

Natural based Learning for Early Childhood Cognitive Development

Reni Amiliya
 Post Graduate School
 State University Yogyakarta
 Yogyakarta, Indonesia
 Reni_amiliya.2017@student.uny.ac.id

Harun
 Lecturer
 State University Yogyakarta
 Yogyakarta, Indonesia
 Harun@uny.ac.id

Abstract—The natural environment plays an important role for education especially in early childhood learning. Currently, learning is often used in early childhood learning such as learning group activities, activity angle, area and center. This recent learning almost ignores natural-based learning and tends to lead to intellectualism and verbalism. To address this problem, this study proposes natural-based learning to facilitate child development in order to develop optimally. The effectiveness of nature-based learning is evaluated by designing learning activities conducted by quasi-experimental method to 28 children. Two variables: Natural-based learning and cognitive development. The results show that there is a significant increase in early childhood cognitive development by 53.6%.

Keyword—*natural-based learning, cognitive, early childhood*

I. INTRODUCTION

Natural-based learning emerges as an attempt to challenge learning that tends to be verbalistic. This learning emerges as an indispensable learning model for early childhood education because it offers the concept of the implementation of nature-based learning or back to nature school [1]. Educators need to apply nature-based learning in order to improve the child's development holistically [2], [3], [4], [5]. Through nature-based learning, children gain experience through activities or practices that originate from experiments, observations and exploration. Furthermore, when children play in their natural environment unconsciously get information and experience about the environment through observations they do during activities in the natural environment [6].

In nature-based learning, the lesson plan is emphasized on the making of themes, sub themes and implementation plans of sub theme learning [7]. The theme to be used is a theme that can support natural-based learning. Furthermore, natural-based learning also needs to be managed or programmed in order not to be harmful to children [8]. This is done considering that this learning is conducted in the natural environment.

This study explores natural-based learning for early childhood cognitive development that is foundation of the next level of education. When children master cognitive abilities in early childhood education it will help them in future education levels. The aim is to analyze whether natural-based learning has a positive effect on early childhood cognition.

The rest of this paper is organized as follow: Section II describes the literature review. Section III describes the material and proposed methodology. Section IV presents the obtained result and following by discussion. Finally, Section V concludes this work.

II. LITERATURE REVIEW

This natural-based learning emerges as an attempt to challenge learning that tends to be verbalistic. Natural-based learning was first coined by Lightghart in 1857. This learning presents the form of teaching with real goods [1]. The initial idea of this nature-based learning is the learning process undertaken by encouraging children to learn through the real natural environment around. Learning materials derived from nature are easy to obtain, seen, remembered and easy to put into practice. The form of natural-based learning is learning through the environment around the child.

Through nature-based learning, children can bring active activity in exploring the natural environment such as observing, investigating and studying the environment. The natural environment also draws attention to the child so that the child has a lot of knowledge that comes from nature. A special stimulus of the natural environment is to provide different playing opportunities for children and can hardly be duplicated by indoor learning. The natural environment is described as an open and changing environment and is possible for children to gain freedom, rough movement and contact with natural elements [9]. Then when children play outside, children also benefit from exposure to sunlight, natural elements and fresh weather that are useful for bone development, the immune system becomes strong and physical activity. Some of the most interesting findings of the relationship between child contact with the natural environment is the increase in self pride and sense of being [10]. One example of contact with nature includes gardening that supports an attachment. This experience shapes personal meaning and attachment to the elements of nature, broadening the identity of the participants. In addition, learning with nature also allows one to connect and feel closer to God and motivate to preserve nature as a form of respect for God's creation [11].

Natural-based learning is also an important source of cognitive development such as the ability to play constructively, imagination, collaboration and improve the ability of science,

art, math, language and social [3], [4]. Furthermore, natural-based learning also has a positive influence on environmental behavior [12] and is supported by earlier studies that natural-based activities such as picking, planting or caring for fruits and vegetables enhance a child's pro-environmental stance [13], [14]. This study explains that other factors must also be considered in learning the child's ecological behavior through contact with nature that is about the type of daily exposure of children to nature. However, this study does not explain why different types of natural experiences have different effects on the child's pro-environmental attitudes. In line with the study, other studies have found that nature-based learning can foster caring, respect and respect for others, nature and place [15]. Later, Otto also stated that natural-based learning is also proposed to improve ecological behavior [16]. The results of this study reveal that there is a substantial effect of natural-based learning on ecological behavior. However, the effect depends on the learning offered by the institution. Natural-based learning can focus on promoting natural environmental knowledge about flora, fauna and ecosystems conducted through direct interaction with nature.

