



The Effect of the Jumbo Snakes and Ladders Game Media on the Motor Development and Numeracy Ability of Kindergarten Children

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Abstract: The golden age of lifelong learning begins when children are between the ages of 0 and 6. The objectives of this research are to determine the effect of the giant snakes and ladders game media on children's motor development and counting skills at Nusa Indah Kindergarten, and to determine the effect of the giant snakes and ladders game media on children's counting skills at Nusa Indah Kindergarten. This study uses a quantitative approach with a quasi-experimental research design. The results of this study indicate that the learning outcomes of early childhood students in group B at Nusa Indah Kindergarten, through the jumbo snakes and ladders game model, can improve children's motor development. Second, the jumbo snakes and ladders game model can also improve the counting abilities of early childhood students.

Keywords: Children's numeracy skills; Jumbo snakes and ladders game; Motor development

Introduction

The golden age of lifelong learning begins when children are between the ages of 0 and 6 (Rijkiyani et al., 2022). The form of education for the golden age is early childhood education (PAUD), starting with childcare centers, playgroups (KB), and kindergarten (TK), where management is both formal and non-formal (Kasmiati, 2024). With PAUD, there are specific characteristics related to the stages and ages of development in both physical and emotional aspects, as well as other aspects (Zamzam et al., 2023). The development of early childhood also needs to be outlined in several aspects, including language, cognitive, physical, moral, religious, motor, mathematical, and social-emotional aspects, which are applied in early childhood education (Khadijah & Wahyuni, 2024). In fulfilling the development and thinking abilities of young children, it is important to understand basic mathematical language

for the process of developing sensitivity to numbers and space (Liu & Zhang, 2022).

In fact, at Nusa Indah Kindergarten, based on researchers' observations, it was stated that 78% of class B students had difficulty in counting. This also includes difficulties in exploring each student's motor skills. The need to develop skills based on process rather than product modeling. So, it needs to be developed in early childhood as a process to build meaningful experiences (Habibi, 2023).

The solution is to create learning media that fosters creativity in children. Simultaneous learning thru play for early childhood can be implemented using various strategies and learning models (Nursholichah & Yusuf, 2024). Play within the context of learning can take the form of traditional and modern games with diverse types and forms, creating an atmosphere of both play and learning (Susiani et al., 2023). Learning simultaneously with play for early childhood will generate enthusiasm in the design of learning thru play

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(Maharani & Ramadan, 2023). Additionally, learning media that incorporate games can also enhance gross motor skills in early childhood (Hoskens et al., 2024).

One form of game for learning purposes is the jumbo snakes and ladders game. The advantages of the jumbo snakes and ladders game are understood by many people (Setiani & Handayani, 2022). In its application, the snakes and ladders game are played by two to four early childhood children, aiming to train them in competition (Agustin et al., 2023). Also, playing jumbo snakes and ladders can impact children's ability to cooperate and act sportingly in learning (Gultom et al., 2023). The form of the jumbo snakes and ladders game is defined as a competitive game that directs the ability to cooperate and be sportsmanship-like, thus enabling the engineering of early childhood children's experiences and morals (Cahyanti et al., 2023).

The jumbo snakes and ladders game media applied to early childhood, with a jumbo size consisting of a plastic floor mat (banner) depicting the jumbo snakes and ladders game (Damayanti et al., 2023). As for early childhood students who are the pawns, the children play the role of pawns moving on a numbered grid that corresponds to the number of steps on the dice they roll (Kartikaningrum & Mulyani, 2024). By applying a unique form of play, it will be possible to predict its impact on aspects of early childhood development, which can enhance the motor skills of young children (Manrique et al., 2024).

