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Research Article

THE EFFECT OF DIGITAL STORYBOOK MEDIA ON ENHANCING THE LITERACY SKILLS OF STUDENTS AT SD NEGERI 1 PEUSANGAN SELATAN

Aisyah[1], Alfi Syahrin[2], and Silvi Listia Dewi[3]
[1] Master's Student, Elementary Education Program, Almuslim University, Indonesia
[2] Lecturers, Master's Program in Elementary Education, Almuslim University, Indonesia
[3] Lecturers, Master's Program in Elementary Education, Almuslim University, Indonesia

Corresponding Author:
Aisyah,
Master's Student, Elementary Education Program, Almuslim University, Jl. Tengku Abdurrahman No. 37, Matangglumpangdua, Kecamatan Peusangan, Kabupaten Bireuen, Provinsi Aceh, 24261, Indonesia
Email: aisyah44@gmail.com

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Abstract
Literacy skills are one of the fundamental competencies that elementary school students must possess to support academic success across various subjects. However, students' literacy skills remain relatively low, as indicated by difficulties in understanding reading texts, identifying important information, and interpreting textual meanings. One effort to address this issue is the use of engaging learning media that align with students' characteristics, namely digital story book media. This study aimed to determine the effect of digital story book media on improving the literacy skills of fifth-grade students at SD Negeri 1 Peusangan Selatan. This study employed a quantitative approach using an experimental method with a One Group Pretest-Posttest Design. The sample consisted of 17 fifth-grade students selected through total sampling. Data were collected through literacy skill tests administered before (pretest) and after (posttest) the treatment. Data analysis was conducted using descriptive statistics, normality tests, homogeneity tests, N-Gain analysis, and hypothesis testing through the Paired Sample t-Test. The results showed that the mean pretest score of 58.53 increased to 75.00 in the posttest. The N-Gain analysis yielded a score of 0.397, categorized as moderate improvement. The hypothesis test showed a statistically significant pretest - posttest difference ($t = 9.998$, $df = 16$, $p < .001$). The N-Gain score was 0.397, indicating moderate improvement. These results suggest that students' literacy-test scores were higher after the digital-storybook intervention; however, the one-group design does not establish that the media alone caused the change.

Keywords: Digital Story Book; Elementary Students; Reading Comprehension; Reading Literacy

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INTRODUCTION

Education is one of the primary factors in improving the quality of human resources. In the context of 21st-century education, literacy skills have become a fundamental competency that students must possess to cope with the increasingly complex developments in science, technology, and information. Literacy is no longer understood merely as the ability to read and write, but also as the ability to access, comprehend, process, evaluate, and effectively utilize information in everyday life. Literacy refers to an individual's ability to identify, understand, interpret, create, communicate, and use information through various forms of text in different life contexts (Meniado, 2026; Polomoshnov et al., 2026; Sari et al., 2026). Therefore, strengthening literacy has become one of the primary focuses of educational development in many countries, including Indonesia.

In elementary education, literacy skills play a crucial role as they serve as the foundation for students' success in learning various subjects. Strong literacy skills enable students to understand information, develop critical thinking abilities, solve problems, and communicate effectively. The Ministry of Education, Culture, Research, and Technology (Liu & Shen, 2026; Zanki et al., 2026), emphasizes that literacy is an essential competency that supports learning achievement and character development among students (Pong et al., 2026). Low literacy skills can lead to poor academic performance and difficulties in understanding learning materials across different subject areas.

Despite its importance, various national and international assessments indicate that the literacy skills of Indonesian students still require improvement. The results of the Programme for International Student Assessment (PISA) published by the OECD reveal that Indonesian students' reading proficiency remains below the average of OECD member countries. This condition highlights the need for continuous efforts to improve the quality of literacy instruction from the elementary school level. One factor contributing to low literacy achievement is the suboptimal use of instructional media capable of attracting students' attention and facilitating their active engagement in the learning process (Asniza et al., 2021; Laaksonen et al., 2026).

