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The use of an open-ended learning approach on the ability to recognize the concept of numbers: Its effectiveness for children 4-5 years old

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Abstract

The formation of numerical concepts is a critical stage in early childhood development. Understanding numbers lays the groundwork for future mathematical abilities and academic success. This study aims to investigate the effect of an open-ended learning strategy on the capacity of 4-5-year-old children to recognize number concepts. To reach the research goal, a quantitative approach was used, along with experimental methodologies. The study participants were children aged 4-5 years old, and data was collected via total sampling. The experimental group was taught using an open-ended learning technique, while the control group followed a traditional structured teaching method. Pre-and post-tests were used to examine the children's ability to recognize number concepts. Statistical analysis, including t-tests, was used to compare the performance of the experimental and control groups. The results of this study show that using an open-ended learning strategy improves the capacity of 4-5-year-old children to recognize number concepts. In comparison to traditional structured teaching method, the open-ended approach stimulates active inquiry, independent thinking, and problem-solving, which improves children's cognitive development with regard to numerical concepts. This study suggests that open-ended learning techniques are excellent educational strategies for developing number concept identification in young children. This study's findings have ramifications for early childhood educators and curriculum makers. This study stresses the necessity of implementing such tactics in educational settings by demonstrating the benefits of an open-ended learning strategy in developing number concept awareness. Open-ended learning techniques can improve children's mathematics ability while also contributing to their general cognitive development. Furthermore, these findings may motivate additional study and inquiry into the use of open-ended learning approaches in various domains of early childhood education, increasing our understanding of successful teaching strategies for young children.

Keywords: Childhood, The Ability To Recognize The Concept of Numbers, The Open-Ended

INTRODUCTION

Every nation should pay attention to early childhood education since children are the nation's future leaders and heirs (Devi, 2020; Komalasari, 2016; Nurlaila et al., 2022; Warmansyah and Nirwana, 2023). Students' preparation for future schooling is greatly influenced by their education (Amalina, 2020;Wulandari et al., 2020; Wulandani et al., 2022; Yuningsih et al., 2022). The preschool years, or early childhood, are a crucial time for children to reach their full potential (Yahya et al., 2021; Idris et al., 2022; Nuha and Munawaroh, 2022; Warmansyah et al., 2023).

Children enter a prime learning period between the ages of 4-5 (Mulyana et al., 2022;Mulyati and Sisrazeni, 2022; Priyanti and Warmansyah, 2021). Cognitive development is one of the areas that has to be developed in early childhood education (Finch et al., 2016;Sari et al., 2022; Zhou et al., 2012). Cognitive development describes a child's capacity for critical thought, learning, comprehension of their environment and its conditions, memory stimulation, and the solution of straightforward tasks (Kontribusi et al., n.d.; Komala et al., 2020)

There are six areas of early childhood development, and each should advance depending on the child's age: moral and religious growth comes first, followed by cognitive development, socio-emotional development, physical and motor development, language development, and creative development (Safitri et al., 2023; Warmansyah, Faradila, et al., 2022; Wulandani et al., 2022). This description makes it clear that cognitive development, which involves a child's capacity for problem-solving, the development of critical thinking abilities, the acquisition of spatial and temporal knowledge, and the enhancement of logical thinking, is one aspect of early childhood development (Astuti et al., 2020; Warmansyah, Amalina, and Febriyani, 2022).

Early childhood cognitive development may be observed in numerous phases, including thinking with realistic things, symbolic thinking, and systematic thinking. Symbols such as letters and numbers help children learn (Authar et al., 2021; Fidyaningrum et al., 2021). This cognitive growth, known as the golden era of children (Karim and Wifroh, 2014), may be fostered from an early age. Children may identify and employ these symbols in their daily life throughout this time (Of et al., 2021). Letters and numbers are used as symbols in cognitive development (Oktaviana et al., 2021; Warmansyah and Nirwana, 2023). The idea of numbers is an example of a numerical symbol, as numbers represent symbols (Rohmalina et al., 2020;Wahyuni et al., 2021). Teaching children about numbers in early childhood education is an important aspect of cognitive development. It aids children in their understanding of numbers (Mualim and Saputra, 2021; Warmansyah et al., 2021).