Aspects of motor development can take the form of controlling physical movements thru the central nervous system, nerves, including coordinated muscles (Clark & Linares-Matás, 2024). As for motor development, it is divided into two types: gross and fine motor skills. Gross motor development involves the use of large muscles and some or all body parts in performing movements (Darma et al., 2024). Types of gross motor skills include jumping, running, crawling, and so on (Ningrum et al., 2023). As for gross motor skills, they are divided into three main movement categories: locomotor movements (moving the body), non-locomotor movements (moving without displacement), and manipulative movements (moving using tools) (Asmuddin et al., 2022). Including, fine motor skills are the development of a child's movements, which encompasses the development of a child's movements using small muscles and specific body parts to perform movements (Zhang et al., 2024b). Therefore, the focus of this research is gross motor skills, where the jumbo snakes and ladders game activity stimulates all categories of gross motor skills (Sulistyo et al., 2021). In addition, it is also necessary to develop computational skills.

The need to improve young children's counting skills will be aided using interesting and creative

learning media (Dewi et al., 2021). The benefits of numeracy skills for early childhood are learning basic mathematical concepts correctly, accurately, interestingly, and even enjoyably, including avoiding fear in numeracy learning (Sari et al., 2020). The application of numeracy skills in early childhood includes ordering, naming, adding, or subtracting numbers that will be acquired up to higher education (Chang et al., 2021). Numeracy learning begins with the introduction of numbers, number shapes, and number naming in early childhood (Aulia & Budiningsih, 2021). Therefore, numeracy or mathematics skills must be taught to young children in a joyful, innovative, and creative way (Widiyatmoko et al., 2024).

The objectives of this research are to determine the effect of the giant snakes and ladders game media on children's motor development and counting skills at Nusa Indah Kindergarten in Sumberasih, and to determine the effect of the giant snakes and ladders game media on children's counting skills at Nusa Indah Kindergarten in Sumberasih. Based on the explanation in the introduction, this research was conducted under the title "The Effect of Giant Snakes and Ladders Game Media on Motor Development and Number Recognition Skills in Children at Nusa Indah Kindergarten in Sumberasih".

Method

As for the research, it uses a quasi-experimental research design with a quantitative approach. The purpose of this research is to examine the influence of the jumbo snakes and ladders game media on the motor development and counting abilities of children at Nusa Indah Kindergarten in Sumberasih. The quantitative approach is used as the basis for providing a description of the causal relationship between the independent variable (the giant snakes and ladders game) and the dependent variables (motor skills and counting ability) objectively and measurably.

Meanwhile, the research design implements a pretest-posttest control group design. As for the experimental and control groups, they were given a pre-material test, namely a pretest, with the aim of determining the initial abilities of early childhood children. Next, the experimental group was given treatment in the form of learning using the Snakes and Ladders game, while the control group received conventional learning, namely lectures in class. Therefore, at the end of the learning process, a posttest was conducted to determine the differences in learning outcomes improvement for each group.

Regarding the measurement scale of students' academic abilities, it is categorized based on the mean

and standard deviation (Sugiyono, 2019). The population in this study is early childhood children in Group B of Nusa Indah Kindergarten, Sumberasih, during the first semester of the 2024-2025 academic year. The research subjects are 31 children from Nusa Indah Kindergarten in Sumberasih. The location was chosen purposively based on accessibility, research needs, and affordability.

The next data collection technique is thru tests used to obtain data on students' motor development and counting skills, using an essay test with ten questions. To ensure the validity and reliability of the test, it is necessary to conduct testing to determine its suitability in terms of validity, reliability, difficulty level, and discrimination power (Arikunto, 2017). The initial analysis (pre-test) was conducted to determine whether the two classes (control and experimental) started from the same initial condition (homogeneous).

In data analysis, contributions form the basis for decision-making on hypotheses. The analysis technique used is single linear regression. Before the research data is analyzed, a normality test and a homogeneity of variance test are conducted. The normality test uses the Kolmogorov-Smirnov criterion with Microsoft Excel (Ms Excel). Next is the hypothesis test, to test the effect of the jumbo snakes and ladders game on motor development and counting ability using the T test (partial) and the paired sample t test, also with the help of the Ms Excel application.

