

## The Effect of The Leaf Diary Game on Increasing The Classification Ability of Children Aged 5-6 Years

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### ABSTRACT

**Purpose** – This study aims to examine the effect of using a leaf diary as an educational medium on the classification abilities of children aged 5–6 years. Classification is a fundamental component in the development of early mathematical concepts and cognitive structuring in childhood.

**Design/methods/approach** – The study employed a quantitative research approach with a pretest-posttest design. The research involved expert judgment for content validation and utilized the normalized N-Gain formula to analyze data collected from the classification activities of early learners before and after the intervention. The leaf diary, containing various types of leaves for observation and comparison, was implemented as a central medium during the learning sessions.

**Findings** – The results demonstrated that the use of a leaf diary had a positive effect on the development of children's classification abilities. The N-Gain analysis showed significant improvement in children's ability to categorize and group objects based on observable characteristics. This improvement is attributed to the engaging nature of the leaf diary, which provided children with tangible and relatable learning experiences through direct exploration and observation.

**Research implications/limitations** – While the findings confirm the effectiveness of the leaf diary, the study was limited in scope to short-term outcomes and a single learning topic. Future research is recommended to assess its impact across different domains and with larger sample sizes, including longitudinal studies to measure retention and transfer of skills.

**Originality/value** – This study highlights the pedagogical value of nature-based learning tools, such as the leaf diary, in fostering early classification skills. By connecting learning with the natural environment, the study provides educators with a practical and developmentally appropriate method to support foundational mathematical thinking in early childhood education.

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## Introduction

Early childhood is defined as the developmental phase of children under the age of eight, during which play serves as a central aspect of their daily activities at home and in educational institutions such as kindergarten, PAUD, or RA/BA/TA (Rantikasari, 2021). According to Arini and Fajarwati (2020), children aged 0–6 years experience rapid growth and development, especially in the early years, making this stage critical for foundational learning. As much as 80% of brain development occurs during this period, indicating the importance of providing quality educational stimulation from an early age. Therefore, early childhood education plays a vital role in ensuring the future quality of human resources by facilitating optimal developmental experiences (Yulia et al., 2021).

Based on Government Regulation No. 137 of 2014, early childhood development encompasses six essential domains: religious and moral values, physical-motor skills, cognitive development, language, social-emotional growth, and artistic expression (Arini & Fajarwati, 2020). Among these, cognitive development—particularly mental capacity and early mathematical thinking—is crucial to be nurtured from an early age. Cognitive development enables children to recognize, classify, compare, and connect objects in their environment. Classification ability, in particular, is a foundational concept that helps children understand diversity and unity by grouping objects based on characteristics such as color, size, shape, or type (Ni'mah, 2016; Musdalifah, 2019). Mastery of this skill allows children to store information in long-term memory and link new experiences to prior knowledge, thereby fostering logical and critical thinking abilities.

However, field observations in TK X, located in Lima Kaum District, revealed that many children still struggle with classifying objects based on visual characteristics. Difficulties were observed in distinguishing size, shape, and color, and most children were unable to explain differences between objects. These findings were supported by interviews with teachers who confirmed that many students were not yet able to describe items based on category or type. Research by Arisani (2014) reinforces this observation, indicating that children's limited classification skills are often due to a lack of learning facilities and limited exploration opportunities. Most learning is still teacher-centered, and children are rarely encouraged to investigate materials independently (Zahro Nauli Ramadhan et al., 2018). Moreover, the frequent use of worksheets and lack of varied instructional methods contribute to the stagnation of classification skill development (Hewi & Asnawati, 2020; Marwiyati & Istiningsih, 2020; Siregar et al., 2020). If these challenges persist, they may hinder children's readiness for future academic demands, particularly in science and mathematics.

Despite the recognition of classification as a key cognitive skill, there remains a gap in the use of contextual, nature-based play media to develop this ability. Previous studies have primarily focused on structured indoor activities and rarely explored the integration of local natural materials in early mathematical development. This study addresses that gap by introducing the leaf diary as a creative and contextualized solution to improve classification skills. The novelty of this study lies in utilizing freely available environmental elements—leaves of various shapes and sizes—to promote exploratory learning that blends cognitive, fine motor, and early science and math competencies (Yulia et al., 2021; Zahro Nauli Ramadhan et al., 2018). The leaf diary not only introduces classification through direct observation and manipulation but also supports children's understanding of natural diversity, comparison, and measurement in a fun and meaningful way.

