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Game LoP: Fostering Logical-Mathematical Intelligence in Early Childhood

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ABSTRAK

Salah satu kecerdasan yang penting dimiliki oleh anak usia dini untuk mendukung kelanjutan pendidikan mereka adalah kecerdasan logis matematis. Namun, banyak anak merasa enggan belajar logika matematika karena dianggap sulit dipahami. Untuk itu, diperlukan media pembelajaran berbasis game edukasi yang mampu menarik minat anak dalam mempelajari logika matematika. Penelitian ini bertujuan untuk menguji keefektifan produk media pembelajaran Game LoP dalam meningkatkan kemampuan logis matematis permulaan anak usia dini. Jenis penelitian ini menggunakan metode eksperimen semu (quasi experiment) dengan desain pretest-posttest dan kelompok kontrol. Instrumen penelitian berupa soal pretest dan posttest dianalisis menggunakan teknik paired t-test dan independent t-test. Hasil penelitian menunjukkan adanya perbedaan signifikan dalam kemampuan logis matematis permulaan antara kelompok kontrol dan kelompok eksperimen setelah penggunaan Game LoP. Selain itu, terjadi peningkatan kemampuan logis matematis pada anak-anak yang menggunakan media pembelajaran tersebut. Dengan demikian, Game LoP terbukti memberikan hasil positif dan signifikan dalam meningkatkan kemampuan logis matematis permulaan anak usia dini. Penelitian ini mengimplikasikan bahwa penggunaan Game LoP dapat menjadi solusi inovatif untuk mendukung pengembangan kecerdasan logis matematis anak.

ABSTRACT

Logical-mathematical intelligence is one of the essential skills that early childhood must develop to support their future educational journey. However, many children are reluctant to learn logical mathematics as it is often perceived as difficult to understand. To address this issue, an educational medium in the form of an educational game is needed to attract children's interest in learning logical mathematics. This study aims to evaluate the effectiveness of the educational media Game LoP in enhancing early childhood logical-mathematical skills. The research employs a quasi-experimental design involving pretest-post-test and control group comparisons. Research instruments include pretest and post-test assessments analyzed using paired t-tests and independent t-tests. The findings reveal a significant difference in early logical-mathematical abilities between the control and experimental groups following the implementation of Game LoP. Additionally, there was a notable improvement in the logical-mathematical abilities of children using this educational medium. Therefore, Game LoP has been proven to yield positive and significant outcomes in enhancing early childhood logical-mathematical skills. This study implies that the application of Game LoP can serve as an innovative solution to support the development of children's logical-mathematical intelligence.

1. INTRODUCTION

Early Childhood Education (PAUD) is a level of education before elementary education which plays a role in developing students aged 0-6 years in optimizing aspects of their development (Fauziddin, 2016). Education for early childhood is the provision of efforts to stimulate, guide, care for and provide learning activities that will produce children's abilities and skills (Mufarizuddin, 2017). In accordance with what is written in the 2013 PAUD curriculum, the aspects of Early Childhood development that must be developed include several aspects, namely physical-motor, cognitive, language, art, social-emotional, and moral and religious values (Tatminingsih, 2019). Based on what is outlined in the PAUD Curriculum, PAUD institutions

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facilitate various aspects of child development such as cognitive, language, social, emotional, physical and motoric. This is in accordance with the opinion of a similar study which revealed that the focus of PAUD development for early childhood includes cognitive and physical-motoric aspects (Nur et al., 2020). Early childhood is an individual who is undergoing a very rapid process of development and growth (Nirawati & Yetti, 2019). Early childhood itself is those who have an age range between 0-8 years (Siregar et al., 2019; Zahara et al., 2019). At the timeEarly age is the golden age for human development or often called the Golden Age. At this time the individual's brain experiences the fastest development throughout his life (Daulay & Fauziddin, 2023). In line with other similar studies, namely the formation of each individual's learning potential occurs in the following stages: 1) 50% at the age of 0-4 years; 2) 40% at the age of 4-8 years; 3) 30% at the age of 8-18 years; 4) 20% at the age of 18-25 years; and 10% at the age of 25-50 years (Purwanti, 2013).