Result and Discussion

Learning Using Jumbo Snakes and Ladders Game on Physical Motor Development

Early childhood education using games is highly recommended, as it is relevant to the developmental stages of young children. In this study, the jumbo snakes and ladders game was chosen as a game-based learning medium rooted in local wisdom (traditional). In the jumbo snakes and ladders game, children are presented with a game that involves movement, which will certainly encourage the development of physical motor skills and counting abilities. Observations were conducted by the researcher with the assistance of educators who used the assessment elements in Table 1.

Table 1. Elements of snake and ladder game assessment

Indicator

Providing knowledge to children through a process of learning while playing.
Stimulating the development of thinking, creativity, and language skills to foster good attitudes, mentalities, and morals.
Creating an attractive, safe, and enjoyable play environment.
Learning about winning and losing.

Indicator

Learning to cooperate and wait for one's turn.

The assessment indicators for the jumbo snakes and ladders game are adjusted to the conditions, taking into account the characteristics of the children and the location. The snakes and ladders game presented is a game with the potential for movement that will certainly encourage the development of physical motor skills. The focus of discussion here is on gross motor development, defined as movements that require coordination of most parts of the child's body (Sugiyono, 2019). A child's ability to manage and coordinate movements between body parts must go through certain processes and stages. Observations were conducted by the researcher with the assistance of educators who used the assessment elements or indicators in Table 2.

Table 2. Elements of assessment of children's motor development

Indicator

Imitation is the skill of copying movements that have been seen, heard, or experienced.

Conceptualization is the skill of manipulating movements to perform activities.

Precision is a skill related to performing movements carefully and correctly.

Articulation is a skill for linking various movements in a continuous manner.

Naturalization is a skill for performing movements in a natural manner.

The results of the observations conducted using the above indicators are summarized in Table 3.

Table 3. Data for the experimental and control classes

Game Score/Physical Motor Skills	Control Group	Experiment Group
High	20	26
Low	11	5

Referring to Table 3, the learning data using Jumbo Snakes and Ladders, which is an accumulation of physical motor development scores through observation using instruments, it can be stated that 26 children achieved high scores while 5 other children achieved lower scores. Gross physical motor development aspect. The determination of high and low scores is based on the class average score standard, meaning that the average of all students' scores is calculated and used as the standard. Children's gross motor skill development scores above the class average are classified as high gross motor skill development scores. Conversely, children's gross motor skill development scores below the class average are classified as low gross motor skill development scores.

Learning Using Jumbo Snakes and Ladders Game on Children's Numeracy Skills

Early childhood learning using the Jumbo Snakes and Ladders game must consider and be adapted to the level and stage of the child's thinking, including their counting ability. The indicators for assessing children's counting ability can be seen in Table 4.

Table 4. Elements for assessing children's numeracy development

Indicator
Understanding Numbers: Recognizing number symbols 1-10, Naming number symbols 1-10, Matching number symbols with quantities of objects.
Counting Objects: Counting objects correctly while pointing to them, Counting objects from 1 to 10.
Ordering Numbers: Ordering number symbols from 1 to 10, Ordering objects according to numbers from 1 to 10.
Comparing Quantities, i.e., Comparing the quantities of different objects and determining which is.
Concepts of Addition and Subtraction

After being taught using the Jumbo Snakes and Ladders game, the children's progress in arithmetic skills will be assessed using the instruments described in Table 4 above. The results of the observations will then be calculated as the average class score, which will serve as the basis or standard for determining high and low scores. The accumulated results of the children's arithmetic skills are presented in Table 5 below.

Table 5. Data comparing conventional classes with experimental classes using the jumbo snakes and ladders game on numeracy skills

Numeracy score	Control Group	Experiment Group
High	15	22
Low	16	9

Based on Table 5, it can be stated that learning using the Jumbo Snakes and Ladders game media resulted in 18 children achieving high scores in arithmetic skills and 14 children achieving low scores.

