INCREMENTAPEDIA
Jurnal Pendidikan Anak Usia Dini Vol. 8 No.2 (16-22)
e-issn: 2686-3146

THE INFLUENCE OF DIGITAL STORYTELLING MEDIA ON CHILDREN'S NUMERATION LITERACY

Muthia Hanum Akhira[a] Delfi Eliza[b]
[a,b] Universitas Negeri Padang
Correspondence: akhiramuthia@gmail.com

Abstract

The research is motivated by the numeracy literacy among children aged 5–6 years stems from a lack of varied media in early mathematics instruction, causing children to struggle with understanding number symbols and numeral forms. This study aimed to develop, test, and analyze the impact of digital storytelling media on children's numeracy literacy. A quantitative method was employed using a quasi-experimental design with a pre-test and post-test control group arrangement. The sample consisted of 32 children selected via purposive sampling, divided into an experimental class of 16 children (Group B2) and a control class of 16 children (Group B1) at the Masjid Raya Jihad Islamic Kindergarten in Padang Panjang City. A checklist assessment tool was used to measure numeracy literacy indicators: rote counting, one-to-one correspondence, and rational counting. The results showed a notable improvement in achievement scores; the experimental class achieved a mean post-test score of 17.50, surpassing the control class mean of 15.81. Hypothesis testing using an independent sample t-test yielded a significance value (Sig. 2-tailed) of 0.011, which is below the 0.05 significance level. Thus, it can be concluded that digital storytelling media has a significant impact and enhances numeracy literacy skills among children at the Masjid Raya Jihad Islamic Kindergarten in Padang Panjang City.

Keywords: Numeracy literecy, Digital Storytelling, early childhood

INTRODUCTION

Early Childhood Education (ECE) serves as a crucial foundation for a child's growth and development during the "golden age"—defined as ages 0 to 6 under national regulations, or up to age 8 according to international standards (NAEYC, 2009). This stage is characterized as a sensitive period during which children respond to various stimuli to reach their full potential, thereby influencing their future development (Yulianti et al., n.d.). Throughout this sensitive period, all aspects of a child's development—including cognitive, linguistic, physical-motor, moral, and socio-emotional domains—advance rapidly and remain highly responsive to environmental stimulation (Azizah & Eliza, 2021).

The government (Ministry of Education and Culture, 2024) emphasizes that providing educational stimulation during this period is essential for supporting children's physical and mental growth, thereby preparing them to advance to the next level of education. One area of cognitive development requiring urgent early stimulation is literacy—specifically numeracy—which is closely linked to a child's capacity for logical thinking (Khoirunnisa et al., 2022). According to Eliza (2017), literacy is defined as the ability to understand, engage with, utilize, and analyze a subject, signifying that it encompasses more than just reading and writing skills. Literacy competencies within the context of 21st-century education include: 1) reading and writing literacy, 2) numeracy literacy, 3) scientific literacy, 4) financial literacy, 5) digital literacy, and 6) cultural and civic literacy (Setiawan et al., 2019).

Among the various forms of literacy, numeracy is closely linked to everyday life (Khairiah et al., 2023). Numeracy skills are required in all aspects of life—whether at home, at work, or in the community (Ekowati & Suwandayani, 2019). Numeracy literacy encompasses the skills and knowledge to: a) use various mathematical symbols and numbers to solve practical problems across different daily life contexts and analyze information presented in formats such as tables, graphs, and charts; and b) make predictions and decisions based on the interpretation of such analyses (Kanusta et al., 2021). For young children, numeracy literacy is not merely the mechanical ability to perform mathematical calculations; rather, it is the competence to understand, use, and apply early mathematical concepts—such as number operations, addition, subtraction, and the recognition of

geometric patterns—within the context of daily life (Yulia et al., 2021). Numeracy literacy helps children develop logical thinking and the ability to solve everyday problems; for instance, counting objects while playing stimulates the brain to think abstractly (Clements & Sarama, 2009).

However, the reality is that numeracy skills in Indonesia still require serious attention. According to the 2022 Programme for International Student Assessment (PISA) study by the OECD, Indonesia ranked 70th out of 81 countries. At the foundational level, numeracy issues often stem from the early childhood education (PAUD) stage; many children can memorize the sequence of numbers from one to ten but do not yet recognize the visual forms or the numerical symbols themselves (Sudarti, 2022). This limited understanding hinders children from developing the mathematical reasoning required when entering primary school (Tanjung, 2024). This situation creates a gap between the needs of early childhood learners—specifically for enjoyable, interactive, and meaningful learning experiences—and the availability of engaging learning media (Eliza et al., 2026). This disparity between the ideal scenario and the actual reality is clearly evident in the field.