The goal of early childhood cognitive development is to improve children's thinking skills in learning acquisition, give multiple problem-solving options, and build mathematical logic and awareness of space and time. Furthermore, youngsters are taught to classify, categorize, and think precisely (Amylia and Setyowati, 2014; Laela et al., 2023). The notion of numbers is taught in kindergarten as part of mathematics education. Its goal is to help youngsters develop their arithmetic abilities, which are important in their everyday lives and serve as a basis for higher education (Safitri et al., 2023; Sumardi et al., 20177).

One of the triggers that may be produced while teaching youngsters the notion of numbers is through pleasurable play activities. These activities can pique children's attention and help them grow cognitively (Metafisika et al., 2022; Nisak et al., 2022; Rahman, Fuadatun, et al., 2017). The capacity to comprehend numerical ideas seeks to assist youngsters in understanding numbers and performing addition and subtraction, all of which are critical for their transition to primary school (Hayati and Fitri, 2016; Khamidah and Sholichah, 2022). Introducing youngsters to the notion of numbers is intended to help them grasp other mathematical concepts in higher-level learning (Jelita et al., 2022; Nur et al., 2020). A crucial mathematical idea that prepares children for early numeracy abilities and future educational advancement is familiarizing them with number symbols (Devi, 2020).

Common problems with children's understanding of the notion of numbers include a lack of knowledge of the concept itself as well as a lack of supportive learning tools to help youngsters grasp the concept of numbers (Khadijah, 2016). Inadequately appropriate teaching approaches that support the process of number concept recognition, as well as a lack of adequate resources and facilities to assist children in understanding number concepts, contribute to the difficulties that teachers face when teaching number concepts due to a lack of training in introducing number concepts to children (Astuti et al., 2020).

These findings are consistent with early observations obtained on August 3, 2022, at TK Pertiwi Kec, Lima Kaum, and Kab Tanah Datar, where there were significant concerns with Group A children's mastery of number concept recognition. A sample of eight children was chosen from a total population of eight, demonstrating that six children were unable to recognize number symbols, particularly digits 1-10. Six youngsters also revealed a lack of capacity to compare magnitudes of numbers, notably when discriminating between conceptions of length and shortness.

Preschools are not permitted to provide direct literacy instruction, according to the Minister of National Education's circular letter No. 1839/C.C2/Tu/2009; instead, learning should be planned within the framework of developing all aspects of a child's development through play-based approaches tailored to their developmental needs (Wulandari et al., 2020). Given the aforementioned challenges, proper stimulation is required to enable successful learning for youngsters. Using a variety of techniques, instructional methods, and learning material helps pique children's interest in mathematics. The open-ended method is one technique that may be explored in mathematics education (Liwis et al., 2017).

The open-ended style of education entails giving mathematical problems to students in an open-ended way, pushing them to give alternative solution techniques (Faridah, Aeni, et al., 2016). Beyond providing many solution possibilities, the core of open-endedness is allowing students to solve issues in their own way while still arriving at accurate solutions (Rohmalina et al., 2020). Open-ended methods to mathematics teaching can evoke a broader range of responses. Students engage in critical thinking and active engagement in the learning process when they participate in open-ended learning. Open-ended learning allows pupils to think creatively and rationally (Rudyanto, 2016).

Open-ended methods provide issues with several valid answers, allowing children to investigate, recognize, and solve difficulties using a variety of strategies. This develops children's reasoning skills, allowing them to think clearly and critically (Habiddin et al., 2022; Zubaidah, 2018). Previous research found that utilizing an open-ended strategy to introduce the notion of numbers to students in Madrasah helped students to examine and completely comprehend the provided challenges. This method allowed pupils to tackle issues in a creative and critical manner. Based on these findings, the researcher chose to use the open-ended method in early childhood education, especially teaching number symbol identification as part of young children's mathematics classes.