The purpose of this study is to examine the impact of leaf diary activities on the development of science and math skills, particularly classification ability, in children aged 5–6 years. Through open-ended exploration of leaf characteristics, children are expected to develop cognitive frameworks that support scientific thinking and mathematical logic. By promoting child-friendly, nature-based, and play-integrated learning methods, this research contributes to early childhood education practices that support holistic development. The results are expected to offer practical recommendations for educators and parents to incorporate environmentally-based media into daily learning routines, especially in resource-limited contexts.

## Methods

### Research Design

This study employed a quasi-experimental design with a one-group pre-test and post-test approach. This design was selected to measure the effect of a treatment in this case, the implementation of the leaf diary activity on children's classification abilities. The pre-test was conducted before the intervention to assess the initial abilities of the participants, while the post-test measured the outcome after the treatment. This design allows researchers to observe changes within the same group, making it suitable for early childhood educational settings where ethical and logistical concerns often limit the use of control groups.

### Participants and Sampling Technique

The population in this study consisted of all students in TK X, located in Lima Kaum District, totaling 34 children aged 5–6 years. The sample was determined using a quota sampling technique, in which the entire population was included as the research sample. This method ensured that the results reflected the characteristics of the whole group and allowed the researcher to draw conclusions applicable to the entire population in the selected setting. The decision to use the whole population also aligns with the practical nature of educational research in early childhood contexts, where smaller class sizes and accessibility permit total inclusion.

### Data Collection Instruments

Data were collected through an observation sheet developed in alignment with the Standard Level of Child Achievement (STTPA) outlined in Permendikbud Number 137 of 2014 (Kementerian Pendidikan dan Kebudayaan, 2014). The observation sheet was designed to assess classification skills such as grouping objects based on color, shape, and size, as well as the ability to explain the reasoning behind these groupings. The instrument consisted of several indicators that were directly observable during the learning sessions. To ensure content validity, the instrument was reviewed and validated through expert judgment involving professionals in early childhood education and curriculum development.

### Data Analysis Technique

The data collected from the pre-test and post-test observations were analyzed using the normalized N-Gain formula. This method was employed to determine the degree of improvement in classification ability among the children after participating in the leaf diary activities. The N-Gain score reflects the difference in performance between the initial and final assessments, normalized to account for the possible range of

improvement. This formula is widely used in educational intervention research to provide a standardized measure of learning gains. The results of the analysis were interpreted according to the criteria for N-Gain effectiveness, helping to determine whether the leaf diary had a significant impact on the targeted cognitive skill.

## Results and Discussion

### Results

The results of the analysis of the classification ability of children in Al Iqlas Kindergarten before and after the application of the leaf diary game can be seen in the table below.

Table 1. Descriptive Statistical Values of Children's Classification Ability Before and After Application of leaf diaries

Statistics	Pre-Test	Post-test
Sample	34	34
Mean	12,7	18,5
Median	12	18
Standard Deviation	4,25355	3,743563
Variants	18,09269	14,01426
Max	23	24
Min	6	10

Table 1 shows the classification ability of children before and after the implementation of the leaf diary. The overall score divided by the number of students is called the mean or the average value which shows an increase from 12.7 to 18.5. Overall, the minimum score before the application of the leaf diary is 6 and the maximum value is 10. Meanwhile, after the application of the leaf diary, the minimum value is 10 and the maximum value is 24. The range or difference between the maximum and minimum scores is decreased to 14 and the variance or distribution of student scores is obtained from the value of the standard deviation raised to the power of 4.25355 decreased to 3.743563.

Table 2. Normality Test of Children's Classification Ability Data Before and After the Leaf Diary Game is applied

	Pre-test	Pos-test
N	34	34
Significant	0,131	0,108

The table above shows that the significance value obtained from the classification ability data processing both before and after the leaf diary game was applied, it was found that Account  $> 0.05$  both in the pre-test and in the post-test. Count in the pre-test was  $0.131 > 0.05$  while the post-test was  $0.108 > 0.05$ . Both data have a significance value greater than 0.05. So it can be concluded that the two data in the table above are normally distributed. After the data is normally distributed, the next step is to test the homogeneity of the data by using Levene's test. The results of the data homogeneity test are shown in the following table.