III. MATERIAL & METHODOLOGY

This section presents the material used and the proposed methodology.

A. Data

The research type is quantitative with quasi experiment method. The subjects of this research are 28 children, 13 boys and 15 girls. The purpose of this research is to improve cognitive ability of early child. The observation sheet is designed to measure the cognitive abilities of early children before and after treatment. Pre-test and Post-test are conducted to determine the effect of natural-based learning on the cognitive abilities of early child.

Cognitive ability is measured by referring to the level of achievement of cognitive development of children aged 4-5 years listed in the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 137 of 2014 on curriculum 2013 early child education [17] such as: learning and solving problems (knowing objects by function, knowing the concept a lot, creating something with their own ideas, observing and feeling), logical thinking (classifies objects into the same or similar groups, recognizes causal phenomena associated with themselves and classifies objects by function , shape, size or color) and symbolic thinking (counting many things, recognizing the concept of the number symbol, recognizing the symbol of the number).

In this study, the observation sheet is adjusted between the Minister of Education and Culture of the Republic of Indonesia Number 137 of 2014 on the 2013 curriculum with research needs. All items on the questionnaire are measured on a 3-point likert scale in Table I.

TABLE I. COGNITIVE INSTRUMENT FOR CHILDREN OF 4 & 5 YEARS OLD

Aspect	Indicator	Good	Sufficient	Less
Kognitif	Knowing the concept, a lot a bit			
	Knowing the pattern or rules of activity			
	Classifying objects by shape			
	Knowing the pattern (AB-AB or ABC-ABC)			
	Knowing the concept of numbers			
	Knowing the number symbol			
	Spelling out many objects one to ten			

B. Proposed Method

The study used quasi experimental method. Prior to treatment in children aged 4-5 years then first done pre-test to determine the initial cognitive abilities of children. Then the child is treated by applying natural-based learning in the learning process after being given child treatment then it is done post-test again to know the effect of natural-based learning on the cognitive abilities of children.

Assessment criteria obtained through the calculation below:

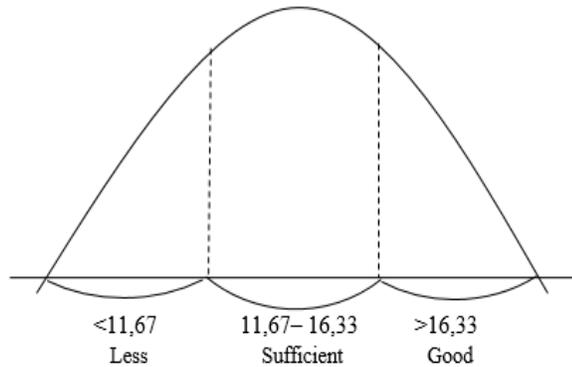
$$\begin{aligned}
 \text{Mean} &= \frac{Nmax + Nmin}{2} + Nmin \\
 &= \frac{21-7}{2} + 7 \\
 &= 7 + 7 \\
 &= 14
 \end{aligned}$$

$$\begin{aligned}
 \text{SD} &= \frac{mean}{6} \\
 &= \frac{14}{6}
 \end{aligned}$$

Good Category => 11.67

Moderate Category = 11.67 - 16.33

Less Category = <11.6



The results are categorized well if > 16.33 is moderate if between $11.67-16.33$ while the results are categorized less if <11.67 .

C. Experimental Design

Prior to nature-based learning, pre-tested the child to determine the child's cognitive abilities beforehand. Then, after the application of natural-based learning model is done back post-test to know the difference of cognitive ability before and after done the treatment. Natural learning based on the embodiment of learning done in the natural environment, using natural media and learning about nature.