Because the open-ended method produces results that can stimulate children's mathematical abilities, researchers are attempting to use it to stimulate mathematical skills in early childhood, as one of the stimulated abilities is the ability to solve problems with correct and accurate answers. The open-ended method improves the capacity to comprehend the notion of numbers in early infancy by effectively and suitably stimulating the ability to answer problems correctly (Musdalifah et al., 2016). While previous research has generally supported the positive impact of an open-ended learning approach on creative and critical thinking, our study focuses on a particular and crucial aspect of young children's mathematical development. This distinction and the added value of our research will be further explained. We focus on learning number symbols, which are the foundation for numeracy abilities such as addition, subtraction, and more complex mathematical ideas. Unlike previous, more generalized studies into the advantages of open-ended learning, our research focuses on number symbols as a crucial part of early numeracy.

The study that is being presented here sets itself apart by examining the possibilities of an

open-ended learning strategy to solve young children's difficulty recognizing number symbols. This study, in contrast to earlier research, focuses on the use of open-ended learning strategies to encourage critical and creative thinking in the context of teaching number symbol recognition in early mathematics education. By providing a fresh method to enhance young children's numeracy abilities, the suggested research aims to close the gap in present educational approaches. As a result, the purpose of this study is to assess the influence of the open-ended learning approach on the capacity to recognize numbers and symbols in the context of mathematics education, which should begin at a young age.

METHOD

The one-group pretest-posttest design was used in this study as a pre-experimental research method. The study was done at the TK Pertiwi facility in Tanah Datar Regency. A class was chosen at random using a lottery technique like the sampling strategy used in this study, which used simple random sampling. Eight children aged 4-5 from the chosen class made up the experimental group.

Table 1. Research Design

Group	Pretest	Treatment	Posttest
Eksperimen	O1	X	O2

The open-ended learning strategy was used in the study to see how it affected students' comprehension of number concepts. The phases of the research process were as follows:

Selection of Participants:

Using the Simple Random Sampling method, a class from TK Pertiwi was randomly selected as a participant. With eight youngsters between the ages of 4-5, the chosen class served as the experimental group.

Pretest Assessment:

An assessment of the children's initial capacity to recognize number concepts was conducted prior to the implementation of the open-ended learning technique. The objective of this examination was to create a baseline to contrast with the posttest results.

Implementation of the Open-Ended Learning Approach:

Open-ended learning was the method of instruction used with the experimental group. This method promoted active investigation, critical thinking, and issue-solving involving mathematical principles. The kids participated in a variety of activities and learned through the use of various tools, resources, and materials.

Posttest Assessment:

To gauge the students' increased comprehension of numerical concepts following the adoption of the open-ended learning strategy, a posttest was administered. The goal of the posttest was to assess how the open-ended learning strategy affected their learning results. While the open-ended learning strategy was being used, observations were conducted to compile information on the students' participation, engagement, and advancement in understanding number concepts. To rigorously track and evaluate their performance, a checklist was used.

Data Analysis:

To ascertain the efficacy of the open-ended learning approach, data from the pretest, posttest, and observations were gathered. To gauge the pupils' knowledge of numerical concepts, statistical analysis, such as comparing pre- and post-test results, was carried out. The t-test is used to examine the test for measuring the ability to recognize the concepts of numbers. A normality and homogeneity test is done on the data group before the t-test. The study used these techniques in order to look at how the open-ended learning strategy affected the students' comprehension of numerical concepts. A thorough evaluation of the children's initial capacity to recognize number concepts and their

involvement in the open-ended learning approach was possible thanks to the use of a pretest-and-posttest design and observers.

RESULT

Tests were used to get the research findings. The data collection included a total of six tests, with the first serving as a pretest to examine the participants' baseline level before to treatment. Following this, four treatments sessions were held to assess the children's progress in identifying number concepts. Finally, a posttest was administered to see whether the children's ability to recognize the concepts of numbers had improved since the original test and treatment sessions.

The data in this study is normally distributed. The normality test determines whether or not the data for each variable is regularly distributed. Shapiro-Wilk is the formula utilized. The capacity to understand the notion of children's numbers is projected to improve with the use of statistical data management computer software, SPSS version 22. The normalcy test results are displayed in the table below:

Table 2. Shows the Results of Hypothesis Testing Data on Children's Number Recognition Ability.