Normality Test Results Data

The purpose of the normality test is to determine whether the sample comes from a normally distributed population or not. If the p-value is < 0.05 , then H_0 (normally distributed data) is rejected. The significance value used refers to the Kolmogorov-Smirnov formula. The results of the normality test are presented in Table 6.

Table 6. Normality test data

Normality Aspect	Experiment Group
Jumbo Snakes and Ladders Game	0.06
Physical Motor Development	0.08
Counting Skills	0.09
Interaction Snakes and Ladders Game	0.07

Based on the results of the normality test, a p-value of > 0.05 was obtained, namely the jumbo snakes and ladders game, physical motor development, children's counting abilities, and their interactions, as shown in Table 6. It can be concluded that H_0 is accepted, namely that the data is normally distributed.

Homogeneity Test Results Data

The purpose of testing data homogeneity is to determine whether the components of a number of populations are the same or not. If a p-value of < 0.05 is obtained, then H_0 is rejected, meaning that the samples are from a homogeneous population or homogeneity is fulfilled (Abubakar, 2021). The results of the normality test are presented in Table 7 below.

Table 7. Homogeneity result test

Homogeneity Aspect	Experiment Group
Jumbo Snakes and Ladders Game	0.09
Physical Motor Development	0.07
Counting Skills	0.06

Table 7 shows the results of the homogeneity test with a p-value > 0.05 in all aspects, so H_0 is accepted. With these results, it can be stated that the data has homogeneous variance.

Hypothesis Test Results Data

The data from the hypothesis test results is data obtained from testing using the statistical program Ms Excel, starting with Tests of Between-Subjects Effects or using a difference test (T-Test). This test is conducted on the null hypothesis of the independent variable of traditional games against two dependent variables, namely motor development and counting ability, as follows: Working hypothesis (H_a): There is an effect of the Jumbo Snakes and Ladders game on the motor development of Nusa Indah Kindergarten children in Sumberasih during the first semester of the 2024-2025 academic year; Null hypothesis (H_0): There is no effect of the Jumbo Snakes and Ladders game on the motor development of Nusa Indah Kindergarten children in Sumberasih during the first semester of the 2024-2025 academic year.

As for the second hypothesis, it can be elaborated as follows: Working Hypothesis (H_a): There is an effect of the Jumbo Snakes and Ladders game on the counting ability of Nusa Indah Kindergarten children in the odd

semester of the 2024-2025 academic year; Null Hypothesis (H_0): There is no effect of the Jumbo Snakes and Ladders game media on the counting ability of Nusa Indah Kindergarten children in the odd semester of the 2024-2025 academic year.

These two hypotheses will then be tested using the Ms Excel program, with the hypothesis testing results presented in Table 8.

Table 8. Hypothesis test results data

Source Data	Type III				
	Mean Square	Df	Mean Square	F	Sig
Number					
Corrected Model	243.351 ^a	5	51.31	0.73	0.343
Intercept	62130.1	1	5627.03	1130.03	0.000
The Effect of Jumbo Snake Ladder on Physical Motor Development	111.17	1	114.52	1.401	0.072
The Effect of Jumbo Snakes and Ladders on Numeracy Skills	132.67	1	129.13	2.952	0.065
Errors	2170.03	1	-	-	-

Based on Table 8, it can be stated that the results of the first test, which yielded an F-test result of 1.401 at a significance level of 0.072. Since the sig. t test result is ≥ 0.05 , H_0 is rejected, meaning the null hypothesis is rejected, and the working hypothesis (H_a) is valid, which is: "There is an effect of the Jumbo Snakes and Ladders game media on the motor development of Nusa Indah Kindergarten children in Sumberasih during the odd semester of the 2020-2021 academic year." This result is also relevant to the opinion that improving gross motor skills thru zigzag running games (Lita et al., 2023). This is also supported by evidence for incorporating functional training into physical education for early childhood to improve the development of basic motor skills (Zhang et al., 2024a). Additionally, to improve motor skills, access to nutritious food for children is necessary (Purwanto & Ockta, 2024). This is because, in providing gross motor skill development, practice is required to develop them, one of which is in the form of dance (Djuanda & Agustiani, 2024). This is because, to deepen motor abilities, creativity is needed to support early childhood development (Ghanamah, 2024). Ultimately, many factors are needed to develop gross motor skills in early childhood students (Hura et al., 2024).

