THE EFFECT OF THE PROJECT-BASED LEARNING MODEL ON THE ABILITY OF RATIONAL COUNTING IN GROUP B AT TK ISLAM AZ-ZAHRAH PALEMBANG

Ameliya Nada Khana[1]✉, Windi Dwi Andika[2]
[1]Universitas Sriwijaya, Palembang, Indonesia
[2]Universitas Sriwijaya, Palembang, Indonesia
✉*Correspondence: ameliyannada@gmail.com*

Abstract: *The basic ability of counting in children is important for the development of mathematics at a later stage so the selection of learning models can affect this ability. This study aims to see the effect of rational counting ability in group B of Az-Zahrah Islamic Kindergarten through a project-based learning model. The type of research used is pre-experiment with a shot case study design. The sampling technique used purposive sampling, namely class B4 with a total of 16 children using posttest and observation which will then be analyzed using a one-sample T-test. The results obtained are that the project-based learning model positively influences the ability of rational counting in group B of Az-Zahrah Palembang Islamic Kindergarten. This can be seen in the child's score in each aspect, such as rote counting, one-to-one correspondence, counting, and cardinal, which has developed as expected. The results of this research can be an alternative for schools or educators in developing counting skills for group B through project learning.*

Keywords: Rational Counting, Learning Model, Project Based Learning, Early Childhood Education

A. Introduction

Numeracy is an essential aspect of mathematics that needs to be developed early. Numeracy skills are also one of the foundations for solving problems in everyday life. According to Febrizalti & Saridewi (2020), counting is the basis for children's mathematical abilities in further education, so the material in counting becomes the largest part of mathematics. Fara et al. (2020) also said that early counting is the basis of several sciences used in every human's life. Early counting taught in early childhood education will affect further education, so it is important to teach counting concepts at an early age.

The Kompas Daily newspaper reported that the acquisition of mathematics PISA scores in Indonesia in 2022 experienced a 13-point decline from the previous year, 2018. This decline is also due to learning loss during the Covid-19 pandemic. Iwan Pranoto said that for the last 20 years, Indonesia has been below the average of OECD countries, indicating a learning crisis (ELN, 2023). Then, in observations at Az-Zahrah Palembang Islamic Kindergarten, some children still have difficulty counting objects by pointing or without pointing to the object. The lack of children's ability to count can be caused by a learning model emphasizing less on children's rational counting ability. So, it is necessary to stimulate activities that can affect counting skills, especially in rational counting. Activities for early childhood are playing while learning. So, it is necessary to design children's learning with a fun concept.

Learning in early childhood currently refers to the independent curriculum, which is a curriculum launched in 2022 that is designed to facilitate catching up with literacy and numeracy. Lestari Koesumawardani, as Coordinator of the Assessment Function of the Directorate of PAUD, Ministry of Education and Culture Research, stated that in the independent curriculum, there is project-based learning, namely the project to strengthen the Pancasila learner profile (P5) (PaudPedia, 2022). This P5 will measure the achievement of the Pancasila learner profile developed from the P5 dimensions: Belief and devotion to God Almighty and noble character, independence, critical thinking, creativity, cooperation, and global diversity (PaudPedia, 2022). The project learning model will make all children actively

participate in learning activities so that researchers want to use project learning in classroom learning activities.

A study by Puspitasari & Nurhandayani (2023) that the make-a-match cooperative model influenced the ability to count children aged 4-5 years. Then, in research by Cardona & Maimunah (2022) conducted on group B children, it was found that activities such as the numbered head-together model, talking sticks, and smart flag games could develop children's cognition in the concept of counting. Furthermore, research by Lestari (2023) said that project learning affects children's ability to conceptualize numbers in group B. Then, in research conducted by Nurhayanti et al. (2021), it was found that the project-based learning model with concrete number tree media can improve children's numeracy skills in group A.