In addition to literacy skills, listening skills also play an important role in children's language development. Listening is the first language skill acquired by individuals before speaking, reading, and writing. Through listening activities, students obtain information, enrich their vocabulary, understand language structures, and develop thinking and communication skills. Listening skills refer to the ability to comprehend messages, information, and meanings conveyed orally, serving as the foundation for the development of other language skills (Slobodiak, 2026). Therefore, literacy and listening skills should be developed in an integrated manner within elementary school learning processes.

One factor influencing the success of literacy instruction is the use of learning media that align with students' characteristics. Learning media function as tools for delivering instructional messages in a more engaging, concrete, and understandable manner. According to Tafonao (2022), learning media can increase learning motivation, clarify instructional content, and help students understand concepts more effectively (Laili & Sutomo, 2026). Therefore, teachers are required to select and utilize innovative media to make learning more meaningful.

Storybook media are storybooks that combine text and illustrations, making them attractive to students while helping them understand the content more easily. Stories presented in storybooks generally use simple language, clear plot structures, and illustrations appropriate to children's cognitive development levels. The use of storybook media allows students not only to read texts but also to comprehend story meanings through the accompanying images and narratives. Consequently, this medium has the potential to improve students' literacy skills as well as their listening abilities.

The use of digital storybooks can be understood through constructivist and cognitive perspectives. From a constructivist perspective, students actively build meaning by connecting information in a text with prior knowledge and experience (Azim et al., 2026; Ling Shi, 2026;

Lu et al., 2026). Digital storybooks may support this process by combining written language with illustrations and, where available, audio or interactive features. Illustrations can provide contextual clues for unfamiliar words and story events, while audio can model pronunciation and support the connection between spoken and written language. Students can use these cues to identify key information, follow the sequence of events, and interpret the meaning of a story. These are the literacy-related outcomes examined in the present study. Because the study did not separately measure motivation, vocabulary growth, or critical thinking, any effects on those outcomes are treated as possible implications rather than measured findings.

Research, found that the use of illustrated storybooks can improve elementary students' reading comprehension skills (Kao et al., 2016). Showed that illustrated story media can enhance students' reading interest and engagement in learning. Furthermore, concluded that the use of storybooks significantly influences elementary students' literacy skills because it helps them understand reading content and identify important information within texts (Liang et al., 2025). However, most previous studies have focused separately on reading skills, reading comprehension, or reading interest. Research specifically examining the effect of digital storybook media on improving elementary school students' literacy skills remains limited, particularly within the context of elementary schools in Bireuen Regency.

Based on preliminary observations conducted in January 2026 in Grade V at SD Negeri 1 Peusangan Selatan, it was found that students' literacy skills were still not optimal. Some students experienced difficulties in understanding reading materials, identifying important information in texts, and answering questions based on the readings provided. In addition, students' reading interest was relatively low. Observations of the learning process revealed that teachers predominantly employed lecture methods and textbooks as the primary learning resources, resulting in a teacher-centered learning environment with limited active student participation.

This condition differs from the ideal literacy learning environment, which requires active, interactive, contextual, and enjoyable learning processes. Literacy instruction should be capable of increasing students' reading interest, developing deep reading comprehension skills, fostering critical thinking abilities, and actively engaging students in learning activities. Therefore, learning media that integrate visual, narrative, and contextual aspects are needed to help students understand information more effectively.

Based on the above considerations, the use of digital storybook media is viewed as a relevant alternative solution for improving elementary school students' literacy skills. This medium is not only suitable for students' developmental characteristics but is also supported by theories and previous research demonstrating its effectiveness in language learning. Therefore, the researcher was interested in conducting a study entitled "The Effect of Digital Storybook Media on Improving Literacy Skills of Fifth-Grade Students at SD Negeri 1 Peusangan Selatan." It is expected that this study will contribute theoretically to the development of literacy learning research and provide practical benefits for teachers and schools in improving the quality of Indonesian language instruction at the elementary school level.