Preliminary observations at the Masjid Raya Jihad Islamic Kindergarten in Padang Panjang revealed that children were not yet optimally able to recognize numeral forms. They struggled to read numbers written by the teacher on the board and could not yet associate the quantity of objects on picture cards with the corresponding numeral symbols. Problem analysis indicated that this situation stemmed from the children's lack of enthusiasm for learning numbers, caused by the use of unengaging instructional media. Teachers had largely relied on conventional methods—such as physical number cards and writing on the board—without incorporating interactive variations. According to Charlesworth and Lind (2009), numerical understanding begins with foundational concepts such as one-to-one correspondence, counting, and grasping quantity. Young children learn that each item counted represents a specific amount—such as when counting toys or other objects—which serves as a crucial step in building a meaningful understanding of numbers.

To address this issue, the use of technology-based learning media or interactive multimedia is considered a highly relevant solution (Suryana, 2021). One potential innovation to implement is digital storytelling media. According to Peck (1989, cited in Maureen et al., 2018), storytelling is a process in which a storyteller uses vocalization, narrative structure, and mental imagery to communicate with listeners. Rahiem (2021) notes that the application of digital storytelling in early childhood education makes learning activities more engaging and communicative while enhancing children's involvement in the learning process. Digital storytelling serves not only as a learning medium but also creates a creative learning experience through storylines, visualizations, and educational messages (Salim, 2026). Furthermore, digital storytelling presents narratives in an engaging manner—incorporating images, sound, animation, and video—which is expected to boost children's attention when learning number concepts (Yenti & Delfi Eliza, 2024); additionally, it conveys stories in a way that is enjoyable, non-didactic, and capable of fostering imagination (Putri & Eliza, 2023).

This medium serves as a method for conveying fictional or real-life stories by integrating multimedia elements—such as images, text, video, audio, and music—into a cohesive and dynamic narrative (Fadillah & Dini, 2021). Various studies indicate that storytelling is an effective learning strategy that not only enhances language skills but also helps children grasp basic mathematical concepts (Rahiem, 2021). Given that digital devices like smartphones and tablets have become part of children's daily lives, the use of digital storytelling is expected to capture the attention of children with short attention spans. Through contextual story visualization, this medium can transform abstract numerical symbol concepts into something concrete and enjoyable, allowing children to learn through play (Maghfiroh & Suryana, n.d.).

Although previous studies have addressed digital media in children's learning, research specifically examining the empirical impact of digital storytelling on the numeracy literacy of children aged 5–6 in Padang Panjang City remains limited. Based on the premise that digital storytelling applications positively influence children's numeracy skills, this study aims to analyze and empirically demonstrate the effect of using digital storytelling media on the numeracy literacy of children at the Masjid Raya Jihad Islamic Kindergarten in Padang Panjang. Theoretically, this article is expected to enrich scholarly discourse on technological innovation in early childhood education, while practically, it aims to make a tangible contribution to teachers in developing effective and engaging early mathematics learning media.

RESEARCH METHODS

The study employs a quantitative approach with a quasi-experimental design. A quantitative approach involves the steps taken to analyze data and the techniques used to interpret analysis results (Hartono, 2018:194). This method was selected to determine the impact of using digital storytelling media on children's numeracy literacy by comparing a group that received the intervention with a group that did not receive the specific treatment. The research was conducted at the Masjid Raya Jihad Islamic Kindergarten in Padang Panjang City.

The research population comprises all 179 children at the school, distributed across 11 classes. A purposive sampling technique was employed. Purposive sampling is a method of selecting a sample based on specific criteria or considerations. In this study, the sample selection was based on the defined population groups (Sugiyono, 2018). From this population, two study groups were selected to represent the population: Class B2 (16 children) served as the experimental group, and Class B1 (16 children) served as the control group.