Based on the studies that have been conducted, it is known that there are several learning models, such as the make-a-match cooperative model, the numbered head together model, talking sticks, and the smart flag game, that can have a positive effect on the ability to count in group B. Then it is also mentioned in the studies that have been conducted that the project learning model can positively affect the concept of number in Group B and positively affect the ability to count in Group A. However, in this case, not many studies discuss learning models that focus on children's abilities in the rational counting aspect.

In A'tiana et al. (2021), it is explained that rational counting is when children correctly label the name of the number for the collection of objects or objects being counted so that the child can understand the meaning of a number. So, in this aspect of rational counting, children are not only able to count numbers and memorize the sequence of numbers, but children will associate them with objects so that children will understand the rational meaning of a number. The rational counting aspect can also be the basis for children to learn to solve problems in everyday life.

Based on the studies that have been conducted, there has not been much discussion about the project-based learning model's application to learning to count in group B, especially in the rational counting aspect. Therefore, the purpose of this research is to find out whether this project-based learning can affect children's counting skills, especially in the rational counting aspect, so that

the results of this article can be an alternative for schools or educators to develop counting skills for group B through project learning.

B. Method

This study uses a pre-experimental research design with the type of one-shot case study, a research design where one group is given treatment and then observes the results (Sugiyono, 2018). This design is used following the objectives to be achieved, namely to determine the effect of the project-based learning model on rational counting skills in group B so that group B will be given treatment, namely the project-based learning model, which is then observed and analyzed the results. The sample in this study consisted of students in group B in class B4, with a total of 16 students, consisting of 9 boys and 7 girls. The sample selection used a purposive sampling technique, namely determining the sample with certain considerations. This technique is used because the sample selected is under the objectives and abilities under study, namely rational counting ability. The data collection technique in this study used observation in the form of a posttest. The instrument in this study will be attached to Table.1 below.

Table 1. Research instruments

No	Aspect	Indicator
1	Rote counting	(1) The child names the numbers in order based on their memory
2	One-to-one correspondence	(2) The child points to objects while counting objects
3	Number line	(3) The child counts objects in the correct order
4	Counting	(4) The child counts all the objects that the teacher tells them to
5	Cardinal	(5) The child can mention the last number as the quantity of the group of objects counted

Then, the data were analyzed using statistics, namely the normality test and one-sample t-hypothesis test. The normality test is used to determine whether the research data is normally distributed or not. Furthermore, a one-sample hypothesis test was carried out with the following formula:

$$t_{hit} = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

(Sugiyono, 2018)

Description :

t_{hit}: Calculated T Value

$\bar{x}$: Sample Mean Value

μ_0 : Expected Value of The Sample

s : The Standard Deviation of The Test Sample

n : Number Of Research Samples

The research method consists of the data collection technique, the data analysis, and the number of participants used in the study. Formula writing can use the equation including the main source as a reference. The literature research must contain a flow of thought in the study, steps in data collection (information gathering), analytical techniques, and standards of reference used to conduct a critical and in-depth study.

C. Result and Discussion

In this study, observations were made by conducting treatment using project-based learning to see if there was an effect on rational counting skills in group B at Az-Zahrah Islamic Kindergarten.

At the first meeting, we discussed the project activities that would be carried out, namely the activity of making a school mockup and introducing the tools and materials for making this school mockup. In introducing the tools and materials, the discussion method was used so that children discussed the tools and materials that could be used to make the planned project. Then, a paper containing pictures of tools and materials used in making this school mockup project is used, and the question and answer method is carried out so that the child answers and mentions the names and uses of the tools and materials. After

that, the child is invited to count how many pictures of tools and materials are in the paper. The paper has 10 tools and materials so that the children count together from 1 to 10. Then, the child is observed when invited to mention the sequence of numbers according to the number of tools and materials that have been mentioned in the order and precisely.

The second meeting discussed buying and selling related tools and materials for making school mockups. Before starting learning, children's seats are arranged first to make it easier for children to buy and sell. Then, the main materials for buying and selling are provided, namely ice cream sticks and paper as transaction tools. In this activity, children look actively to participate as sellers or buyers. This second meeting was carried out using the role-playing method so that there were children who became sellers and became buyers, then took turns. Then, it was observed when the child counted the tools and materials that had been purchased or in the basket by pointing to them. Then, it was also observed when the seller counted his money.