This learning is designed by using games done in nature, using natural materials and learning about nature. The game used in this study is the number jump. The game is performed in a natural or outdoor environment. At the planning stage, the teacher creates a starting and finishing line and draws geometric shapes on the ground between the lines. The form is drawn like triangle, circle and square as much as 2 pieces and side by side using wooden or stone branch as a tool to draw it. Master also provides leaves that have been shaped into the same shape. Master also provides a box for storing leaves, planting twigs on the ground and providing mats as a place for after activities game. Implementation of this game is done by competed between 2 groups. In this game, each member of each group has to wait for his friend to finish his game until the finish line and then he plays. The rules in this game is to skip the form according to the teacher's instruction. For example, the teacher gives instructions for the child to jump the 3rd triangle shape, then the child must jump according to the instruction of the teacher. If the child either jumps to another shape or another number, then the child returns to the starting line and enters the created loop and can not follow the game again. The winner of this game is the group with the most members completing the game by entering the finish line. After the game is over, the teacher invites the children to sit on the floor, then the children together calculate the leaf shape that each group gets. Then ask the child to determine the group with the most leaves. Once the group is determined the teacher asks the child to arrange the leaves on the wooden branches that the teacher has plugged in the ground with the order of triangles, circles and squares. It is said to succeed if the child can arrange according to teacher instruction. Successful of this experiment is if there is a

significant difference between cognitive ability before and after treatment and the ability of children has met the standards set forth in the Regulation of the Minister of National Education No. 137 of 2014.

IV. RESULTS AND DISCUSSION

After finding the methodology and procedures for the children of this study, it was found various results and discussion related to natural-based learning on early childhood cognitive development. The results and discussion in this study are presented as follows.

A. Result

In this research, the researcher performs assumption test before doing hypothesis test. Assumption test is done normality test, homogeneity test, linearity test. Test assumptions or hypotheses are used to verify the research hypothesis and Asym results. The sig test reached $p < 0.05$ then this indicates that the hypothesis is accepted [18], Therefore, it is concluded that natural learning can significantly improve the cognitive abilities of early childhood.

Description of Cognitive Development Outcomes: From the research, it is found that the average value of pre-test in children aged 4-5 years of 10.18 then after the natural-based learning obtained post-test value of 17.04 therefore there is a significant change between the cognitive abilities in children before and after the application of natural-based learning.

To find out the test of hypothesis or relationship, the researcher first conducted assumption test in the form of normality test, homogeneity test and linearity test as a requirement in the use of t-test analysis. Normality test is performed to determine whether the distribution of data is normal or not. The results of Normality it is known that the sig value before treatment is 0.078 and the sig value after treatment is 0.128 which means the value of $\text{Sig} > 0,05$ then the data is normally distributed. Homogeneity tests aim to provide confidence that a set of data being manipulated in a series of analyzes comes from populations that are not much different in diversity. The results of Homogeneity it is know that the Asymp sig value was obtained before treatment 0.507 and after treatment 0,568 the value was greater than 0.05. So it can be concluded that both groups are homogeneous or have the same variance. Linearity testing aims to determine whether the data have in line with linear or not (whether the relationship between the variables to be analyzed following a straight line or not). In linearity testing apply the provisions if the deviation $\text{sig} > 0.05$ then the relationship between variables is linear. Conversely, if the deviation $\text{sig} < 0.05$ then the relationship between variables is not linear. Data shows that sig is 0.712, the value is greater than 0.05 ($0.712 > 0.05$) therefore it is concluded that the relationship between variables is linear.

After performing assumption test, the next step is to test the hypothesis. Hypothesis test is performed to see the cognitive development of children aged 4-5 years after being given treatment by applying natural-based learning model, so it is

important to see the relationship between pretest and posttest data like the Table II below:

TABEL II. HYPOTHESIS TEST

		Paired Samples Test					t	df	Sig. (2-tailed)
		Paired Differences			95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Paired	pretest	-	.80343	.15183	-	-	-45.162	7	.000
	posttest	6.85714			7.16868	6.54560			