The data collection instrument consisted of an observation checklist designed based on aspects of early childhood basic numeracy literacy, comprising: (1) rote counting (memorizing the number sequence), (2) one-to-one correspondence, and (3) rational counting (counting quantities). The instrument underwent validation by a subject matter expert (an early childhood education lecturer specializing in literacy) and reliability testing using Cronbach's Alpha via SPSS software. Test results were assessed using a four-level rubric with a scoring scale of 1 to 4, categorized as: Not Yet Proficient/Not Yet Developed (Score 1), Adequate (Score 2), Competent (Score 3), and Proficient (Score 4).

The data for this study were primarily obtained from the children serving as the research sample. The research procedure followed three structured stages: preparation, implementation, and conclusion. The implementation stage began with a pre-test administered to both the experimental and control groups to establish a baseline for each child's numeracy skills. Subsequently, the experimental group received a specific intervention consisting of instruction integrated with digital storytelling media over three sessions. In contrast, the control group continued with conventional number-recognition instruction using picture cards. The implementation phase concluded with a post-test administered to both groups to evaluate the impact of the intervention on the children's number-recognition skills following the instructional period.

The resulting test data were processed using a quantitative analysis approach with the aid of SPSS for Windows software. Prior to hypothesis testing, the researcher conducted prerequisite analyses, including a normality test using the Shapiro-Wilk technique (given that the sample size was fewer than 30 children per group) and a homogeneity test to ensure equality of variance between the groups. Once the normality and homogeneity prerequisites were met, the final stage involved hypothesis testing using the independent sample t-test, a parametric statistical technique. This test was applied to compare the mean gain scores of the experimental and control groups at a significance level of 0.05, thereby allowing the effectiveness of the intervention to be measured empirically

RESULTS AND FINDINGS

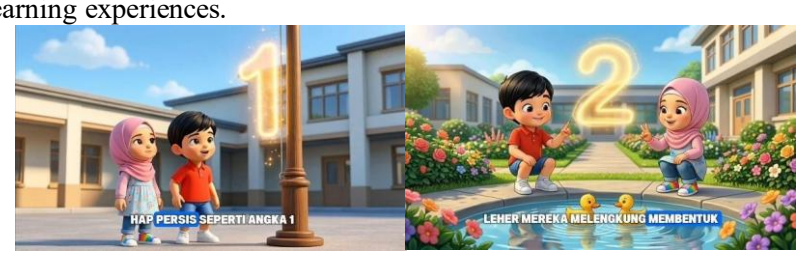
The results of this study demonstrate a focus on empirically verifying the impact of using digital storytelling media on the numeracy literacy skills of children aged 5–6 years at the Masjid Raya Jihad Islamic Kindergarten in Padang Panjang City. Based on the descriptive statistical analysis of the post-test data from both groups, a striking difference in the level of improvement was observed.

1. Rote counting (memorizing the sequence of numbers)

   The results of this study align with the theory proposed by Charlesworth and Lind (2009), which posits that rote counting—defined as a child's ability to memorize the sequence of numbers before grasping their actual meaning—represents an initial stage in numeracy development. This ability serves as a foundation for the subsequent development of number concepts. The findings also concur with Sudarti (2022), who states that early childhood numeracy begins with the gradual ability to recognize, name, and use number symbols. Digital storytelling offers an enjoyable learning experience, making the process of memorizing numbers more effective than conventional instruction that relies solely on number cards and a whiteboard. In conclusion, the study supports the theory of Charlesworth and Lind (2010) that the ability to memorize number sequences can

develop optimally when children receive stimulation that is engaging and suited to their learning characteristics.

2. One-to-one correspondence
   The results of this study align with the theory proposed by Charlesworth and Lind (2009), which explains that one-to-one correspondence is a fundamental skill in early mathematics learning. Children must be able to match a single number with a single object to avoid double-counting or skipping items. These findings are also supported by Utoyo (2017), who states that the concept of number develops through concrete experiences, such as directly counting objects. Digital storytelling provides such concrete experiences through audiovisual media, making it easier for children to grasp the relationship between numbers and quantities. Furthermore, the results are consistent with Piaget's theory of cognitive development, which posits that young children are in the preoperational stage; therefore, instruction should utilize concrete and visual media. Digital storytelling meets these criteria by combining images, sound, animation, and narrative to help children understand the concept of one-to-one correspondence. In conclusion, the study's findings support the theory (Charlesworth & Lind, 2009) that one-to-one correspondence skills develop more effectively when children engage in concrete and engaging learning experiences.
3. Rational counting (determining the total quantity)
   The results of this study align with the theory proposed by Charlesworth and Lind (2009), which states that rational counting is the ability to comprehend the total quantity after the counting process is complete. This stage demonstrates that the child understands the meaning of numbers, rather than merely memorizing a numerical sequence. The findings are further supported by Purpura (2010), who explains that the ability to determine a total quantity is a crucial aspect of numeracy literacy and serves as a foundation for the development of subsequent mathematical operations. Through digital storytelling, children have the opportunity to count objects within a story and subsequently determine the total quantity independently. Furthermore, these results concur with the views of Dogan and Robin (2009), who state that digital storytelling can facilitate mathematics learning by integrating narrative, language, and logical concepts, thereby helping children grasp number concepts in a more meaningful way. It is concluded that digital storytelling media can enhance rational counting skills; thus, the study's findings support the theory of Charlesworth and Lind (2009) that an understanding of quantity develops through engaging, concrete, and meaningful learning experiences.



