019). Creativity is a person's capacity to generate and innovate something new, & solve problems with new methods and ideas, which are relatively different from other people or before. Early childhood creativity includes skills, activeness, imagination, language and fun (Mardian & Hartati, 2019).

Based on observations the following day on July 20, 2023 at the Pembina 2 State Kindergarten and the UNRI Pekanbaru FKIP LAB Kindergarten. It was found that children's creativity has not developed optimally. It is said that it is not yet developed, it can be seen that there is a lack of imagination and creative ideas in children in forming and exploring work, seen from the children's work which is almost the same as that exemplified by the teacher. Lack of freedom for children to develop creativity, The statement is clear and concise teachers limit children's exploration and inhibit children's creative abilities, this can be seen when the theme of my town is the state of nature (forest fires) the teacher only provides 1 activity, namely a mosaic filling in the pattern of a picture of a forest fire using tissue that has been destroyed with water. Teachers do not provide tools and materials, so children do not have the freedom to carry out activities according to the child's wishes in developing their creativity.

This is caused by the learning method used by the teacher, namely problem based learning, which is not implemented optimally in the classroom. The problem based learning method has a project work duration of 1 meeting. So aspects of child development, especially creativity and critical thinking in early childhood, are difficult to develop and are not yet visible. In its implementation, the project based learning method provides students with a great opportunity to make a decision when choosing a topic, carrying out activities, and completing the project that has been chosen, so that in this model students in the learning process work in real life, as if the students were there. in the real world and can create a product or work realistically (Sari & Angreni, 2018).

The researcher conducted an interview with a teacher at Pembina 2 Pekanbaru State Kindergarten on July 25 2023. The interview revealed that teachers are still uncertain about implementing the project-based learning method due to a lack of training project based learning method. Teachers also have difficulty in time management, because to use PJBL they must have good time management skills. Teachers also find it difficult to carry out projects, because children like to ask for help in completing assignments. The teacher also only provides 1 activity, this can be seen when the theme of my city is the topic of natural conditions (rain) with 1 activity, namely making a flooded market in groups.

To overcome the problems above, researchers are interested in applying project based learning and creativity methods with the aim of improving the critical thinking abilities of young children.

METHODS

The research method used is the quasi-experimental method. The quasi-experimental method (quasi-experimental) is basically the same as quasi-experiment, the difference is that in

controlling variables, control is primarily focused on the most dominant variable. This research uses a control group and an experimental group (Sukmadinata, 2009).

This the investigation was carried out at the UNRI FKIP LAB Kindergarten and the Pembina 2 Pekanbaru State Kindergarten. The sample size was 20 children as a control group at the UNRI FKIP LAB Kindergarten and a sample of 20 children as an experimental class at the Pembina 2 Pekanbaru State Kindergarten. The tool utilized was a recording sheet for observations. The data collection methods involved observation and documentation carried out directly by researchers by looking at the implementation of activities and making observations regarding the study explores the impact of project-based learning and creativity on children's critical thinking abilities.

The main tool for data collection is a structured observation sheet. An observation sheet was developed based on specific research needs to ensure comprehensive data collection. This study also used SPSS 26.0 for data analysis, which facilitated statistical evaluation strict consideration of The research intervention's efficacy is determined through pretest and posttest results. Data was collected through a combination of observation, interviews and techniques documentation. Observations are recorded systematically using the existing observation sheet pre-designed during the pretest and posttest phases. Interviews with teachers and documentation the results of the children's activities provided additional qualitative data to contextualize the findings quantitative.

The data was analyzed using SPSS 26.0, employing the paired t-test to compare pre-test and post-test results scores, and thereby determine the statistical significance of any changes observed in critical thinking skills and creativity. To ensure validity and validity of the research, several measurements were applied. Observation sheets are rigorously tested and refined during the pilot phase to increase its validity. Inter-observer validity assessed by having several observers independently evaluate portions of the data, and consistency in observations is verified. Validity is handled through validation of the content of the observation sheet by Experts in early childhood education use project-based learning materials and quasi-experimental research designs to reduce confounding variables and enhance internal validity of findings.

RESULT AND DISCUSSION

To be able the research results underwent a hypothesis test using the t test, followed by normality and homogeneity tests to draw conclusions.