Provided if the value of $P < 0.05$ then there is a difference between the results of pretest and posttest. And if $P > 0,05$ then there is no difference between pretest and posttest result. Based on the table above shows the average difference of 6.86 and the value of P (2 tailed) of 0,000 means the value of sig $< 0,05$ so it is concluded that there is difference of value after treatment and experiencing a significant improvement and indicate that there is difference between pretest result and posttest. As for the comparison of recapitulation of pretest-posttest result can be seen in Table III below:

TABLE III. PRETEST-POSTTEST TABLE

Category	Category	Score Rank	Pretest		Posttest	
			F	%	F	%
Good	66,7%-100%	>16,33	0	0	15	53,57%
Moderate	33,4%-66,6%	11,67-16,33	7	25%	13	46,43%
Less	0,5% - 33,3%	<11,67	21	75%	0	0

Table III shows that all children experience improvement in the first cognitive development: this can be seen in children who are in either 0% to 53.57% category, 25% to 46.43% and less than 75% to 0%. The description of the comparison results before and after the treatment can be seen in the following Figure 1:

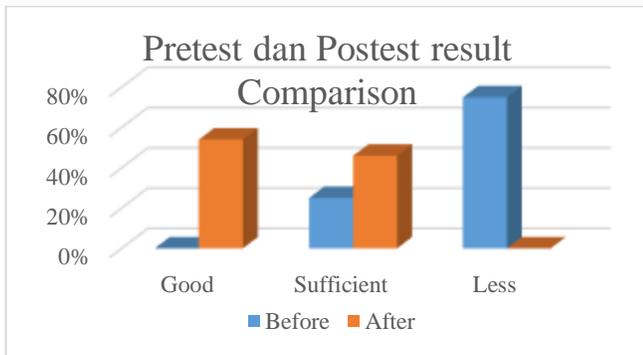


Fig 1. Before and after natural-based learning comparison

By comparison before and after it is known that all children experience an increase in cognitive development. This means that natural-based learning significantly affects the child's cognitive development.

B. Discussion

This study applied nature-based learning to improve the cognitive abilities of children because this learning is believed to be able to optimize all aspects of development in early childhood. The pretest results show that 75% of children are in the less category and no children are in either category. Supposed children 4-5 years old already have good cognitive knowledge in accordance with indicators of the level of achievement of child development in the regulation of minister of education number 137 of 2014. Various factors both internal and external causes of low cognitive child.

After the observation that causes the low cognitive child is the process of implementation in learning that tend to be verbalistic and rarely use the natural environment. Then, researchers apply nature-based learning as a fun learning model, the child as an active learner and performed by playing. This study involved 2 kindergarten teachers, treatments were done 4 times to prove that natural-based learning can improve children's cognitive. The results showed that cognitive children increased significantly to 53.57% in good category. Within a period of 1 month, this research is said to be successful because it improves cognitive development of children. Besides being a fun learning and a child as an active learner, a quiet child becomes accustomed to socializing with his teachers, friends and the environment.

V. CONCLUSION

This study investigates the effect of natural-based learning to improve cognitive abilities of early childhood. The results of experimental studies show that natural-based learning significantly affects cognitive abilities in early childhood. The purpose of learning is not only to develop cognitive ability but also prosocial attitude and sense of responsibility towards nature. Learning by nature-based learning methods is very necessary in early childhood education because children are in nature, children will have many opportunities in developing their prosocial behavior such as caring and empathy for animals and plants. Direct experience with nature can provoke curiosity and questions about plants, animals, places and elements facing children [19]. With learning in nature, it will be a program that serves to strengthen or enhance a sense of responsibility and attitude of children to the natural environment [20]. Thus the child will be the next generation who is not only intellectually intelligent but also able to help the community to preserve nature and further survival.

ACKNOWLEDGEMENT

Thank you to the beloved campus State University Yogyakarta especially Postgraduate Program that is very helpful and support in the completion of this article. Not forgetting a thank you to the supervisor, Mr Harun who has guided the author in completing this article. Last, gratitude is also always

devoted author of this article for both parents who always support and be inspiration in everything.