Tests of Normality						
Class	Kolmogorov-Smirnov [a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Pretest	.352	8	.006	.796	8	.056
Postest	.205	8	.200*	.931	8	.522
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

The data utilized is normally distributed, based on the normality test findings from the pretest and posttest (Kolmogorov-Smirnov or Shapiro-Wilk). The pre-test results were 0.811, which means 0.056 > 0.05. Meanwhile, the posttest results yielded a value of 0.800, indicating that 0.522 > 0.05. As a result, the data is normally distributed. This study investigated assumptions and used normally distributed data in addition to homogeneity-distributed data. SPSS was used by the researchers to locate data with a homogenous distribution. This is seen in the table below about the homogeneity test.

Table 3. Data from the Homogeneity Test

Test of Homogeneity of Variances			
Levene Statistic	df1	df2	Sig.
8.463	1	14	.063

The results of the homogeneity test, which is based on the normality test, indicate that the data used follows a uniform distribution. The obtained significance level is 0.063, which is greater than the significance threshold of 0.05, demonstrating that the data is indeed homogenous. Furthermore, research was undertaken to assess the hypothesis. This hypothesis is considered provisional since the new responses are rooted in empirical data collected for the purpose of examination. Subsequent to obtaining the treatment outcomes, the next step involves evaluating the treatment data through statistical tests to determine whether the improvement in the ability to comprehend the concept of numbers in 4-5-year-old children, facilitated by an open-ended intervention, is statistically significant.

Hypothesis testing is carried out after the treatment outcomes. The subsequent phase is to analyze the data from the intervention using statistical tests to assess the extent of improvement in children's understanding of numerical concepts through an open-ended learning approach. In this context, the t-test analysis is performed as outlined in the table below:

Table 4. Testing the Truth of the Alternative Hypothesis (Hα)

Code	Pretest	Postest	D	D*
AR	27	49	22	484
RR	33	48	15	225
FR	24	48	24	576
AL	26	50	24	576
KM	26	48	22	484
VH	35	49	14	196
RA	27	47	20	400
RS	26	49	23	529
	Count		164	3470

The next step involves interpreting the t-value, which begins by considering the degrees of freedom (df) or dB, where df = N-1 = 8-1 = 7. By comparing the magnitude of the obtained t-value, which is t = 15.19, with the critical t-value at a significance level of 1%, denoted as tt 1% = 3.106, it becomes evident that the t-value is more significant than the critical value, i.e., 15.19 > 3.106. This leads to the acceptance of the alternative hypothesis, indicating that the open-ended learning approach has an impact on the ability of 4-5-year-old children to comprehend number concepts. Consequently, there appears to be a substantial difference within the sample group between the pre-test and post-test.

DISCUSSION

The present study aligns with a number of previous research findings concerning the efficacy of the open-ended learning strategy in fostering children's understanding of numerical concepts. The advantages of the open-ended approach in encouraging students' critical and creative thinking have been repeatedly shown by earlier research (Rudyanto, 2016). This is in line with the main goal of our research, which is to evaluate how early mathematics instruction affects children's capacity to recognize numbers and symbols through open-ended learning.

The use of the Open-Ended approach to learning can help youngsters comprehend numerical concepts. This is because children can solve issues in an open-ended way, as indicated by their capacity to respond to presented difficulties (Sumardi et al., 2017). The ability to understand number concepts in children can be developed and trained through an open-ended learning approach. In the upcoming learning activities, it is advisable to use an engaging and enjoyable approach that involves children directly in learning number concepts with the open-c approach (Nur et al., 2020). The ability to understand number concepts can be defined as a child's ability to recognize numbers, count, order numbers, and connect numbers to objects (Astuti et al., 2020).

The open-ended learning approach directs children to solve problems openly and find solutions to the given problems. This approach presents problems and encourages problem-solving through various methods with diverse solutions or alternatives (Faridah, Aeni, et al., 2016). The open-ended approach is a teaching method in which the teacher creates problem situations and conditions for students, and the solutions to these problems can be obtained through various methods.