One aspect of the 6 aspects of child development, which is important to stimulate early on is the cognitive aspect, especially logical-mathematical ability. Logical-mathematical intelligence is an ability that can be mastered by a child in solving various problems faced in everyday life (Citrowati, 2019). This is related to patterns, sequences, classifications, sizes, concepts, numbers, one-to-one correspondence, geometric shape concepts, making estimates and processing data by manipulating and using concrete media before operating abstract symbols. While logical mathematical intelligence is one form of intelligence which is a nearly global symbol system that is important for maintaining human life and productivity (Gardner, 2003). In line with that, Armstrong is of the opinion as quoted, that logical mathematical intelligence is intelligence in terms of numbers and logic (Sujiono, 2014). Cognitive maturity in preschool children is broadly grouped into four stages, namely the sensory motor stage (0-2 years), the pre-operational stage (2-7 years), the concrete operational stage (7-11 years) and the formal operational stage (11 years - adults) (Marinda, 2020; Suparno, 2001). The preoperative stage is marked by the use of symbols to represent an object or thought.

The problem that is happening now is Mathematics has always been considered the most frightening learning material by students, so many children are less interested in studying it (Maulana et al., 2020; Suprapti, 2016). In fact, many children are reluctant to learn mathematical logic. In other words, this intelligence is avoided by most children because it is difficult and considered confusing to learn or understand by children. This is proven by the lack of interest in logical-mathematical learning in various educational institutions in Indonesia. From the author's observations on learning to develop logical-mathematical abilities in several kindergartens in Kediri City, the problems that researchers found in the field were that children had difficulty recognizing the symbols of numbers 1-20, children had difficulty distinguishing numbers that were almost the same shape, for example between the numbers 6 and 9, children were not yet able to mention the order of numbers correctly, children had difficulty connecting symbols with objects up to 20, besides that the media used by teachers did not vary. Logical-mathematical learning is actually everywhere close to our daily lives. A liking for logical-mathematical must be raised since early childhood, and logical-mathematical learning while playing will provide enjoyment for AUD in getting to know mathematics.

Learning media is an important component in the world of education (Makapedua et al., 2021). Simple learning using concrete media that is appropriate to the child's age can stimulate children in logical and mathematical terms, thus creating a pleasant atmosphere for children (Dhieni, 2009; Syamsiyah & Hardiyana, 2021). The functions of learning media are 1). Attracting students' attention, 2). Helping to accelerate understanding in the learning process, 3). Clarifying the presentation of messages so that they are not verbalistic, 4). Overcoming space limitations, 5). Learning is more communicative and productive, 6). Learning time can be conditioned, 7). Eliminating student boredom in learning, 8). Serving students' diverse learning styles and, 9). Increasing the level of student activity or involvement in learning activities (Sanjani, 2021; Sutikno, 2013).

In the learning process, refreshment is needed along with technological developments in the world of education (Ritonga et al., 2022). One alternative learning media that can be used in logical-mathematical learning activities is through educational games. The use of Game media for learning is very effective. This is supported by previous research entitled "Development of Game Quiz Learning Media for Early Childhood Using Adobe Flash Applications", then research entitled "Development of Adobe Flash-Based Learning Media with the Application of Van Hiele's Theory", in the two studies the results were obtained explaining that Game media in the form of interactive media can improve children's learning abilities (Atiaturrahmaniah & Ibrahim, 2017; Waziana & Febriansyah, 2016). However, researchers also found shortcomings in the media used in previous research, namely Adobe Flash-based media has shortcomings, namely in the application of Adobe Flash CS6 media in the learning process, sufficient preparation and special skills are required so that teachers must be able to choose ideas that are interesting enough to be poured into Adobe Flash (Mustarin et al., 2019).

Based on these findings, researchers attempted to design educational games that are appropriate to the character of early childhood that can be used in logical-mathematical learning activities.Early childhood has unique learning characteristics and is positioned as a king in his world, namely the world of play (Muthmainnah, 2020; Siswanto et al., 2019). They have a natural tendency to express whatever interests them through play (Ningsih & Fauzi, 2023). Researchers designed a power point-based game, which is one type of multimedia-based learning media. Multimedia is the use of computers to present and combine text, sound, images, animations, audio, and video with tools and connections (links) so that users can navigate, interact, create and communicate (Apriani et al., 2019; Hasmalena & Rantina, 2018). This educational game contains learning activities for counting, recognizing geometric shapes, colors, subtraction, addition, which are packaged in an interesting way, and do not make it difficult for children, namely "Game Logical of Mathematic-Power" (LoP).

Based on the explanation above, it is deemed necessary to conduct a study by implementing the LoP Game to improve the logical-mathematical abilities of early childhood. It is expected that the information obtained from this study can be a practical reference for subsequent research to develop similar learning strategies on broader materials with other innovative forms of games. Then, Can the Implementation of the LoP Game Improve the Logical-Mathematical Learning Ability of Early Childhood? This statement is the formulation of the problem of this study.