As for the results of the second test, an F-test result of 1.401 was obtained at a significance level of 0.065. Since the sig. t test result is ≥ 0.05 , H_0 is rejected, meaning the null hypothesis is rejected, and the working hypothesis (H_a) applies, which is "There is an effect of the Jumbo Snakes and Ladders game on the counting ability of Nusa Indah Kindergarten children in

Sumberasih during the odd semester of the 2024-2025 academic year." This is in line with the research results, which state that the learning process using the counting barn media can improve the counting ability of children aged 4-5 years (Febiola, 2020). It is also supported by an increase from 30 to 89 in mathematics learning outcomes using the discovery learning model (Muhayati et al., 2023). Thru the abacus, it can also provide counting skills for 5-6-year-old students (Annisa et al., 2024). Another factor, in improving early counting skills for 5-6-year-olds, is the use of natural materials as media (Jayanthi et al., 2022). This includes using finger counting and gestures, as the number of fingers used is positively correlated with numerical development in early childhood (Roesch et al., 2024).

Conclusion

The results of this study indicate that the learning outcomes of early childhood students in group B at Nusa Indah Sumberasih Kindergarten, through the jumbo snakes and ladders game model, can improve children's motor development. Second, the jumbo snakes and ladders game model can also improve the counting abilities of early childhood students.

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Author Contributions

Lead author and researcher of the article, A.A.M.: collected information, created instruments to measure needs and responses, conducted expert validation of materials and media, conducted evaluations, created and tested research products, and data processing and initial article writing; research and writing of the second article, E.T. and K.: conducted instrument validation and initial product design before submitting it to media experts and subject matter experts for validation, and the supervisor who guided and mentored the first author.

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Conflicts of Interest

The author declares that there is no conflict of interest.

References

Abubakar, R. (2021). *Pengantar Metodologi Penelitian*. SUKA-Press UIN Sunan Kalijaga.

Agustin, D., Sriwijayanti, R. P., & Qomariyah, R. S. (2023). Pengaruh Media Ular Tangga Pintar (UTAR) Terhadap Hasil Belajar Siswa Kelas V pada Mata Pelajaran IPS Tema Keragaman Budaya di SDN Dringu Tahun Ajaran 2022/2023. *PARAMETER: Jurnal Pendidikan Universitas Negeri Jakarta*, 35(1), 26-38. <https://doi.org/10.21009/parameter.351.03>

Annisa, F., Alwi, B. M., Angriani, A. D., Patiung, D., & Nur, F. (2024). Meningkatkan Kemampuan Berhitung Melalui Media Sempoa pada Anak di TK aisyiah limbung kec. Bajeng kab. Gowa. *AN-NISA*, 17(1), 51-57. <https://doi.org/10.30863/an.v17i1.6733>

Arikunto, S. (2017). *Pengembangan Instrumen Penelitian dan Penilaian Program*. Jakarta: Pustaka Pelajar.