Table 3. Results of Homogeneity Test of Children's Classification Ability Data

	F	df	Sig.
Classification Competencies	0,08	66	0,779

Table 3 shows that the significance value obtained from the child's classification ability data is 0.779, which is greater than 0.05. The test analysis results were carried out using the Levene test which is presented in table 3.

Table 4. Results of Research Hypothesis Testing Analysis

	T	Df	Sig.
Classification Competencies	-6.949	66	0.000

Based on the analysis of Table 3, the significance value is obtained, then  $h_0$  is rejected and  $h_1$  is accepted. There is an average difference in the ability to classify children before and after the leaf diary activity, it can be interpreted that there is an effect of the leaf diary game on increasing the child's classification ability.

## DISCUSSION

The results of this study indicate that the use of leaf diaries as a learning medium significantly contributes to the improvement of classification abilities in children aged 5–6 years. The activity of observing, comparing, and grouping various types of leaves helps children understand similarities and differences, which is the foundation of classification. This outcome confirms that the leaf diary is not only engaging and enjoyable but also pedagogically effective. As supported by previous studies, learning media that are physically and visually appealing can enhance the delivery of learning content and facilitate the achievement of educational objectives (Kementerian Pendidikan, 2018).

Media that are concrete, contextual, and close to children's daily environments play a central role in supporting meaningful learning. According to Ramadhan et al. (2018), learning tools that incorporate real-world objects, such as natural materials, help to increase children's curiosity and encourage deeper exploration, leading to richer cognitive experiences. Furthermore, the presence of media as tangible learning aids makes abstract concepts more accessible, enabling early learners to process information using sensory and motor interactions. Learning through direct engagement with real objects is proven to support long-term retention and understanding (Yulia et al., 2021).

The leaf diary fulfills several characteristics of effective early childhood media: it is affordable, accessible, environmentally friendly, and developmentally appropriate. Because the materials come from nature and the child's immediate surroundings, such as school gardens or home environments, children are naturally motivated to explore them. This aligns with the view that cognitive development in early childhood is strongly influenced by direct sensory experiences and environmental exploration (Siregar et al., 2020). Through sensory activities touching, observing, and manipulating leaves children acquire classification skills as they learn to identify patterns, compare sizes, and sort based on shape, color, or texture. This process promotes not only scientific thinking but also supports the development of early mathematical logic (Ni'mah, 2016).

Classification ability itself is a fundamental aspect of early mathematical thinking. It enables children to form basic concepts such as set grouping, sorting, and organizing



objects based on specific attributes. As stated by Musdalifah (2019), the process of classification supports cognitive strategies such as analysis, comparison, and synthesis, which are critical for logical reasoning and problem-solving. Moreover, the act of classifying encourages language development as children explain their thinking and justify the criteria they use. This interaction between cognitive and linguistic domains underlines the multidimensional benefits of classification tasks when supported by appropriate media.

Additionally, learning activities that emphasize classification prepare children for more advanced mathematical skills. Activities such as recognizing patterns, comparing quantities, and understanding relationships between objects are all rooted in the ability to classify. According to Marwiyati and Istiningsih (2020), developing mathematical intelligence from an early age fosters not only academic readiness but also shapes positive learning behaviors, such as persistence, creativity, and self-confidence. In this context, the leaf diary serves not just as a tool for classification but as a holistic medium to nurture early STEM-related competencies through play-based exploration.

The use of leaf diaries also has pedagogical implications for both teachers and parents. For educators, the media serves as an alternative to worksheet-based learning, offering children more active and collaborative experiences. For parents, especially in home learning settings, leaf diaries provide a simple yet effective way to engage children in meaningful and educational outdoor activities. As Arini and Fajarwati (2020) highlight, educational tools that are grounded in local context and allow children to interact with their environment are critical to fostering inclusive and accessible early childhood education.

## Conclusion

Learning is carried out outdoors where around the area there are several banana trees, before using banana frond media, children are introduced to banana trees, including the structure, function and parts of banana trees, and children also learn to recognize the shape and color of banana trees, but previously the teacher has provided materials and tools to be used in learning, which uses fresh banana fronds taken from the tree. After cutting the pattern, continue to string the next patterns, according to the shape that the child wants, the child creates banana fronds of various shapes, such as banana fronds that can cause sounds that children imagine as musical instruments, and like banana fronds formed by lumping horses. This is where the aspects of children's art and creativity are seen in addition to children constructing lumping horses and musical instruments, children play them with high art and creativity not only played and moved but children can while singing and and expressing what the child feels.

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