2. METHOD

The type of research used is a quasi-experiment (Quasi Experiment) using 2 designs, namely One group pre-test post-test design and Randomized control group only design. The first design was used for a small-scale trial conducted at PAUD Lab School UNP Kediri with 20 children, while the second design was used for a large-scale trial at Dharma Wanita Betet Kindergarten with 60 children divided into 2 groups, namely the experimental group (group A1) and the control group (group A2). The data collection techniques for this study were tests and observations. The research instrument in the form of questions consisting of pre-test and post-test, as well as observations were used to determine the application and improvement of children's early mathematical logical abilities. Data were analysed using Paired t-test for small-scale trials, while large-scale trials were analysed using Independent t-test. This analysis was conducted to compare the results of the pre-test and post-test and to compare the values of the control and experimental groups. This study is a quasi-experimental study (Quasi Experiment). A quasi-experiment is an experiment in which the placement of the smallest experimental unit into the experimental and control groups is not carried out randomly (non-random assignment) using 2 designs, namely (1) One Group Pre-test Post-test Design and (2) Post-test-Only Design With Non-equivalent Group (Hastjarjo, 2019).

3. RESULT AND DISCUSSION

Result

The first design is used for small-scale trials and the second design as a large-scale trial of the LoP Game. Both designs that have been presented can be explained as follows. This design uses one group or class. Before the group is given treatment in the form of a LoP Game, a pretest is first given to measure initial abilities. After that, the group will be given treatment in the form of a LoP Game and then the final ability is taken to measure the final ability with the aim of knowing if there is a difference. This design uses two groups, namely the experimental group and the control group. The treatment in the form of implementing the LoP Game will be given to the experimental group, while the control group will be given the usual learning. Then each group will be given a posttest to measure their final abilities with the aim of knowing whether there is a difference in the logical-mathematical abilities of the two groups.

The sample in this study used students from 2 kindergartens in Kediri, namely Dharma Wanita Betet Kindergarten as many as 60 children and PAUD Lab School UNP Kediri as many as 20 children. The data collection technique used was a test with a research instrument, namely pretest and posttest questions. The data analysis technique in this study used Paired t-test and Independent t-test. The research instrument used was pretest and posttest questions. There are 3 materials in the pretest and posttest questions, namely recognizing shapes, recognizing colours, and counting. This is adjusted to the material in the LoP Game. Before the hypothesis test is carried out, a prerequisite analysis test is needed, namely the normality test with the Kolmogorov-Smirnov test and the homogeneity test with the Levene test.The following is a grid of indicators for assessing initial mathematical logical abilities presented in Table 1.

Table 1. The Assessment Indicator Grid

Ability	Aspect	Indicator	Number of Questions
Beginning Mathematical Logic	Counting	Adding up	3
		Reduce	2
	Colour	Get to Know Colours	2
		Colour order	3
	Geometric Shapes	Looking for a 1 form partner	3
		Looking for a partner of more than 1 form	2

Implementation of LoP Game in Small Scale Trial

The prerequisite analysis tests conducted include normality and homogeneity tests for pretest and posttest values with the aim of whether the sample data is worthy of being tested for its hypothesis with parametric statistics, namely the Paired t-test. The following are the results of the assumption test of the pretest and posttest values with a sample of 20 children.

Table 2. The Results of the Pretest and Posttest Normality and Homogeneity Tests

Mark	Normality		Homogeneity		Hypothesis
	Mark	Sig.	Mark	Sig.	
Pretest	0.907	0.383	0.894	0.513	H_0 is accepted (Sig > 0.05)
Posttest	0.757	0.616	2.072	0.154	

Based on Table 2, it can be concluded that the samples taken meet the assumption test so that further hypothesis testing can be carried out. Hypothesis testing was conducted to see whether there was a difference in pretest and posttest scores on children's logical-mathematical abilities after the implementation of the LoP Game. The following results of the hypothesis test are presented in Table 3.

Table 3. The Results of Hypothesis Testing with Paired t-test

Paired Groups		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-test – Post-test	-3.500	1.539	0.344	-4.220	-2.780	-10.171	19	0.000

Based on the table, it can be seen that the sig value is 0.0001, so it can be interpreted that the sig value is less than the specified alpha value of 0.05. The conclusion is that H_o is rejected and H_a is accepted.

Table 4. The Correlation Results between Pretest and Posttest Scores

Paired Group		N	Correlation	Sig.
Pair 1	Pretest & Posttest	20	0.552	0.012

The results of the correlation between pretest and posttest scores in Table 4 show a positive and significant correlation.