In the third meeting, a project-based learning model was used to build a school mockup framework, namely the fence and wall using ice cream sticks. In making this framework, the demonstration method was used so that previously, they had made a fence and wall framework to serve as an example of the shape of the fence and wall framework and gave an example of making it to the children so that they would understand better to do this activity. In the fence and wall framework, ten sticks are needed for one fence with alternating colors and ten sticks for one wall framework. Then, ask each child to make the framework for the fence and wall. Then, observe the children when asked to count the sticks needed to make the fence and wall.

Then, at the fourth meeting, still using the demonstration method, this meeting discussed continuing the preparation of the school mockup, namely forming a fence around the school mockup yard and forming the walls into school buildings. Children are asked to arrange together the fence and walls in making this school mockup. Then, the child is observed when the child calculates how many frames he needs for the school mockup and counts the sticks on the fence/roof/wall that are colored or uncolored.

Then the fifth meeting, through the discussion and demonstration method, made improvements to the mockup by adding things related to the school, such as flags, miniature students, decorative flowers, some games such as seesaws, swings, and slides, and tidying up and completing the arrangement of the mockup so that the children could calculate the number of groups of objects needed such as the number of games, the number of miniature children, and the number of flowers. Next, children were observed as they discussed the number of groups in the school mock-up, namely the number of red and orange flowers, the number of games, and the number of miniature boys and girls.

Children's scores on each indicator are shown in the following Table 2. :

Table 2. Children's score in each indicator

	Indicators						
Initials	The child names the numbers in order based on their memory	The child points to objects while counting objects	The child counts objects in the correct order	The child counts all the objects that the teacher tells them to	The child can mention the last number as the quantity of the group of objects counted	total	scores
AZA	4	4	3	3	4	18	90
AK	4	4	3	3	4	18	90
FSA	4	4	3	3	4	18	90
KNA	4	4	4	4	4	20	100
KMF	4	4	3	3	3	17	85
KCH	4	3	3	3	4	17	85
MHH	4	3	3	3	3	16	80
MRA	3	3	3	3	3	15	75
MYA	4	4	4	3	4	19	95
NAK	4	3	3	3	3	16	80
RAM	4	3	3	3	3	16	80
RCR	4	4	4	4	4	20	100
RDK	4	4	4	4	4	20	100
SCP	4	4	4	4	4	20	100
TSZ	4	4	3	3	3	17	85
ZKS	4	3	3	3	3	16	80

Based on the recapitulation of the Children's score, the children's data were obtained, namely, 4 children scored 100, 1 child scored 95, 3 children scored 90, 3 children scored 85, 4

children scored 80, and 1 child scored 75. From this description, the observation data is provided in Table 3. following :

Table 3. Observation Result Data

Nilai	Kategori	Frekuensi	Percentage (%)
82-100	Developing very well	11	69
63-81	Developing as expected	5	31
44-62	Beginning to develop	0	0
25-43	Not yet developing	0	0
	Total	16	100%

It can be seen in the table that the rational counting ability of children is under the average score of children's scores; namely, the value of 25-43 is included in the undeveloped category; there are 0 children or no children who get this category, the value of 44-62 is included in the undeveloped category there are also 0 children or no children who get this category, the value of 63-81 is included in the category of developing as expected there are 5 out of 16 children or 31% of children in this category, and the value of 82-100 is included in the category of developing very well there are 11 children out of 16 or 69% of children in this category.

This section describes the result. In discussion, the author(s) compile, analyze, evaluate, interpret, compare, and contrast the findings with previous research (minimum 5 references). The discussion part should be longer than the introduction. The discussion in the article aims to: (1) answer the problem formulation and research questions; (2) show how the findings were obtained; (3) interpret the findings obtained; (4) link research findings with other studies; and (5) bring up new theories or modification of existing theories. The consistency of the article from the title to the discussion must be considered. The research weaknesses and suggestions for further research are described in this section. There is no need to separate the result and discussion in the form of new chapters/sub-chapters. This section can also load images and/ or table(s).