RESEARCH METHOD

This study employed a quantitative approach using an experimental method with a One Group Pretest - Posttest Design. The research was conducted at SD Negeri 1 Peusangan Selatan, involving 17 fifth-grade students as the research participants. The sample was selected using the total sampling technique. Data were collected through literacy skills tests consisting of a pretest administered before the treatment and a posttest conducted after the implementation of digital storybook media. In addition, observation and documentation were used as supporting data sources for the study.

The literacy test focused on three skills identified in the study context: understanding the reading text, identifying important information, and answering questions based on the text. The

manuscript provided for revision does not specify the number and format of test items, the scoring rubric, the content-validation procedure, item-validity results, reliability coefficient, or the validators' identities. These details must be inserted from the original instrument and validation records before submission: [number and format of items]; [scoring procedure]; [content validator(s) and procedure]; [item-validity method and results]; and [reliability method and coefficient]. No values should be added unless they are supported by the study records.

The collected data were analyzed using descriptive statistics, normality testing (Shapiro - Wilk Test), homogeneity testing (Levene's Test), and N-Gain analysis to determine the level of improvement in students' literacy skills (Habibi et al., 2026). Furthermore, a Paired Sample t-Test was employed to examine the effect of digital storybook media on students' literacy skills. All data analyses were performed using SPSS version 26 with a significance level of 0.05.

RESULTS AND DISCUSSION

This study was conducted at SD Negeri 1 Peusangan Selatan with the aim of determining the effect of using Digital Storybook media on students' literacy skills. The research subjects consisted of 17 students in the experimental class. The research data were obtained through literacy skill tests administered before the treatment (pretest) and after the treatment (posttest).

Table 1. Pretest and Posttest Results of Students' Literacy Skills

No	Inisial	Pretest	Posttest
1	SA	70	85
2	IS	75	90
3	SK	60	75
4	HZ	55	70
5	RE	65	75
6	AK	50	60
7	TM	55	75
8	AT	75	85
9	SR	45	55
10	MZ	55	75
11	MA	75	85
12	CV	50	70
13	MZ	60	70
14	AA	40	75
15	MT	45	70
16	MU	55	75
17	AS	65	85

Based on the data above, the total pretest score was 995 with an average score of 58.53, while the total posttest score was 1275 with an average score of 75.00. This indicates an improvement in students' literacy skills after using Digital Storybook media.

Table 2. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Literacy Skills	34	40	90	66,76	13,020
Valid N (listwise)	34				

Based on Table 2, the descriptive statistical data of students' literacy skills consisted of 34 measurement results, namely 17 pretest scores and 17 posttest scores. The analysis results

showed that the minimum score obtained by students was 40, while the maximum score was 90. The mean literacy score was 66.76, indicating that, in general, students' literacy skills were in the fairly good category. The standard deviation was 13.020, indicating that the distribution of students' literacy skills was quite varied but still centered around the mean value. Meanwhile, the considerable difference between the minimum and maximum scores indicates variations in literacy abilities among students. This may be influenced by internal and external factors, such as concentration level, learning motivation, ability to understand information, and individual learning experiences.

The descriptive statistical results provide an overview that students' literacy skills after the implementation of learning using Digital Storybook media showed positive outcomes and exhibited variations in ability that can still be further developed through more intensive and continuous learning activities.

1. Normality Test

The normality test was conducted to determine whether the students' literacy skill data were normally distributed. In this study, normality testing was performed using the Kolmogorov-Smirnov and Shapiro-Wilk tests with the assistance of SPSS software. Since the sample size was less than 50 participants (n = 17), the decision-making process primarily referred to the Shapiro-Wilk results. The criteria for normality testing were as follows (Di Leo & Sardanelli, 2020; Kwak, 2023):

1. If the significance value (Sig.) > 0.05, the data are normally distributed.
2. If the significance value (Sig.) < 0.05, the data are not normally distributed.