Table 5. The Descriptive Statistics Results

Paired Group		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	5.80	20	1.508	0.337
	Posttest	9.30	20	1.720	0.385

The results of the Table 5 show that the average posttest score is higher than the pretest score for children's early mathematical logical abilities. Based on the results of the hypothesis test, it can be concluded that there is a difference in the pretest and posttest scores for children's early mathematical logical abilities after the use of the LoP Game and the initial mathematical logical abilities increase. Thus, it can be interpreted that the implementation of the LoP Game on early mathematical logical abilities of early childhood provides positive and significant results.

Implementation of LoP Game in Large-Scale Trials

The prerequisite analysis tests conducted include normality and homogeneity tests for the posttest values of the control and experimental groups with the aim of whether the sample data is worthy of being tested for its hypothesis with parametric statistics, namely the Independent t-test. The following are the results of the assumption test of the posttest values of the control and experimental groups with samples of 30 children each.

Table 6. The Results of the Normality and Homogeneity Tests for Control and Experiment

Mark	Normality		Homogeneity		Hypothesis
	Mark	Sig.	Mark	Sig.	
Group Control	1.195	0.115	1.494	0.230	H_0 is accepted
Group Experiment	0.819	0.513	1.645	0.188	(Sig > 0.05)

Based on Table 6, it can be concluded that the samples taken meet the assumption test so that further hypothesis testing can be carried out. Hypothesis testing was conducted to see whether there was a difference in posttest scores from the control and experimental groups on children's logical-mathematical abilities after the implementation of the LoP Game. The following results of the hypothesis test are presented in Table 7.

Table 7. Hypothesis Test Results with Independent t-test

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Mathematical Logical Ability	Equal variances assumed	1.569	0.215	-8.877	58	0.000	-3.500	0.394	-4.289	-2.711
	Equal variances not assumed			-8.877	57.584	0.000	-3.500	0.394	-4.289	-2.711

Based on the Table 7, it can be seen that the sig value is 0.0001, so it can be interpreted that the sig value is less than the specified alpha value of 0.05. The conclusion is that H_o is rejected and H_a is accepted.

Table 8. The Descriptive Statistics Results

Variable		Group	N	Mean	Std. Deviation	Std. Error Mean
Logical Ability	Mathematical	Control	30	6.07	1.461	0.267
		Experiment	30	9.57	1.591	0.290

The results of Table 8 show that the average initial mathematical logical ability of the experimental group is higher than the control group. Based on the results of the hypothesis test, it can be concluded that there is a difference in the initial mathematical logical ability of children in the control group and the experimental group after the use of the LoP Game and the initial mathematical logical ability increases. Thus, it can be interpreted that the implementation of the LoP Game on the initial mathematical logical ability of early childhood children provides positive and significant results.

Discussion

The results of a preliminary study conducted in several kindergartens in the Kediri area found thatin learning ability developmentlogical-mathematicalIn several kindergartens in Kediri City, the problems that researchers found in the field were that children had difficulty recognizing the symbols of numbers 1-20, children had difficulty distinguishing numbers that were almost the same shape, for example between the numbers 6 and 9, children were not yet able to mention the sequence of numbers correctly, children had difficulty connecting number symbols with objects up to 20, in addition, the media used by teachers did not vary. So researchers designed an educational game that contains learning activities for counting, recognizing geometric shapes, colors, subtraction, addition, which are packaged in an interesting way, and do not make it difficult for children, namely "Game Logical of Mathematic-Power" (LoP). Before

the trial process was carried out at the Kindergarten Institution, the LoP Game was first validatedwith several material and media experts in the field of early childhood education. This aims to ensure that the game to be created can function and be in accordance with aspects of early childhood development. The implementation of the FGD resulted in the creation of a story board and materials that became the content of the game. This game consists of 3 materials, including: (1) recognizing shapes, (2) counting, and (3) recognizing colors. Each level in this game has a different level of difficulty. After passing the validation process, the researcher then conducted a small group trial and field test.

Based on the results of the study, it shows that in the process of small group trials and field trials that have been tested on children who attend Betet Kindergarten Kediri and UNP Lab Kindergarten Kediri, it shows that the average initial mathematical logical ability of the experimental group is higher than the control group, and based on the results of the hypothesis test, it can be concluded that there is a difference in the initial mathematical logical ability of children in the control group and the experimental group after the use of the LoP Game and the initial mathematical logical ability has increased. Thus, it can be interpreted that the implementation of the LoP Game on the initial mathematical logical ability of early childhood children provides positive and significant results.