Asmuddin, A., Salwiah, S., & Arwih, M. Z. (2022). Analisis Perkembangan Motorik Kasar Anak di Taman Kanak – Kanak Buton Selatan. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 6(4), 3429-3438. <https://doi.org/10.31004/obsesi.v6i4.2068>

Aulia, B. N. R., & Budiningsih, C. A. (2021). Tingkat Pemahaman Guru Taman Kanak-kanak di Lombok dalam Stimulasi Pengembangan Bahasa Anak Usia Dini. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 5(2), 2259-2268. <https://doi.org/10.31004/obsesi.v5i2.1082>

Cahyanti, S., Kurniawati, E., & Utomo, H. B. (2023). Pengembangan Permainan Ular Tangga Raksasa untuk Menstimulasi Perkembangan Kognitif Anak Usia Dini. *Jurnal Pelita PAUD*, 7(2), 322-330. <https://doi.org/10.33222/pelitapaud.v7i2.2878>

Chang, T.-Y., Hong, G., Paganelli, C., Phantumvanit, P., Chang, W.-J., Shieh, Y.-S., & Hsu, M.-L. (2021). Innovation of Dental Education During COVID-19 Pandemic. *Journal of Dental Sciences*, 16(1), 15-20. <https://doi.org/10.1016/j.jds.2020.07.011>

Clark, J., & Linares-Matás, G. (2024). Snakes, Flakes, and Ladders: From Surprise to Innovation in the Palaeolithic. Comment on Manrique, Friston, and Walker (2024), "Snakes and Ladders in paleoanthropology." *Physics of Life Reviews*, 50, 46-48. <https://doi.org/10.1016/j.plrev.2024.06.002>

Damayanti, M., Hakim, Z. R., Pribadi, R. A., & Setiawan, S. (2023). Pengembangan Media Permainan Ular Tangga untuk Meningkatkan Pemahaman Peserta Didik pada Keragaman Pakaian Adat Daerah. *Ideguru: Jurnal Karya Ilmiah Guru*, 8(3), 797-807. <https://doi.org/10.51169/ideguru.v8i3.733>

Darma, H. P., Bafirman, B., Syahara, S., Khairuddin, K., Rahman, D., & Zarya, F. (2024). The Influence of Physical Fitness, Motor Skills, and Learning Motivation on Cartwheel Skills in Physical Education. *Jurnal Penelitian Pendidikan IPA*, 10(SpecialIssue), 553-558. <https://doi.org/10.29303/jppipa.v10iSpecialIssue.8862>

Dewi, N. W. U. R., Asril, N. M., & Wirabrata, D. G. F. (2021). Meningkatkan Kemampuan Berhitung Permulaan pada Anak Usia Dini Melalui Video Animasi. *Jurnal Pendidikan Anak Usia Dini Undiksha*, 9(1), 99. <https://doi.org/10.23887/paud.v9i2.36800>

Djuanda, I., & Agustiani, N. D. (2024). Perkembangan Kemampuan Motorik Kasar Melalui Kegiatan Tari Kreasi pada Anak Usia 5 - 6 Tahun. *Almarhalah: Jurnal Pendidikan Islam*, 6(1), 33-45. <https://doi.org/10.38153/almarhalah.v6i1.5>

Febiola, K. A. (2020). Peningkatan Kemampuan Berhitung Permulaan Anak Usia Dini Melalui Pengembangan Media Pembelajaran Pohon Angka. *Jurnal Ilmiah Pendidikan Profesi Guru*, 3(2), 238. <https://doi.org/10.23887/jippg.v3i2.28263>

Ghanamah, R. (2024). Creativity and Motor Skill Learning Among Kindergarten Children: Investigating Predictive Correlations and Performance Differences. *Thinking Skills and Creativity*, 54, 101684. <https://doi.org/10.1016/j.tsc.2024.101684>

Gultom, S. T., Sinaga, R., & Silaban, R. (2023). Application of Scientific Approach-Based Learning Assisted by Question Cards and Ladder Snake Media for Evaluating Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, 9(10), 8091-8098. <https://doi.org/10.29303/jppipa.v9i10.2633>

Habibi, M. A. M. (2023). Strategies for Enhancing Early Childhood Science Literacy Through STEAM Education. *Jurnal Penelitian Pendidikan IPA*, 9(12), 11767-11772. <https://doi.org/10.29303/jppipa.v9i12.4960>