Gambar1. Contoh Media literasi numerasi anak

The image above is a still from a digital storytelling video created by the researcher. In the segment featuring the number 1, the video explains that the digit resembles a post and represents a single item; children are invited to count the posts. Similarly, for the number 2, children are asked to count the ducks and are introduced to the shape of the digit, likening it to a duck swimming in the schoolyard.

This study employed pre-test and post-test assessments to measure improvements in the numeracy literacy of children at the Masjid Raya Jihad Islamic Kindergarten. On the first day, the researcher conducted a pre-test using a conventional method involving number cards. Following data collection, the researcher administered an intervention using digital storytelling media to enhance the children's numeracy literacy skills. The table below presents the calculated results of the children's pre-test scores.

Tabel 2. Hasil Pre-test Kelas Eksperimen dan Kontrol

VARIABEL	PRE-TEST EKSPERIMEN	PRE-TEST KONTROL
Nilai Terendah	11	10
Nilai Tertinggi	19	16
Rata - Rata	16	14,06

Based on the results above, the pre-test scores for the children's initial numeracy literacy skills at the Masjid Raya Jihad Islamic Kindergarten in Padang Panjang City ranged from a high of 19 to a low of 10, with an average of 14.06. Consequently, the researcher implemented a treatment using digital

storytelling media to enhance the children's numeracy literacy skills.

\To evaluate the impact of using digital storytelling media, the researcher conducted a post-test using an observational method—specifically, assessing the children individually—to measure improvements in their numeracy literacy skills. The following table presents the post-test results regarding the children's numeracy literacy skills after the use of digital storytelling media.

Tabel 3 Hasil Post-test Kelas Eksperimen Dan Kontrol

VARIABEL	PRE-TEST EKSPERIMEN	PRE-TEST KONTROL
Nilai Terendah	15	13
Nilai Tertinggi	20	18
Rata-rata	17,5	15,88

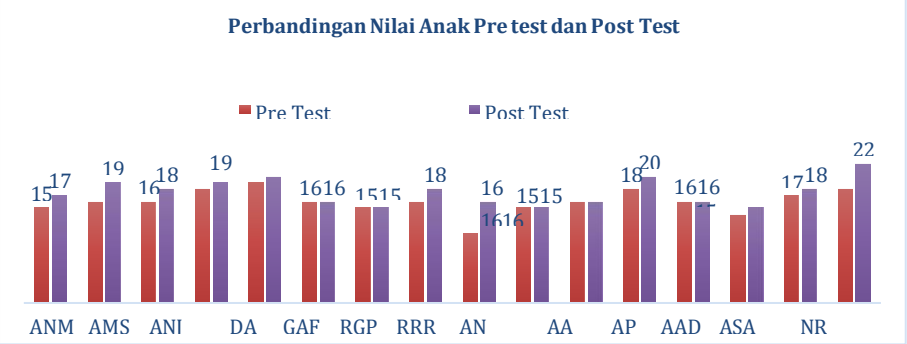
Based on the table above, the post-test results for the children's numeracy literacy skills—following the use of digital storytelling media—show a high score of 20, a low score of 13, and an average score of 15.88. The post-test results indicate that digital storytelling can improve children's numeracy literacy skills; the following is a comparison of the children's pre-test and post-test scores

Tabel 4 Hasil Pre-test dan Post-test Kelas Eksperimen dan Kontrol

Variabel	PRE-TEST EKSPERIMEN	POST-TEST EKSPERIMEN	PRE-TEST KONTROL	POST-TEST KONTROL
Nilai Terendah	11	15	10	13
Nilai Tertinggi	19	20	16	18
Rata-rata	16	17,5	14,06	15,88

Based on the research conducted, the pretest results showed an average score of 16, with a high of 19 and a low of 13. Both the control and experimental classes demonstrated improvement; however, the improvement in the control class was not as significant as that in the experimental class. The researcher outlines the comparison of individual scores between the pretest and post-test in the following chart.