REFERENCES

- [1] Tim Pengembang Kurikulum. (2008). *Model Pembelajaran Berbasis Alam Pendidikan Anak Usia Dini Formal dan Nonformal*. Jakarta: Badan Penelitian Dan Pengembangan Pendidikan Departemen Pendidikan Nasional.
- [2] Asah, S. T., Bengston, D. N., & Westphal, L. M. (2012). The Influence of Childhood: Operational Pathways to Adulthood Participation in Nature-Based Activities. *Environment and Behavior*, 44(4), 545–569. <https://doi.org/10.1177/0013916510397757>
- [3] Carter, D. (2016). A Nature-Based Social-Emotional Approach to Supporting Young Children’s Holistic Development in Classrooms With and Without Walls: The Social-Emotional and Environmental Education Development (SEED) Framework. *The International Journal of Early Childhood Environmental Education International Journal of Early Childhood Environmental Education*, 4(1), 9–24.
- [4] Cooper, A. (2015). Nature and the Outdoor Learning Environment: The Forgotten Resource in Early Childhood Education. *International Journal of Early Childhood Environmental Education*, 3(31), 85–97.
- [5] Ernst, J. (2014). Early childhood educators’ preferences and perceptions regarding outdoor settings as learning environments. *International Journal of Early Childhood Environmental Education*, 2(1), 97–125.
- [6] Acar, H. (2014). Learning Environments for Children in Outdoor Spaces. *Procedia - Social and Behavioral Sciences*, 141, 846–853.
- [7] Wulansari, B. Y. (2016). *Jurnal Pendidikan dan Pemberdayaan Masyarakat*, 3, 16–27.
- [8] Burke, R. S. (2014). Taming the Wild: Approaches to Nature in Japanese Early Childhood Education. *International Journal of Early Childhood Environmental Education*, 2(1), 76–96.
- [9] Bento, G., & Dias, G. (2017). The importance of outdoor play for young children’s healthy development. *Porto Biomedical Journal*, 2(5), 157–160. <https://doi.org/10.1016/j.pbj.2017.03.003>
- [10] Taylor, A. F., Kuo, F. E., Spencer, C., & Blades, M. (2006). Is contact with nature important for healthy child development? State of the evidence. *Children and Their Environments: Learning, Using and Designing Spaces*, 124–139.
- [11] Kunchambo, V., Lee, C. K. C., & Brace-Govan, J. (2017). Nature as extended-self: Sacred nature relationship and implications for responsible consumption behavior. *Journal of Business Research*, 74, 126–132.
- [12] Collado, S., Corraliza, J. A., Staats, H., & Ruíz, M. (2015). Effect of frequency and mode of contact with nature on children’s self-reported ecological behaviors. *Journal of Environmental Psychology*, 41, 65–73.
- [13] Lohr, V. I., & Pearson-Mims, C. H. (2005). Children’s active and passive interactions with plants influence their attitudes and actions toward trees and gardening as adults. *HortTechnology*, 15(3), 472–476.
- [14] Wells, N. M. (2000). At home with nature: Effects of “greenness” on children’s cognitive functioning. *Environment and Behavior*, 32(6), 775–795.
- [15] Coe, H. (2016). From Excuses to Encouragements: Confronting and Overcoming the Barriers to Early Childhood Outdoor Learning in Canadian Schools. *Journal of Childhood Studies*, 41(1), 5.
- [16] Otto, S., & Pensini, P. (2017). Nature-based environmental education of children: Environmental knowledge and connectedness to nature, together, are related to ecological behaviour. *Global Environmental Change*, 47, 88–94.
- [17] Kementerian Pendidikan dan Kebudayaan. (2014). Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia. *Peraturan Menteri Pendidikan Dan Kebudayaan Nomor 137 Tahun 2014, Tentang Standar Nasional Pendidikan Anak Usia Dini*.
- [18] Wei, C.-W., Chen, H.-H., & Chen, N.-S. (2015). Effects of Embodiment-Based Learning on Perceived Cooperation Process and Social Flow. *Procedia - Social and Behavioral Sciences*, 197, 608–613.
- [19] Acar, I., & Torquati, J. (2015). The power of nature: Developing prosocial behavior toward nature and peers through nature-based activities. *YC Young Children*, 70(5), 62–71.
- [20] Ewert, A., Place, G., & Sibthorp, J. (2005). Early-life outdoor experiences and an individual’s environmental attitudes. *Leisure Sciences*, 27(3), 225–239.