Learning with the open-ended approach can stimulate students' mathematical abilities, and researchers have attempted to apply the open-ended approach to stimulate early childhood mathematical abilities, as one of the stimulated abilities is problem-solving (Delyana, 2015). Through effective and appropriate problem-solving stimulation, the open-ended approach significantly influences early childhood's understanding of number concepts (Wulandari et al., 2020).

In prior research observed that the utilization of an open-ended learning approach in students at Madrasah Ibtidaiyah Munawarah Kota Jambi contributed to a profound exploration of existing issues, leading to the development of critical and creative problem-solving skills. Rudyanto's study in (2016) also affirmed that this approach has the potential to boost the creative and critical thinking capabilities of children. Based on the results of this study, researchers attempted to apply the open-ended learning approach in early childhood education, particularly in the understanding of number symbols as part

of mathematics lessons for young children.

Previous research found that open-ended method can stimulate children's mathematical abilities (Mulyana et al., 2022),. Therefore, researchers have attempted to apply the open-ended approach to stimulate early childhood mathematical abilities, as one of the stimulated abilities is the ability to solve problems with correct and accurate answers (Rohmalina et al., 2020).

In conclusion, our study supports other research by emphasizing the beneficial effects of an open-ended learning strategy on kids' cognitive development, especially in the areas of critical and creative thinking. Nevertheless, by focusing on the particular field of number symbol recognition and conducting the research in the distinctive setting of early childhood education in Indonesia, our study goes beyond these broad conclusions. By doing this, we hope to offer a more focused and contextually appropriate analysis that clarifies the suitability and efficacy of the open-ended approach in a particular educational setting. This, in turn, contributes to a more thorough understanding of early childhood education techniques by adding depth and specificity to the body of current knowledge.

LIMITATION

One limitation of this study is the extremely limited sample size, and this constraint could potentially hinder the applicability of the results to a broader population. Furthermore, the study was done in a specific educational setting, which may have altered the outcomes due to cultural and contextual variables. The reliance on a pretest-posttest methodology, as well as the lack of long-term follow-up evaluations, limit the capacity to analyze the long-term impact of the open-ended learning strategy. Furthermore, the study focused primarily on number concept recognition and did not include a control or comparison group. These limitations underscore the need for further research with bigger and more varied samples, consideration of multiple educational contexts, and a more comprehensive assessment of the impact of the open-ended learning strategy on many elements of learning.

IMPLICATION AND CONCLUSION

This work has implications for future research attempts since it lays the path for further examination of open-ended learning methodologies in several areas of early childhood education. Future research can continue to improve educational practices and contribute to the optimum development of children in their early years by improving our understanding of successful teaching approaches for young children. The study's findings have important significance for early childhood educators and curriculum makers. This study underscores the necessity of adopting such techniques in educational settings by demonstrating the favorable impacts of employing an open-ended learning strategy on the identification of number concepts in young children. The use of open-ended learning strategies promotes active inquiry, independent thinking, and problem solving while also improving cognitive growth in connection to numerical ideas.

AUTHOR CONTRIBUTION STATEMENT

The authors' roles in this study are outlined as follows: J.W. conceived the research idea and designed the study. F.A. and N.H. formulated the theoretical framework. R.Y. and M.S. ensured the appropriateness of the analytical methods employed in the research. A.M. carried out the data analysis and its interpretation. W.T.U. provided guidance and oversight throughout the research process. All authors actively engaged in discussions regarding the results and made substantial contributions to the final manuscript.

DECLARATION

The authors confirm that they have no associations or involvement with any organization or entity that has a financial interest (such as payments, grants for education, participation in speakers' events, employment, consultancy, stock ownership, or other financial interests, as well as expert testimony or patent licensing arrangements) or non-financial interests (like personal or professional relationships, affiliations, knowledge, or beliefs) in relation to the subject matter or materials discussed

in this manuscript.

DATA AVAILABILITY

The dataset produced and/or analyzed during the present study can be obtained from the corresponding author upon reasonable request.

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REFERENCES

Amalina, A. (2020). Pembelajaran matematika anak usia dini di masa pandemi covid-19 tahun 2020. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *5*(1), 538–548.