The results of this study are also supported by several previous studies, which First entitled "21st Century Learning Challenges: Developing Interactive Learning Media Based on PowerPoint to Improve Student Learning Outcomes", The impact obtained by students in the application of power point-based learning media is very influential, which initially students were not active in learning are now seen to be active, this can be seen from the increase in student learning outcomes. Based on the results of the study, it can be concluded that learning using power point-based learning media can improve the learning outcomes of class VI A students at SDN Haurngombong II, Pamulihan District, Sumedang Regency (Amalida & Halimah, 2023). The two previous studies entitled ""Development of Interactive Learning Media Based on Microsoft PowerPoint", the results of the study showed that the interactive learning media developed was declared feasible. Media validation and material validation showed an average score of 82.50% and 79.16%. Student responses to interactive teaching materials obtained a score of 81.75% in small-scale trials while large-scale trials obtained a score of 85% (Anyan et al., 2020). The third study entitled "Development of Learning Media Based on Power Point Ispring Suite 8 in Elementary Schools", Development of learning media based on power point ispring suite 8 refers to the ADDIE development model consisting of 5 stages, namely analyse, design, development, implementation and evaluation. The learning media based on PowerPoint Ispring Suite 8 that was developed is valid, practical and effective (Nuraini et al., 2020). Fourth, the research entitled "Development of Picture Letter Card Media Based on Microsoft Power Point for Cognitive Aspects of Symbolic Thinking in Recognizing Letters in Children Aged 5-6 Years at Tunas Bangsa Watumanu Kindergarten, Jerebuu District, Ngada Regency" The results of the research on the development of picture letter card media based on Microsoft Power Point, the results of expert trials and children as product users are as follows. (1) Content expert trials with a score of 87.27% are in the very valid category, (2) Learning design expert trials with a score of 81% are in the valid category, (3) Media expert trials with a score of 80% are in the valid category, (4) child trials through two stages, namely; 1) individual trials with a total of 2 children with a score of 87.5% are in the very valid category, and 2) small group trials with a total of 5 children with a score of 87.5% are in the very valid category. Based on the results of the assessment, this Microsoft PowerPoint-based picture letter card media is suitable for use in early childhood 5-6 years old (Meo et al., 2022).

LoP game has several advantages compared to other research development products entitled "Development of Learning Media Game Quiz for Early Childhood Using Adobe Flash Application" in these studies the field trial process has been carried out and produced a product based on Adobe Flash software. In previous studies it has been stated that it is suitable for widespread use, however Adobe Flash-based media has disadvantages, namely in the application of Adobe Flash CS6 media in the learning process, sufficient preparation and special skills are required so that teachers must be able to choose ideas that are interesting enough to be poured into Adobe Flash (Mustarin et al., 2019; Waziana & Febriansyah, 2016). While the Power point-based learning game product has several advantages that have also been expressed by several researchers, namely 1). PowerPoint media is equipped with images, texts, and videos that attract students to learn which can support teachers as learning media in the classroom, 2). PowerPoint in the learning process has advantages including: a. Interesting presentation because there are games of color, letters, and text animations or image animations, b. More stimulating students to find out more information about the teaching materials presented, c. Visual information messages are easy for students to understand, d. Teachers do not need to explain much of the teaching materials being presented, e. Can be reproduced as needed, and can be used repeatedly, f. Can be stored in the form of optical or magnetic data, so it is practical to carry anywhere (Hamzah, 2019; Wijayanti & Relmasira, 2019).

Suitable and appropriate learning is a learning model that focuses on interactive, playful, and exploratory activities. Playing is an important activity for children, because by playing children will increase their experience and knowledge. Through playing children get lessons that contain aspects of cognitive development, emotions and creativity development (Adimayanti & Siyamti, 2020). Because interactive activities can make children more active, enthusiastic and more motivated in learning. In addition, through game-based learning (Play-Based Learning) it is very appropriate with the characteristics of early childhood because children are able to learn through playing activities, so that specially designed games are able to facilitate children in learning (Wulandari, 2023). Children's logical mathematical abilities will be able to develop optimally if stimulated with the right games. This is because the development of these abilities requires abstraction abilities while early childhood children are not yet able to think abstractly. Therefore, educational games in the form of games play an important role in being able to stimulate logical mathematical abilities in children (Veronica, 2018). In addition, the use of educational games can stimulate and improve problem-solving abilities in children (Winarni et al., 2020). Educational games are a technology that can be used as an innovative learning medium to support teaching and learning activities. Thus, the use of games in the world of education will have a positive impact on the learning process (Panggayudi et al., 2017).