The sample of this study was 16 children in group B of Az-Zahrah Islamic Kindergarten Palembang. Researchers analyzed children's rational counting ability in the interval class of the

developing as expected category so that the value taken was 63. Then, researchers analyzed the final value of observation after being given treatment so that the average score was 85.06 and the standard deviation was 9.09, with the highest value obtained of 100 and the lowest value of 75.

Furthermore, hypothesis testing was carried out using the following one-sample t-test:

$$t_{hit} = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

$$t_{hit} = \frac{85,06 - 63}{9,09/\sqrt{16}}$$

$$t_{hit} = \frac{22,06}{9,09/4}$$

$$t_{hit} = \frac{22,06}{2,27}$$

$$t_{hit} = 9,71$$

From these results, the result is 9.71. Hypothesis testing is based on the conclusion, namely if the t_{count} value ≤ t_{table} then H0 is accepted and Ha is rejected if t_{count} ≥ t_{table} then H0 is rejected and Ha is accepted. The t_{table} is based on the degree of freedom, namely n-1 = 15 and a = 0.05, so the t table value is 1.75. In this case, it is found that the t_{count} value of 9.71 is greater than the t_{table} of 1.75, so H0 is rejected, and Ha is accepted. Furthermore, it is concluded that there is an effect of the project-based learning model on the ability of rational counting in group B at Az-Zahrah Islamic Kindergarten Palembang.

In each meeting, observations were made related to children's rational counting abilities. In indicator 1 about rote counting, the child mentions the name of the number in order based on his memory. Here, the child mentions the name of the number according to the number of ingredients, namely 1-10, in sequence correctly. Almost all children got the Very Good Developing category on this indicator. Only one child got the Developing As Expected category. Accordance to Chundri & Zulmiati (2023), who says that children's counting competence in kindergarten is to be

able to count by voice up to the number 10. The ability to count starts from learning to memorize numbers such as the order of one, two, three, and so on, which then becomes the basis for children to represent the number (Solikhah et al., 2019). Rosdiana & Kharizmi (2021) say that counting is needed in daily activities so that numbers are the basis for math skills. So, in this case, it is important to teach early counting, such as rote counting, to support the children's abilities at a later stage.

Then, in indicator 2, about one-to-one correspondence, namely children pointing to objects while counting objects, the results show that 10 children are in the category of Developing very well, and 6 children get the category of Developing as expected. In this case, children do buying and selling activities at, the so-called market day. Market day is an activity that can be used according to the characteristics of children aged 5-6 years, where in this activity, there will be sellers, buyers, and transaction tools (Anggraini et al., 2023). In buying and selling activities or market day, children are observed when counting how many tools and materials for projects they have bought or in their basket, following indicator 2 to be achieved. According to Nuraeni et al. (2023), on market day, children will be introduced to the concept of numbers through social interaction and experience with the surrounding environment and concrete objects. Market day is also one of the activities in line with this year's latest curriculum, the independent learning curriculum (Novita et al., 2023), so it can be an appropriate activity for current learning.

Furthermore, in indicator 3, about the number line, namely children counting objects in the correct order, the results show that there are 5 children in the Very Good Developing category and 11 children in the Developing As Expected category. In indicator 3, children arrange the framework of the school mockup, namely the fence and walls, using ice cream sticks. All children will make a framework of fences and walls, which are then combined and arranged at the next meeting. The child makes a fence and wall frame with each frame containing ten sticks, so the child will calculate or prepare in advance the sticks that need to be used. Audina et al. (2022) say that children at the age of five are more likely to assign number values to the objects they count. One of the children's abilities in counting is counting objects (Sumiarti

& Marhun, 2021). So, to achieve indicator 3, the observation was to invite children to count the sticks of ice cream needed to make fences and walls.