Amylia, L. R., & Setyowati, S. (2014). Pengaruh outdoor learning terhadap kemampuan mengenal konsep bilangan anak kelompok a di tk tunas harapan menongo sukodadi. *Paud Teratai*, *3*(3), 1–10.

Astuti, E. M., Novianti, R., & Febrialismanto, F. (2020). Meningkatkan kemampuan mengenal konsep bilangan melalui media animals manipulatife lotto pada anak usia 5-6 tahun di tk alfarizky kids kabupaten kampar. *Jurnal Review Pendidikan dan Pengajaran (JRPP)*, *3*(1), 97–107.

Authar, N., Muflihah, T., Fidyaningrum, S. A., Hardiana, A. S., Azizah, A., & Ramadhani, D. (2021). Improving vocabulary mastery through the traditional game "engklek" for children in kalijaten village, kec. taman, kab. sidoarjo. *Child Education Journal*, *3*(2), 92–99.

Delyana, H. (2015). Peningkatan kemampuan pemecahan masalah matematika siswa kelas vii melalui penerapan pendekatan open ended. *lemma*, *2*(1), 144859.

Devi, N. M. I. A. (2020). Pengembangan media pembelajaran puzzle angka untuk meningkatkan kemampuan mengenal lambang bilangan. *Jurnal Ilmiah Pendidikan Profesi Guru*, *3*(3), 416–426.

Faridah, N., Aeni, A. N., et al. (2016). Pendekatan open-ended untuk meningkatkan kemampuan berpikir kreatif matematis dan kepercayaan diri siswa. *Jurnal pena ilmiah*, *1*(1), 1061–1070.

Fidyaningrum, S. A., Dewayanti, S. A., & Authar, N. (2021). Improving young learners' vocabulary mastery through game-based learning using "mofin mystery box". *Child Education Journal*, *3*(2), 129–136.

Finch, J. E., Obradovic, J., & Yousafzai, A. (2016). Home environment quality mediates the effects of an early intervention on children's social-emotional development in rural pakistan. *Society for Research on Educational Effectiveness*.

Habiddin, H., Ashar, M., Hamdan, A., & Nasir, K. R. (2022). Digital comic media for teaching secondary school science. *International Journal of Interactive Mobile Technologies (IJIM)*, *16*(03), 159–166.

Hayati, N., & Fitri, R. (2016). Meningkatkan kemampuan mengenal konsep bilangan melalui bermain bombik modifikasi pada anak kelompok bermain. *Jurnal PAUD teratai*, *5*(3), 1–5.

Idris, T., Wita, A., Rahmi, E., & Warmansyah, J. (2022). Ablution skills in early childhood: The effect of big book media. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *6*(6), 5549–5557.

Jelita, J., Syarfina, S., & Fadhila, N. (2022). Plant puzzle: How to apply it to increase children's interest in learning science? *Child Education Journal*, *4*(1), 50–60.

Karim, M. B., & Wifroh, S. H. (2014). Meningkatkan perkembangan kognitif pada anak usia dini melalui alat permainan edukatif. *Jurnal PG-PAUD Trunojoyo: Jurnal Pendidikan dan Pembelajaran Anak Usia Dini*, *1*(2), 103–113.

Khadijah, K. (2016). Perkembangan kognitif anak usia dini.

Khamidah, A., & Sholichah, N. I. (2022). Digital pop up learning media for early childhood cognitive development. *Indonesian Journal of Early Childhood Educational Research (IJECER)*, *1*(1), 11–19.

Komala, K., et al. (2020). Meningkatkan kemampuan pemahaman konsep bilangan anak usia dini kelompok b melalui metode open ended. *Tunas Siliwangi: Jurnal Program Studi Pendidikan Guru PAUD STKIP Siliwangi Bandung*, *6*(2), 105–110.

Komalasari, E. (2016). Skill-based curriculum development to prevent the violence against children. *Indonesian Journal of Islamic Early Childhood Education*, *1*(1), 101–108.