Bagan 1. Perbandingan Nilai Pretest dan Post test



The image above reveals a difference in children's numeracy literacy skills before and after using digital storytelling media. Overall, the children's numeracy literacy skills improved following the use of digital storytelling media. After the intervention involving digital storytelling, the children's numeracy literacy skills increased.

RESULTS AND DISCUSSION

Based on the data analysis, it can be concluded that digital storytelling media has a significant influence on the numeracy literacy skills of children at the Masjid Raya Jihad Islamic Kindergarten in Padang Panjang City. Digital storytelling has been shown to significantly impact children's abilities in rote counting, one-to-one correspondence, and rational counting. Interactive and engaging activities can motivate children's learning, thereby helping them develop numeracy literacy skills in a manner that is concrete, meaningful, and aligned with their cognitive developmental stages. Thus, digital storytelling can serve as an effective learning activity for fostering numeracy literacy in early childhood.

Conclusions

Research findings indicate that digital storytelling provides a meaningful learning experience for children in developing their numeracy literacy skills. Instruction in numeracy literacy using digital

storytelling offers a learning experience that is both contextual and meaningful. The use of dynamic visuals, colors, sound, and narrative arcs proves effective in capturing the attention of children with short attention spans. This implies that transforming early mathematics concepts—shifting them from abstract ideas into forms children can visualize and into an enjoyable learning process—can spark intrinsic motivation; simultaneously, it shifts gadget usage from passive consumption to an interactive learning activity that stimulates cognitive development.

Suggestions

Given the limitations of the scope and timeframe for the intervention in this study, future researchers are recommended to conduct more comprehensive research. This could be achieved by extending the duration of the treatment, expanding the sample size across different early childhood education institutions, and combining quantitative instruments with qualitative approaches to explore the dynamics of children's engagement and logical reasoning processes more fully, deeply, and holistically.

REFERENCES

Azizah, A., & Eliza, D. (2021). Pelaksanaan Metode Bermain Peran dalam Mengembangkan Kemampuan Membaca dan Menulis pada Anak. *Jurnal Basicedu*, *5*(2), 717–723. https://doi.org/10.31004/basicedu.v5i2.798

Charlesworth, R., & Lind, K. K. (2009). *Math& Science for young children* (M. Darnell, Ed.; Sixth Edition).

Clements, D. H., & Sarama, J. (2009). *Learning Trajectories in Early Mathematics-Sequences of Acquisition and Teaching*.

Dogan, B., & Robin, B. (2009). Educational uses of digital storytelling: Creating digital storytelling contests for K-12 students and teachers. *Society for Information Technology & Teacher Education International Conference*, 633–638.

Ekowati, D., & Suwandayani, beti. (2019). *Literasi Numerasi untuk Sekolah Dasar* (R. Anantya, Ed.). UMM PRES.

Eliza, D. (2017). Emergent Literacy Based on Wordless Picture Book to Introduce Minangkabau Cultural Value and Identity for Early Childhood. *International Conference of Early Childhood Education (ICECE 2017)*, 284–288.

Eliza, D., Erita, Y., Hasanah, A., Anisa, N., & Dhanil, M. (2026). Development of a Mobile Role-Playing Game Application to Enhance Scientific and Cultural Literacy in Early Childhood Education. *JOIV: International Journal on Informatics Visualization*, *10*(2), 862–871.

Fadillah, I., & Dini, K. (2021). Digital storytelling sebagai strategi baru meningkatkan minat literasi generasi muda. *Journal of Education Science*, *7*(2), 81–98.

Hartono. (2018). *Metodologi Penelitian (atau dalam beberapa cetakan berjudul lengkap Metodologi Penelitian: Panduan Praktis bagi Mahasiswa dan Peneliti)*. 194.

Kanusta, M., Sahertian, P., & Soraya, J. (2021). Implementasi Gerakan Literasi Minat Baca Dan Hasil Belajar. *Jurnal Penelitian Dan Pendidikan IPS*, *15*(2), 152–156.