4. CONCLUSION

Based on the results of the trials that have been carried out, the conclusion of this study, namely small group tests and field tests, it can be concluded that there is a difference in children's early mathematical logical abilities in the control group and experimental group after the use of the LoP Game and the initial mathematical logical abilities increased. Thus, it can be interpreted that the implementation of the LoP Game on the early mathematical logical abilities of early childhood provides positive and significant results. The implication of this study is that there is expected stimulation in every learning in the form of the use of appropriate games so that it can stimulate, especially the early mathematical logical abilities of early childhood.

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6. REFERENCES

Adimayanti, E., & Siyamti, D. (2020). Terapi Bermain English Games Untuk Meningkatkan Kemampuan Kognitif Anak Prasekolah. *Jurnal Pengabdian Kesehatan*, *3*(2). https://doi.org/10.31596/jpk.v3i2.84.

Amalida, L., & Halimah, L. (2023). Tantangan Pembelajaran Abad-21: Pengembangan Media Pembelajaran Interaktif Berbasis Power Point Untuk Meningkatkan Hasil Belajar Siswa. *Jurnal Ilmiah PENDAS: Primary Educational Journal*, *4*(1). https://doi.org/10.29303/pendas.v4i1.2082.

Anyan, A., Ege, B., & Faisal, H. (2020). Pengembangan Media Pembelajaran Interaktif Berbasis Microsoft Power Point. *JUTECH : Journal Education and Technology*, *1*(1). https://doi.org/10.31932/jutech.v1i1.690.

Apriani, N., Fadillah, F., & Astuti, I. (2019). Pengembangan Multimedia Pembelajaran Membaca pada Anak Usia Dini. *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa*, *8*(11). https://doi.org/10.26418/jppk.v8i11.37461.

Atiaturrahmaniah, & Ibrahim, D. S. M. (2017). Pengembangan Media Pembelajaran Berbasis Adobe Flash Dengan Penerapan Teori Van Hiele. *Jurnal Didika: Wahana Ilmiah Pendidikan Dasar*, *1*(1), 1–13. https://doi.org/10.29408/didika.v3i1.659.

Citrowati, E. (2019). Penerapan Konsep Geometri dalam Mengembangkan Logika Matematika di TK Melati Kabupaten Pasaman Barat Tahun 2018. *Jurnal Menara Ilmu*, *13*(4), 35–40. https://doi.org/10.33559/mi.v13i4.1305.

Daulay, M. I., & Fauziddin, M. (2023). Implementasi Kurikulum Merdeka Pada Jenjang PAUD. *JURNAL BUNGA RAMPAI USIA EMAS*, *9*(2). https://doi.org/10.24114/jbrue.v9i2.52460

Dhieni, N. dk. (2009). *Metode Pengembangan Bahasa*. Universitas Terbuka. https://core.ac.uk/download/pdf/198234596.pdf.

Fauziddin, M. (2016). Peningkatan Kemampuan Kerja Sama melalui Kegiatan Kerja Kelompok Pada Anak Kelompok A TK Kartika Salo Kabupaten Kampar. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *2*(1). https://doi.org/10.31004/obsesi.v2i1.47.

Gardner, H. (2003). *Multiple Intelligences, Kecerdasan Majemuk Teori dan Praktek*. Interaksara.

Hamzah, K. (2019). Efektifitas penggunaan media powerpoint topik lingkaran terhadap motivasi, aktivitas dan hasil belajar matematika siswa. *PROXIMAL: Jurnal Penelitian Matematika Dan Pendidikan Matematika*, *2*(2), 18–24. https://www.e-journal.my.id/proximal/article/view/207/169.

Hasmalena, R., & Rantina, M. (2018). Pengaruh Penggunaan Multimedia Terhadap Pemahaman Konsep Pada Mata Kuliah Pengembangan Kognitif dan Kreatifitas Anak Usia Dini Di UNSRI Palembang. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *2*(1), 85–93. https://doi.org/10.31004/obsesi.v2i1.11.

Hastjarjo, T. D. (2019). Rancangan Eksperimen-Kuasi Quasi-Experimental Design. *Jurnal Buletin Psikologi*, *27*(2), 187–203. https://doi.org/10.22146/buletinpsikologi.38619.

Makapedua, C. S., Wonggo, D., & Komansilan, T. (2021). Pengembangan Media Pembelajaran Pengenalan Hewan Berbasis Augmented Reality Untuk Anak Usia Dini. *Edutik : Jurnal Pendidikan Teknologi Informasi Dan Komunikasi*, *1*(4). https://doi.org/10.53682/edutik.v1i4.2212.