Kontribusi, q., Menjawab, P., Multidimensional, T., Ekologi Di Indonesia, K., Sutarno, Kristiyanto, A., Pd, M., Dwi, P., Setter, Layouter, Mokhamad, N., Zaman, S., Si, Candra, D., Penerbit, P., Prasetyo, A., Wisnu, W., Hum, M., Rifki, S., & Pt, E. (n.d.). *Prosiding webinar nasional iv pascasarjana dalam rangka dies natalis uns ke 44 tahun 2020*. https://pasca.uns.ac.id/hima/wp-content/uploads/sites/47/2020/07/Fullpaper-e-Prosiding-Pascasarjana-UNS-2020_compressed_opt.pdf

Laela, M. N., Ashari, F. A., Nurcahyani, L. D., Rusmilawati, N., & Ishak, Z. B. (2023). Development of ape jemari keahlian to develop cognitive abilities in children 4-5 years old. *Indonesian Journal of Early Childhood Educational Research*, *1*(2), 97–106.

Liwis, N. W. N., et al. (2017). Pengaruh model pembelajaran matematika realistik terhadap kemampuan mengenal konsep bilangan pada anak kelompok a taman kanak-kanak gugus v kecamatan buleleng gugus v kecamatan buleleng tahun ajaran 2016/2017. *Jurnal Pendidikan Anak Usia Dini Undiksha*, *5*(1), 116–126.

Metafisika, K., Azizah, R. N., & Fitriyah, F. K. (2022). The development process of islamic steam activity storybooks for early childhood. *Child Education Journal*, *4*(1), 1–12.