1. Normality test

a. Normality Test of Children's Creativity Development

Table 1. Normality Test of Children's Creativity Development

Class	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	Df	Sig.	Statistics	Df	Sig.
Creativity Experiment Post-test	,266	20	,001	,787	20	,001
Creativity Control Post-test	,165	20	,159	,958	20	,505

The table shows that there were 20 students in each of the trial and comparison groups who took the post-test. The trial group's Shapiro-Wilk value is 0.001, while the control class's is 0.505. Following that, the information is distributed in a typical manner as shown by its sig > 0.05, according to the Shapiro-Wilk calculation above.

b. Normality Test of Children's Critical Thinking Abilities

According to post-test results, the experimental class's Shapiro-Wilk value was 0.189, whereas the control class's was 0.273. The results of the normality test are displayed in a table:

Table 2. Normality Test of Children's Critical Thinking Abilities

Class	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	Df	Sig.	Statistics	Df	Sig.
Critical Thinking Experiment Post-test	,222	20	.011	,935	20	,189
Critical Thinking Control Post-test	,130	20	,200*	,943	20	,273

Since the average data has a sig > 0.05, it may be inferred from the Shapiro-Wilk calculation above that the information follows a normal distribution. Therefore, it can be expressed that the information is distributed in a normal manner.

2. Homogeneity Test

a. Homogeneity Test of Children's Creativity Development

For the homogeneity test, researchers used the gain score in the experimental and control classes' post-test findings from the data obtained during the research. Testing the second requirement uses the one way anova test. Post-test homogeneity test calculation the table below shows the outcomes for the two classes:

Table 3. Homogeneity Test of Children's Creativity Development

Levene Statistics	df1	df2	Sig.
1,678	1	38	.203

The test table created with SPSS 26.0 shows that the significance value is 0.203. Since the significance value is more than 0.05, specifically 0.203 > 0.05, the data can be considered homogenous. Therefore, the two classes that are employed for research are homogeneous, and research may be conducted because of this.

b. Homogeneity Test of Children's Critical Thinking Abilities

The data is considered homogeneous, as indicated by the significance value of 0.010, which is greater than 0.05, as shown in the pre-test homogeneity test results.

Table 4. Homogeneity Test of Children’s Critical Thinking Abilities

Levene Statistics	df1	df2	Sig.
7,306	1	38	,010

The research is conducted on homogeneous classes, allowing for the efficient execution of the study.

3. Hypothesis Test

a. Hypothesis Test of Children's Creativity Development

Hypothesis testing used in this research is a parametric statistical test, namely the t-test for independent samples. to determine whether the two groups differ significantly from one another.

Table 5. Hypothesis Test of Children’s Creativity Development

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	Q	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Results	Equal variances assumed	1,678	.203	12,851	38	,000	5.85000	.45523	4.92843	6.77157
	Equal variances not assumed			12,851	36,336	,000	5.85000	.45523	4.92704	6.77296

The study discovered that project-based learning techniques greatly influence children's creativity development in Pekan Baru City Kindergartens, as evidenced by a significant difference in variance between the experimental and control classes, as indicated by a sig value of $0.000 < 0.05$.

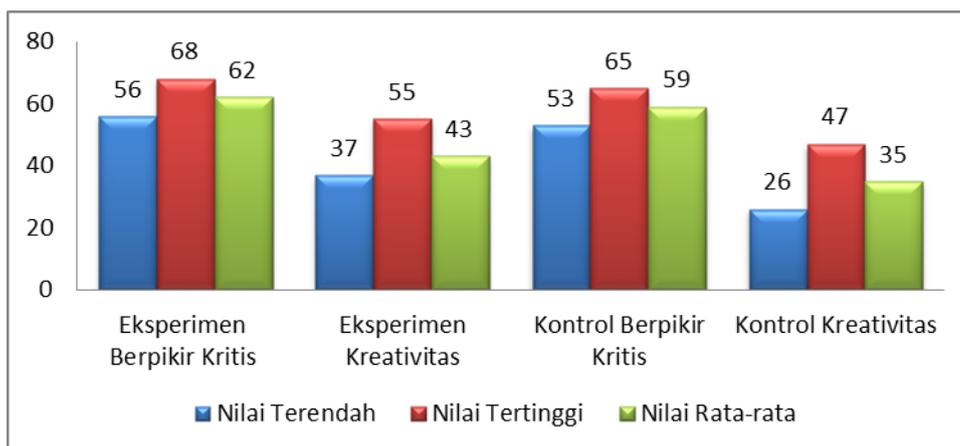
b. Hypothesis Test Children's Critical Thinking Abilities