Kemendikbud. (2024). *Salinan Permendikbudristek Nomor 8 tahun 2024 tentang Standar Isi Pada Jenjang Paud dikdas dikmen*.

Khairiah, F., Eliza, D., Rakimahwati, R., & Mayar, F. (2023). Development of Early Childhood Science Literacy E-Modules Base Learning Project Method. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *7*(6), 7493–7502. https://doi.org/10.31004/obsesi.v7i6.5814

Khoirunnisa, I., Sianturi, R., & Lidinillah, M. (2022). *Analisis Media Magnetic Number Untuk Meningkatkan Kemampuan Berhitung Anak Usia 5-6 Tahun* (Vol. 4).

Maghfiroh, S., & Suryana, D. (n.d.). *Media Pembelajaran untuk Anak Usia Dini di Pendidikan Anak Usia Dini*.

Maureen, I. Y., van der Meij, H., & de Jong, T. (2018). Supporting Literacy and Digital Literacy Development in Early Childhood Education Using Storytelling Activities. *International Journal of Early Childhood 2018 50:3*, *50*(3), 371–389. https://doi.org/10.1007/S13158-018-0230-Z

NAEYC. (2009). *Developmentally Appropriate Practice*.

Purpura, D. J. (2010). *Informal number-related mathematics skills: An examination of the structure*

of and relations between these skills in preschool (Doctoral dissertation, The Florida State University).

Putri, S. R., & Eliza, D. (2023). Pengaruh storytelling terhadap karakter sopan santun anak usia 5-6 tahun. *Murhum: Jurnal Pendidikan Anak Usia Dini*, *4*(2), 651–665. https://doi.org/10.37985/murhum.v4i2.354

Rahiem, M. D. H. (2021). Storytelling in early childhood education: Time to go digital. *International Journal of Child Care and Education Policy*, *15*(1). https://doi.org/10.1186/s40723-021-00081-x

Salim, A. (2026). Digital Storytelling Berbasis Kearifan Lokal Jember Untuk Meningkatkan Kreativitas Mahasiswa PG-PAUD. *Jurnal Ilmu Multidisiplin*, *6*.

Setiawan, R., Nurani, D., Mardianto, A., Misiyanto, islamiyah, audina, & Komalasari. (2019). *GERAKAN LITERASI SEKOLAH DI SEKOLAH DASAR*.

Sudarti. (2022). PENERAPAN PEMBELAJARAN LITERASI NUMERASI PADA ANAK USIA DINI. *Journal Universitas Muhammadiyah Surakarta*, 130–139.

Sugiyono, T. (2018). Metode Penelitian Evaluasi (Pendekatan Kuantitatif, Kualitatif dan Kombinasi). *Bandung: Alfabeta*.

Suryana, D. (2021). *Pendidikan Anak Usia Dini (Teori dan Praktik Pembelajaran)* (T. editor U. P. editor, Ed.).

Tanjung, B. N. (2024). *Actualization of Numeracy Literacy in Character Education at Elementary School Level in the Era of Disruption*. *3*(2), 55–66. https://doi.org/10.30596/jcositte.v1i1.xxxx

Utoyo, S. (2017). *METODE PENGEMBANGAN MATEMATIKA ANAK USIA DINI*.

Yenti, S., & Delfi Eliza. (2024). Pengembangan Model Buku Cerita Sejarah Pulau Cingkuak Untuk Meningkatkan Literasi Anak Usia Dini Di Tk Pembina 02 Painan. *JPI (Jurnal Pendidikan Indonesia)*, *13*(2), 359–366. https://doi.org/10.23887/jpiundiksha.v13i2.75875

Yulia, R., Eliza, D., Kunci, K., Literasi, :, Pengembangan, ;, Berbahasa, L., Anak, ;, & Dini, U. (2021). PENGEMBANGAN LITERASI BAHASA ANAK USIA DINI. *Universitas Negeri Padang*, *V*(1), 2549–8371. https://doi.org/10.29313/ga:jpaud.v5i1.8437

Yulianti, E., Jaya, I., & Eliza, D. (n.d.). *Pengaruh Role Playing terhadap Pengenalan Literasi Numerasi di Taman Kanak-kanak Twin Course Pasaman Barat*. *2019*(2), 41–50.