Hoskens, J., Vandekerckhove, I., Waele, L. D., Feys, H., Goemans, N., & Klingels, K. (2024). How Do Fine and Gross Motor Skills Develop in Preschool Boys with Duchenne Muscular Dystrophy? *Research in Developmental Disabilities*, 154, 104845. <https://doi.org/10.1016/j.ridd.2024.104845>

Hura, D., Gea, Y. J., & Gea, S. S. (2024). Faktor yang Mempengaruhi Perkembangan Motorik Kasar Anak 3-5 Tahun di Desa Lasara Sawo Kecamatan Sawo Kabupaten Nias. *OBAT: Jurnal Riset Ilmu Farmasi dan Kesehatan*, 2(1), 213-222. <https://doi.org/10.61132/obat.v2i2.264>

Jayanthi, I. A. M., Marsono, M., Made, G. J., & I Komang, S. (2022). Peningkatan Kemampuan Berhitung Permulaan Melalui Media Bahan Alam. *Generasi Emas*, 5(2), 21-32. [https://doi.org/10.25299/gejpiaud.2022.vol5\(2\).10218](https://doi.org/10.25299/gejpiaud.2022.vol5(2).10218)

Kartikaningrum, R., & Mulyani, P. K. (2024). Development of UTAYA: Implementing Snakes and Ladders Media for Contextual Teaching and Learning of Forces in Physics Education. *Jurnal Penelitian Pendidikan IPA*, 10(9), 7018-7029. <https://doi.org/10.29303/jppipa.v10i9.8471>

Kasmiati, K. (2024). Science Learning for Early Childhood Students with Science Games Play. *Jurnal Penelitian Pendidikan IPA*, 10(8), 566-571. <https://doi.org/10.29303/jppipa.v10i8.8330>

Khadijah, K., & Wahyuni, S. (2024). Pengembangan Permainan Tradisional untuk Meningkatkan Perkembangan Anak Usia Dini. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 8(5), 1151-1166. <https://doi.org/10.31004/obsesi.v8i5.6073>

Lita, L., Jatisunda, M. G., Nahdi, D. S., Nurlatifah, I., Rasyid, A., & Cahyaningsih, U. (2023). Peningkatan Keterampilan Motorik Kasar Anak Usia Dini Melalui Permainan Outbond Kids. *Jurnal Educatio FKIP UNMA*, 9(2), 1133-1140. <https://doi.org/10.31949/educatio.v9i2.5274>

Liu, Y., & Zhang, X. (2022). Spatial Skills and Counting Sequence Knowledge: Investigating Reciprocal Longitudinal Relations in Early Years. *Early Childhood Research Quarterly*, 59, 1-11. <https://doi.org/10.1016/j.ecresq.2021.09.013>

Maharani, S. A., & Ramadan, Z. H. (2023). Development of Flash Card Media for Early Reading Student. *Jurnal Penelitian Pendidikan IPA*, 9(10), 8446-8455. <https://doi.org/10.29303/jppipa.v9i10.5491>

Manrique, H. M., Friston, K. J., & Walker, M. J. (2024). 'Snakes and Ladders' in Paleoanthropology: From Cognitive Surprise to Skillfulness a Million Years Ago. *Physics of Life Reviews*, 49, 40-70. <https://doi.org/10.1016/j.plrev.2024.01.004>

Muhayati, E. I., Trisnawaty, W., & Subaidah, S. (2023). Implementation of Discovery Learning Models to Improve Students Mathematic Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, 9(5), 3975-3980. <https://doi.org/10.29303/jppipa.v9i5.2190>

Ningrum, M. A., Niya, L. D. C., & Hamidah, M. (2023). Meningkatkan Kemampuan Motorik Kasar Melalui Permainan Halang Rintang pada Anak Usia Dini. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 7(5), 5133-5142. <https://doi.org/10.31004/obsesi.v7i5.4868>

Nursholichah, K. U., & Yusuf, H. (2024). Ragam Model Pembelajaran pada Pendidikan Anak Usia Dini. *Journal of Education Research*, 5(3), 4036-4040. <https://doi.org/10.37985/jer.v5i3.1313>