Marinda, L. (2020). Teori perkembangan kognitif Jean Piaget dan problematikanya pada anak usia sekolah dasar. *An-Nisa Journal of Gender Studies*, *13*(1), 116–152. https://doi.org/10.35719/annisa.v13i1.26.

Maulana, I. M., Yaswinda, Y., & Nasution, N. (2020). Pengenalan Konsep Perkalian Menggunakan Media Rak Telur Rainbow pada Anak Usia Dini. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *4*(2). https://doi.org/10.31004/obsesi.v4i2.370.

Meo, V., Meka, M., & Oka, G. P. A. (2022). Pengembangan Media Kartu Huruf Bergambar Berbasis Microsoft Power Point Untuk Aspek Kognitif Berpikir Simbolik Mengenal Huruf Pada Anak Usia 5-6 Tahun Di Tkk Tunas Bangsa Watumanu Kecamatan Jerebuu Kabupaten Ngada. *Jurnal Citra Pendidikan*, *2*(1). https://doi.org/10.38048/jcp.v2i1.397.

Mufarizuddin. (2017). Peningkatan Kecerdasaan Logika Matematika Anak melalui Bermain Kartu Angka Kelompok B di TK Pembina Bangkinang Kota. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *1*(1), 62–71. https://doi.org/10.31004/obsesi.v1i1.32.

Mustarin, A., Arifyansah, R., & Rais, M. (2019). Penerapan media pembelajaran adobe flash cs6 dalam meningkatkan hasil belajar siswa kelas x atph pada mata pelajaran alat dan mesin pertanian di smkn 4 jeneponto. *Jurnal Pendidikan Teknologi Pertanian*, *5*(1), 1–8. https://www.academia.edu/download/102950381/4729.pdf.

Muthmainnah, H. (2020). Karakteristik Belajar Anak Usia Dini Dalam Perspektif Islam. *Bunayya : Jurnal Pendidikan Anak*, *5*(1). https://doi.org/10.22373/bunayya.v5i1.6379.

Ningsih, A. C., & Fauzi, F. (2023). Desain Kreatif Lingkungan Bermain Luar Ruangan: Sebuah Solusi Bagi Heterogenitas Karakteristik Anak Usia Dini. *PAKAR Pendidikan*, *21*(2). https://doi.org/10.24036/pakar.v21i2.358.

Nirawati, T., & Yetti, R. (2019). Peningkatan Kemampuan Berhitung Anak Melalui Permainan Meja Putar Di Taman Kanak – Kanak. *Jurnal Riset Tindakan Indonesia*, *4*(1), 51–58. https://doi.org/10.29210/300338700.

Nur, L., Hafina, A., & Rusmana, N. (2020). Kemampuan Kognitif Anak Usia Dini Dalam Pembelajaran Akuatik. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, *10*(1), 42–50. https://doi.org/10.24246/j.js.2020.v10.i1.p42-50.

Nuraini, I., Sutama, S., & Narimo, S. (2020). Pengembangan Media Pembelajaran Berbasis Power Point Ispring Suite 8 Di Sekolah Dasar. *Jurnal VARIDIKA*, *31*(2). https://doi.org/10.23917/varidika.v31i2.10220.

Panggayudi, D. S., Suweleh, W., & Ihsan, P. (2017). Media Game Edukasi Berbasis Budaya untuk Pembelajaran Pengenalan Bilangan pada Anak Usia Dini. *MUST: Journal of Mathematics Education, Science and Technology*, *2*(2). https://doi.org/10.30651/must.v2i2.883.

Purwanti, K. L. (2013). Perbedaan Gender Terhadap Kemampuan Berhitung Matematika Menggunakan Otak Kanan Pada Siswa Kelas I. *Jurnal Sawwa: Jurnal Studi Gender*, *9*(1), 107–122. https://doi.org/10.21580/sa.v9i1.668.

Ritonga, R. S., Syahputra, Z., Arifin, D., & Sari, I. M. (2022). Pengembangan Media Pembelajaran Smart Board Berbasis Augmented Reality Untuk Pengenalan Hewan Pada Anak Usia Dini. *Jurnal PG-PAUD Trunojoyo : Jurnal Pendidikan Dan Pembelajaran Anak Usia Dini*, *9*(1). https://doi.org/10.21107/pgpaudtrunojoyo.v9i1.13418.