Then, the children continued to build the framework of the school mockup by forming a fence around the school mockup yard, forming the walls into school buildings, and making flowers for the school mockup yard. In indicator 4, about counting, the child counts all the objects that the teacher points to. Here, children count based on groups of objects, such as counting sticks on the fence/roof/wall that are red or not red, then counting flowers that are yellow or orange. According to A'tiana et al. (2021), it is also explained that rational counting is where children attach the name of the number to the set of objects being counted. In indicator 4, there are 4 children in the category of developing very well and 12 children in the category of developing as expected.

Then, in indicator 5, the child continues the preparation of the school mock-up framework until it is complete so that in the observations made, the child can achieve indicator five about the number symbol, namely, the child can mention the last number as the number of groups of objects counted. Here, the child counts the number of flowers/toys/miniature people in the completed schoolyard mockup. According to Siegler et al. (2020), one of the abilities in counting is understanding the cardinality principle, which states that the last object in the count is the number of objects in the set. If preschool children already have cardinality ability, they already have the basic capital for school (Winda & Mahyuddin, 2022). Then, according to Amelia & Aisya (2021), one of the characteristics of the project is that it ends with a product. At this last meeting, the completion of the project, namely the school mock-up, was the project's final product. In this indicator 5, there are 10 children in the category of Developing very well and 6 children are in the category of developing as expected

The implementation of this project-based learning model makes students learn and produce work so that this model can increase their motivation and skills in solving problems (Saputro & Rayahub, 2020). In this case, it can be seen that in every meeting, children are always eager to continue their projects so that children can focus on learning. Then, in this study, the project-based learning model is associated with children's rational

counting learning, where children are also stimulated by counting what tools and materials are used for their project, namely making a school mockup, how many tools and materials for the project they have bought or in their basket, counting while pointing sticks for making fences and walls, counting groups of objects in the school mockup, and determining the number of groups in the school mockup.

This project-based learning model has many benefits for children. According to Sari et al. (2023), this model has several benefits, including stimulating children's abilities higher than before, improving achievement, increasing enthusiasm for learning, fostering collaboration, and challenging children to solve problems. This is in line with research conducted by Handayani & Sinaga (2022), which states that there is an increase in the development of critical thinking skills of children aged 5-6 years through the application of the project-based learning model. Other research on project-based learning models, such as that conducted by Indarwati et al. (2023), found_that the project-based learning model can improve students' counting skills in grade 1 elementary school. Rasmani et al. (2023) explained that this model-based learning also contributes positively to cognitive development, and social, language, and academic achievement. The project-based learning model is currently also promoted in the independent curriculum, so it is important to learn this model because it has many benefits for students.

Not only the project-based learning model; another study conducted by Puspitasari & Nurhandayani (2023) states that the cooperative learning model type makes a match and has a positive effect on counting ability in children aged 4-5 years. Research conducted by Cardona & Maimunah (2022) also states that the numbered head-together model can develop early childhood cognition in the concept of counting numbers. This shows that the selection of learning models certainly also determines the success of teaching and learning activities in the classroom. It is important to choose the suitable model to develop children's aspects, one of which is to improve children's ability to count, especially in rational counting. Rational counting is the basic thing that needs to be taught from an early age so that children understand the real meaning of numbers and become the basis

for children in further education.

The results of this article show a positive influence between the project-based learning model and rational counting skills in group B children. This can be an alternative for schools or educators when choosing a learning model focusing on counting skills or children's rational counting skills at an early age.

D. Conclusion

It can be concluded that there is an effect of the project-based learning model on the ability of rational counting in group B at Az-Zahrah Islamic Kindergarten Palembang. This is based on the results of the calculation and analysis of the T-test, which obtained a t-count value of 9.71, greater than the t-table of 1.75 so that in this case, H0 is rejected, and Ha is accepted. On observation, it can be seen that children have been able to achieve indicators of rational counting ability; namely, the child mentions the name of the number in order based on his memory, the child points to the object while counting the objects, the child counts the objects in the correct order, the child counts all the objects the teacher points to, and the child can mention the last number as the quantity of the group of objects counted.

Based on the research that has been passed, further research is recommended to redevelop the project-based learning model by comparing other types of activities that focus more on rational counting skills in early childhood.

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