Table 6. Hypothesis Test of Children’s Critical Thinking Abilities

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	Q	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Results	Equal variances assumed	7,306	,010	21,704	38	,000	13.30000	.61280	12.05945	14.54055
	Equal variances not assumed			21,704	28,083	,000	13.30000	.61280	12.04490	14.55510

The study found that project-based learning methods significantly impact children's critical thinking abilities in Pekan Baru City Kindergartens. The variance of the N-gain data was homogeneous, and a significant difference was observed between the control and experimental classes, confirming the hypothesis (Ha).

This research follows several steps, starting with assessing children's abilities before treatment and review their understanding after treatment. Initially, A pretest was given to evaluate their understanding of using project based learning conventional approach to looking at children's critical thinking skills and creativity. Next, the sample received four treatments. Finally, the posttest was conducted after treatment. The results show a significant impact when project based learning is applied during learning, as shown in the following table:



The experimental class's highest score of 68, lowest score of 56, and average score of 62 for children's critical thinking abilities can be explained by the graph above. In contrast, the children's creative experimental class scored the highest at 55, the lowest at 37, and the average at 43. With the maximum score of 65, the lowest score of 53, and the average score of 59, the critical thinking abilities control class received the highest scores. However, the class that was given the creativity control received the best score (47), the lowest score (26), and the average score (35).

The findings lend credence to the idea that project-based learning might help kids become more creative and critical thinkers throughout educational activities. Project based learning provides context learning that engages children with various kinds of questions and carrying out project activities. Although the results are promising, the limitations of this study must be acknowledged. The research's limitations are that the factors that can influence the development of creativity and critical thinking abilities in early childhood are not only the project based learning method. However, in this research we only looked at two variables, while there are still many other factors that can influence it. It is hoped that future research can examine more deeply the influencing factors, not just two variables.

Research shows that project-based learning methods positively impact children's creativity and critical thinking abilities. The method enhances teaching and learning activities, making children enthusiastic and more engaged. The stages of project-based learning make learning more meaningful for children, based on hypothesis 1 and hypothesis 2.

1. The Influence of Project Based Learning Methods on the Development of Creativity in Kindergarten

The study revealed that the project-based learning method at UNRI FKIP LAB Kindergarten and the problem-based learning method at Pembina 2 Pekanbaru State Kindergarten significantly enhanced creativity development during pretest and posttest. Many studies (Handayani & Sinaga, 2022); (Kusadi et al., 2020); (Agustina, 2021) show that PBL has a positive impact on the development of children's cognitive and social abilities at the kindergarten level. Children who engage in project-based learning often show improvements in the ability to collaborate, communicate, and think analytically. The experimental class utilized project-based learning five times to enhance children's creativity, motivation, responsibility, communication, social skills, cooperation, and problem-solving abilities (Nuryati et al., 2020).

Research indicates that children are capable of problem-solving and idea development. This can be seen when the teacher takes children to observe land vehicles around the child, namely 2-

wheeled and 4-wheeled vehicles. Children are able to name the parts of these vehicles in general and are able to name other land vehicles. Children are able to express their opinions during observations. The skill of resolving issues is a vital capability that kids should possess. This is because when children are in the process of playing and learning, children will encounter small problems that need to be solved by themselves (Romanti & Rohita, 2021).

The capacity to address issues is a crucial talent that kids should possess in the 21st century. This skill begins to develop from an early age and plays a crucial part in forming the ability to act independently, which is known as self-determination. Apart from training the ability to find solutions, this skill also influences the enhancement of additional abilities, including analytical and organized thinking abilities, innovation, and interpersonal communication (Syaodih et al., 2018). Problem-solving skills can also help children explore the world around them and complete assignments at school (Lestari, 2020).

Children can develop creativity through group projects, using provided materials and contextual learning. They can create cars from origami paper, cut and paste existing parts, and experiment with various colors. This creativity involves producing new ideas and tools, and inventing something new, demonstrating inventiveness (Khasanah & Ichsan, 2019).