Sanjani, M. A. (2021). Pentingnya strategi pembelajaran yang tepat bagi siswa. *Jurnal Serunai Administrasi Pendidikan*, *10*(2), 32–37. https://doi.org/10.37755/jsap.v10i2.517.

Siregar, W. W., Khadijah, K., & Nunzairina, N. (2019). Upaya MeningkatkanKemampuan Kognitif Melalui

Penerapan Metode Pembelajaran Mind Mapping Pada Anak Usia 5-6 Tahun di Ra Al-Kamal Hubungan Kemampuan Berkomuikasi Lisan Anak Dengan Perilaku Sosial Anak Usia 5-6 Tahun di TKIT Baitussalam. *Jurnal Raudhah*, *7*(1). https://doi.org/10.30829/raudhah.v7i1.467.

Siswanto, S., Zaelansyah, Z., Susanti, E., & Fransiska, J. (2019). Metode Pembelajaran Anak Usia Dini Dalam Generasi Unggul Dan Sukses. *Paramurobi: Jurnal Pendidikan Agama Islam*, *2*(2), 35–44. https://doi.org/10.32699/paramurobi.v2i2.1295.

Sujiono, Y. N. (2014). *Konsep Dasar Pendidikan Anak Usia Dini*. PT. Indeks.

Suparno, P. (2001). *Teori Perkembangan Kognitif Jean Piaget*. Kanisius.

Suprapti, E. (2016). Peningkatan Pembelajaran Matematika Anak Usia Dini Dengan Microsoft Powerpoint Ispring Pada Materi Pengenalan Konsep Bilangan. *Pedagogi: Jurnal Anak Usia Dini Dan Pendidikan Anak Usia Dini*, *2*(1). https://doi.org/10.30651/pedagogi.v2i1.27.

Sutikno, S. (2013). *Belajar dan Pembelajaran*. Prosfect.

Syamsiyah, N., & Hardiyana, A. (2021). Implementasi Metode Bercerita sebagai Alternatif Meningkatkan Perkembangan Bahasa Anak Usia Dini. *Urnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *6*(3), 1197–1211. https://scholar.archive.org/work/2ekll4rz55gitds24wkwsid4ca/access/wayback/https://obsesi.or.id/index.php/obsesi/article/download/1751/pdf.

Tatminingsih, S. (2019). Alternative Stimulasi Kemampuan Kognitif melalui Penerapan Model Pembelajaran Berbasis Permainan Komprehensif. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, *3*(1), 183–190. https://doi.org/10.31004/obsesi.v3i1.130.

Veronica, N. (2018). Permainan Edukatif Dan Perkembangan Kognitif Anak Usia Dini. *Pedagogi : Jurnal Anak Usia Dini Dan Pendidikan Anak Usia Dini*, *4*(2). https://doi.org/10.30651/pedagogi.v4i2.1939.

Waziana, W., & Febriansyah. (2016). Pengembangan Media Pembelajaram Game Quiz Untuk Anak-Anak Usia Dini Menggunakan Aplikasi Adobe Flash. *Jurnal Manajemen Pendidikan Islam Al-Idarah*, *1*(1), 26–31. https://doi.org/10.54892/jmpialidarah.v1i1.5.

Wijayanti, W., & Relmasira, S. C. (2019). Pengembangan Media PowerPoint IPA Untuk Siswa Kelas IV SD Negeri Samirono. *Jurnal Penelitian Dan Pengembangan Pendidikan*, *3*(2), 77–83. https://repository.uksw.edu/bitstream/123456789/19293/7/T1_292014510_Judul.pdf.

Winarni, D. S., Naimah, J., & Widiyawati, Y. (2020). Pengembangan Game Edukasi Science Adventure Untuk Meningkatkan Keterampilanpemecahan Masalah Siswa. *Jurnal Pendidikan Sains Indonesia*, *7*(2), 91–100. https://doi.org/10.24815/jpsi.v7i2.14462.

Wulandari, G. R. (2023). Model Pembelajaran Berbasis Permainan Tradisional Kayung (Angka Payung) Untuk Meningkatkan Kemampuan Berfikir Simbolik Anak Usia 4-5 Tahun. *Jurnal Citra Pendidikan*, *3*(3). https://doi.org/10.38048/jcp.v3i3.1839.

Zahara, R., Khadijah, & Lubis, R. (2019). Upaya Meningkatkan Kemampuan Kognitif Melalui Penerapan Metode Pembelajaran Mind Mapping Pada Anak Usia 5-6 Tahun Di Ra Al-Kamal. *Jurnal Raudhah*, *07*(01), 26–39. https://doi.org/10.30829/raudhah.v7i1.466.