Purwanto, S., & Ockta, Y. (2024). Sports Nutrition and Gross Motor Skill Development in Youth Athletes: A Literature Review. *Jurnal Penelitian Pendidikan IPA*, 10(8), 572-579. <https://doi.org/10.29303/jppipa.v10i8.8991>

Rijkiyani, R. P., Syarifuddin, S., & Mauizdati, N. (2022). Peran Orang Tua dalam Mengembangkan Potensi Anak pada Masa Golden Age. *Jurnal Basicedu*, 6(3), 4905-4912. <https://doi.org/10.31004/basicedu.v6i3.2986>

Roesch, S., Moeller, K., & Bahnmueller, J. (2024). Finger Counting, Finger Number Gesturing, and Basic Numerical Skills: A Cross-Sectional Study in 3- to 5-year-olds. *Journal of Experimental Child Psychology*, 242, 105892. <https://doi.org/10.1016/j.jecp.2024.105892>

Sari, N. M., Yetti, E., & Hapidin, H. (2020). Pengembangan Media Permainan Mipon's Daily untuk Meningkatkan Kemampuan Berhitung Anak. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 4(2), 831. <https://doi.org/10.31004/obsesi.v4i2.428>

Setiani, G. A. K., & Handayani, D. A. P. (2022). Permainan Ular Tangga: Media Pembelajaran Siswa Kelas V Sekolah Dasar. *Mimbar Ilmu*, 27(2), 262-269. <https://doi.org/10.23887/mi.v27i2.49128>

Sugiyono, S. (2019). *Metode Penelitian Pendidikan (Kuantitatif, Kualitatif, Kombinasi, R&D dan Penelitian Pendidikan)*. Bandung: CV Alfabeta.

Sulistyo, I. T., Pudyaningtyas, A., & Sholeha, V. (2021). Profil Kemampuan Motorik Kasar Anak Usia 5-6 Tahun. *Kumara Cendekia*, 9(3), 156. <https://doi.org/10.20961/kc.v9i3.50732>

Susiani, T. S., Wahyudi, W., Arifin, R. N., & Salimi, M. (2023). Model Quantum Teaching berbantuan Media Konkret untuk Meningkatkan Hasil Belajar Seni Budaya dan Prakarya Siswa. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 7(6), 6515-6527. <https://doi.org/10.31004/obsesi.v7i6.5349>

Widiyatmoko, A., Putra, A. T., Astuti, B., Rakainsa, S. K., Sutarto, H., Mustikaningtyas, D., & Darmawan, M. S. (2024). Analysis of STEM Knowledge of Pre-Service Science and Mathematics Teacher. *Jurnal Penelitian Pendidikan IPA*, 10(3), 1292-1298. <https://doi.org/10.29303/jppipa.v10i3.5411>

Zamzam, R., Kusmawati, A., Ichsan, I. Z., & Puspitasari, P. R. (2023). Zero Waste Knowledge and Behavior of Early Childhood Pre-Service Teacher in Science Education. *Jurnal Penelitian Pendidikan IPA*, 9(12), 10590-10595. <https://doi.org/10.29303/jppipa.v9i12.5464>

Zhang, D., Geok, S. K., Chan, Y. M., Zaremohzzabieh, Z., Lam, S. K., & He, S. (2024a). Exploring the Effects of a 12-Week Functional Training Program on Fundamental Motor Skills for Primary School Children Aged 6-7. *Children and Youth Services*

Review, 167, 108008.
<https://doi.org/10.1016/j.childyouth.2024.108008>

Zhang, D., Soh, K. G., Chan, Y. M., Feng, X., Bashir, M., & Xiao, W. (2024b). Effect of Functional Training on Fundamental Motor Skills Among Children: A Systematic Review. *Helijon*, 10(23), e39531.
<https://doi.org/10.1016/j.heliyon.2024.e39531>