Creativity gives children a great sense of joy and inner satisfaction, as well as rewards that have a real impact on their personality development (Andayani, 2021). Creativity cannot be measured with certain tools or instruments but can be seen through the way children express their ideas or thoughts in creating works (Marwiyati, 2021). Creative activities allow someone to express their feelings and thoughts. The project-oriented learning approach further contributes positively to increasing the creativity of young children (Nikmah et al., 2023).

The findings in the field were that children were able to solve problems, this was seen when the teacher played videos of various types of land vehicles around the children. The teacher asks questions about what land vehicles are around the child, then the child is able to tell about their experiences when riding vehicles such as cars, motorbikes and bicycles. After that, when making projects, when the teacher provides tools and materials, children are able to make cars with the tools and materials given and children are able to be creative. In playing while learning, children make choices according to their decisions, develop imagination and creativity, practice problem solving, develop ways of communicating and negotiating (Sinaga & Timbange, 2022).

Children are able to create new ideas, when making land vehicle market projects, children are able to create their own work, this can be seen when children make red lights from origami paper and make trees from origami paper. Project Based Learning is a learning activity that can provide opportunities and freedom for children to develop their creativity to solve problems (assignments or projects) given (Agustina, 2021). Children are able to provide an explanation of their project, in the activity of creating a market for land vehicles, children are able to tell and explain what activities the children do. When the teacher asks what the children are doing and the children are able to find a solution to the problem, and the children are able to express themselves when presenting the results of their land vehicle market work in groups. Learning using this method is child-centered learning. Activities designed using this project method provide the widest possible opportunity for children to work and stimulate children to think creatively (Sinaga & Timbange, 2022).

The findings of the study indicate that fostering critical thinking abilities during early childhood by being given a variety of tools and materials after the posttest is carried out is said to be developing as expected. This study is further reinforced by findings from other investigations

(Imamah & Muqowim, 2020) Research shows that children's creativity is significantly influenced by project-based learning methods in kindergarten, as they exhibit creative, fluent, and the ability to think critically in problem analysis and detail exploration.

2. The Influence of Project Based Learning Methods on Critical Thinking Ability in Kindergarten

Researchers found that project-based learning (PJBL) at UNRI FKIP LAB Kindergarten and problem-based learning at Pembina 2 Pekanbaru State Kindergarten significantly improved critical thinking skills in young children, highlighting the potential of PJBL in early childhood education and higher levels.

After the children were given activities using the project based learning method, the children were very enthusiastic about learning so that the children were capable of enhancing their analytical reasoning abilities. The findings of this study are additionally backed by investigations carried out by (Handayani & Sinaga, 2022) Project-based learning stimulates children through exploratory activities, promoting critical thinking skills for the future by recognizing cause and effect and drawing conclusions from events.

Critical thinking is an attitude of thinking deeply and using logical reasoning to assess assumptions based on existing evidence. This ability develops gradually and starts in childhood (Rahmasari et al., 2021). The goal of fostering critical thinking abilities in youngsters is to educate them on articulating their ideas, addressing challenges, and assessing the information they receive. In addition, by teaching critical thinking from an early age, children are expected to become more through, persistent, and responsible individuals (Yunita et al., 2019). Critical thinking skills that children need to have include the ability to form concepts, analyse, evaluate, and make conclusions or decisions based on information obtained from observations, direct experience, and learning at school (Fitriani & Vinayastri, 2022). Therefore, early childhood education must be designed to provide direct experience and support the development of critical skills (Pangestu, 2024).

The conclusion from these various studies is that the project-based learning model not only supports creativity and innovation, but is also very effective in developing critical thinking skills in young children. Here, children's critical thinking skills can be developed well if they receive pleasant stimuli and motivation that builds critical thinking skills in children, one of which is by implementing the project based learning method in class. It is proven the hypothesis of the study suggests that the project-based learning approach has a considerable impact on the critical thinking skills of young learners.

CONCLUSIONS

The study explores how project-based learning affects the creative and critical thinking skills of young children. Findings indicate that project-based learning greatly improves creativity and critical thinking in early childhood, with children demonstrating heightened excitement and engagement in the learning experience ($p < 0.05$).

CONFLICTS OF INTEREST STATEMENT

The writers state that there are no competing interests, the co-authors concur with the content of the document, and this submission is unique, not currently being evaluated by any other journal.

AUTHOR CONTRIBUTIONS

Ripa Natari and Rakimahwati initially proposed the idea, while Farida Mayar and Yaswinda created the theory, executed calculations, and confirmed the analytical approaches.

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