Mualim, R., & Saputra, M. F. (2021). Optimizing online learning during covid 19 pandemic in junior high school. *Journal of Islamic Education Students*, *1*(1), 19–27.
Mulyana, F. A. P., Nandiyanto, A. B. D., & Kurniawan, T. (2022). E-learning media for the ability to recognize and count numbers in kindergarten students. *International Journal of Research and Applied Technology (INJURATECH)*, *2*(1), 151–157.
Mulyati, S., & Sisrazeni, S. (2022). The relationship between stressful study and students' sleep pattern during covid-19 pandemic. *Journal Of Islamic Education Students*, *2*(1), 21–30.
Musdalifah, M., Antara, P. A., & Magta, M. (2016). Pengaruh permainan congklak bali terhadap kemampuan mengenal konsep bilangan pada anak kelompok b di ra baitul mutaallim tegalinggah tahun ajaran 2015/2016. *Jurnal Pendidikan Anak Usia Dini Undiksha*, *4*(2).
Nisak, F. F., Munawaroh, H., & Abbas, S. (2022). The effect of "kids moderations" interactive multimedia on religious moderation attitudes in early childhood. *Indonesian Journal of Early Childhood Educational Research (IJECER)*, *1*(1), 38–47.
Nuha, A. U., & Munawaroh, H. (2022). Effectiveness of rural youth tutoring activity in increasing children's learning motivation in pandemic era. *Indonesian Journal of Early Childhood Educational Research (IJECER)*, *1*(1), 20–28.
Nur, L., Hafina, A., & Rusmana, N. (2020). Kemampuan kognitif anak usia dini dalam pembelajaran akuatik. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, *10*(1), 42–50.
Nurlaila, N., Khairowati, R., Komalasari, E., Fitriani, W., & Kamaluddin, K. (2022). Developing animated video using sparkol videoscribe to optimize listening skills of children. *AIP Conference Proceedings*, *2524*(1).
Oktaviana, W., Warmansyah, J., & Trimelia Utami, W. (2021). The effectiveness of using big book media on early reading skills in 5-6 years old. *Al-Athfal: Jurnal Pendidikan Anak*, 7(2), 157–166.
Priyanti, N., & Warmansyah, J. (2021). Improving critical thinking skills of early childhood through inquiry learning method. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *5*(2), 2241–2249.
Rahman, T., Fuadatun, F., et al. (2017). Peningkatan kemampuan anak usia dini mengenal konsep bilangan melalui media flashcard. *Jurnal PAUD Agapedia*, *1*(1), 118–128.
Rohmalina, R., Aprianti, E., & Lestari, R. H. (2020). Pendekatan open-ended dalam mempengaruhi kemampuan mengenal konsep bilangan anak usia dini. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *5*(2), 1409–1418.
Rudyanto, H. E. (2016). Pengembangan kreativitas siswa sekolah dasar melalui pembelajaran matematika open-ended. *Premiere Educandum: Jurnal Pendidikan Dasar Dan Pembelajaran*, *3*(02).
Safitri, N. D., Hasanah, U., Masruroh, F., Khulusinniyah, K., & Dodd, J. (2023). The development of thematic board educational game tools to train the literacy skills of children 5-6 years old. *Indonesian Journal of Early Childhood Educational Research (IJECER)*, *1*(2), 75–86.
Sari, M., Warmansyah, J., & Husna, N. (2022). Efektivitas media puzzle geometri terhadap kecerdasan visual spasial anak usia 3-4 tahun. *Jurnal Pendidikan Anak*, *8*(2), 73–82.
Sumardi, S., Rahman, T., & Gustini, I. S. (2017). Peningkatan kemampuan anak usia dini mengenal lambang bilangan melalui media playdough. *Jurnal PAUD Agapedia*, *1*(2), 190–202.
Wahyuni, S., Bastian, A., & Nofrianti, S. (2021). Is there a distinction in socialization ability between children who are addicted to gadgets and those who are not? a comparison study. *Child Education Journal*, *3*(2), 110–122.
Warmansyah, J., Amalina, A., & Febriyani, E. (2022). Analisis korelasi self-efficacy guru paud dalam penggunaan teknologi dengan kesiapan mengajar secara online. *MAp (Mathematics and Applications) Journal*, *4*(1), 9–17.
Warmansyah, J., Faradila, T., Sari, M., & Yuningsih, R. (2022). Correlation study between teacher-child relationships and social skills for 5-6 years old. *Jurnal Pendidikan Anak*, *8*(2), 94–102.
Warmansyah, J., & Nirwana, E. S. (2023). The effect of storytelling methods and self-confidence children's expressive language skills. *Ta'dib*, *26*(1), 29–42.
Warmansyah, J., Yuningsih, R., Nirwana, E. S., Putri, R., et al. (2023). The effect of mathematics learning approaches and self-regulation to recognize the concept of early numbers ability. *Jurnal Pendidikan Usia Dini*, *17*(1), 55–81.
Warmansyah, J., Zulhendri, Z., & Amalina, A. (2021). The effectiveness of lore traditional games towards the ability to recognize the concept of numbers on early childhood. *Ta'dib*, *24*(2), 261–268.
Wulandani, C., Putri, M. A., Pratiwi, R. I., & Sulong, K. (2022). Implementing project-based steam instructional approach in early childhood education in 5.0 industrial revolution era. *Indonesian Journal of Early Childhood Educational Research (IJECER)*, *1*(1), 29–37.
Wulandari, N. P. R., Dantes, N., & Antara, P. A. (2020). Pendekatan pendidikan matematika realistik berbasis open ended terhadap kemampuan pemecahan masalah matematika siswa. *Jurnal Ilmiah Sekolah Dasar*, *4*(2), 131–142.
Yahya, R. N., Jannah, A. N., Prihantini, P., et al. (2021). Pengelolaan perpustakaan dalam mengembangkan minat baca siswa sekolah dasar. *Aulad: Journal on Early Childhood*, *4*(3), 74–79.
Yuningsih, R., Juwita, H., & Fathia, W. (2022). Metode discovery learning terhadap kemampuan berpikir kritis anak usia 5-6 tahun di tk pertiwi batusangkar, tanah datar. *Tumbuh Kembang: Kajian Teori dan Pembelajaran PAUD*, *9*(2), 148–160.
Zhou, Q., Chen, S. H., & Main, A. (2012). Commonalities and differences in the research on children's effortful control and executive function: A call for an integrated model of self-regulation. *Child development perspectives*, *6*(2), 112–121.
Zubaidah, S. (2018). Mengenal 4c: Learning and innovation skills untuk menghadapi era revolusi industri 4.0. *2nd Science Education National Conference*, *13*(2), 1–18.