Table 3. Normality Test Results

Tests of Normality

	Group	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Literacy Skills	Pretest	0,155	17	0,200*	0,942	17	0,344
	Posttest	0,206	17	0,054	0,918	17	0,136

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Based on the normality test results in Table 3, the significance value (Sig.) for the pretest data was 0.344 and for the posttest data was 0.136. Both values were greater than the significance level of 0.05. Therefore, it can be concluded that the students' literacy skill data, both in the pretest and posttest, were normally distributed.

The Kolmogorov-Smirnov test also showed significance values of 0.200 for the pretest and 0.054 for the posttest, both exceeding 0.05. These findings further confirm that the research data met the normality assumption. Therefore, the students' literacy skill data fulfilled the requirements for analysis using parametric statistics, specifically the Paired Sample t-Test, to test the research hypothesis regarding the effect of Digital Storybook media on students' literacy skills.

2. Homogeneity Test

The homogeneity test was conducted to determine whether the pretest and posttest literacy skill data had equal variances (homogeneous). Homogeneity testing was performed using Levene's Test with the assistance of SPSS software. The criteria for decision-making were as follows (Troha et al., 2026a, 2026b):

1. If the significance value (Sig.) > 0.05, the data have homogeneous variances.
2. If the significance value (Sig.) < 0.05, the data do not have homogeneous variances.

Table 4. Homogeneity Test Results

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Literacy Skills	Based on Mean	1,499	1	32	0,230
	Based on Median	1,028	1	32	0,318
	Based on Median and with adjusted df	1,028	1	31,480	0,318
	Based on trimmed mean	1,406	1	32	0,244

Based on Table 4, the homogeneity test results using Levene's Test based on the mean showed a significance value of 0.230. This value was greater than the significance level of 0.05 (0.230 > 0.05), indicating that the literacy skill data had homogeneous variances. Other test results also showed significance values greater than 0.05, namely 0.318 for Based on Median, 0.318 for Based on Median and with Adjusted df, and 0.244 for Based on Trimmed Mean. Thus, all test results indicate that the research data had relatively equal or homogeneous variances. Based on these findings, it can be concluded that the students' literacy skill data met the homogeneity assumption. Therefore, the data were suitable for parametric statistical analysis and could proceed to the hypothesis testing stage to determine the effect of Digital Storybook media on students' literacy skills.

4. N-Gain Analysis

The N-Gain analysis was conducted to determine the level of improvement in students' literacy skills after the implementation of Digital Storybook media. This analysis was used to measure learning effectiveness by comparing students' pretest and posttest scores.

Table 5. N-Gain Analysis Results

Pretest Mean Score	Posttest Mean Score	N-Gain	Category
58,53	75,00	0,397	Moderate

Based on Table 5, the average pretest score of students' literacy skills before using Digital Storybook media was 58.53, while the average posttest score increased to 75.00 after the treatment. These results indicate an increase in the average score of 16.47 points following the implementation of Digital Storybook media in learning activities. The N-Gain value obtained was 0.397. This value falls within the range of $0.30 \leq g < 0.70$, which is categorized as a moderate improvement. This category indicates that the use of Digital Storybook media provided a reasonably good enhancement of students' literacy skills.

The improvement in students' literacy skills occurred because Digital Storybook media was able to attract students' attention through engaging stories and illustrations that supported the reading content. Through story-listening activities, students became more focused on understanding information, identifying conveyed messages, and remembering the content of the stories they heard or read.

Therefore, the N-Gain analysis results indicate that Digital Storybook media is fairly effective in improving students' literacy skills. Although the improvement achieved has not yet reached the high category, the use of this media has been proven to provide positive changes in students' learning outcomes, particularly in literacy skills.

5. Research Hypothesis Testing

Hypothesis testing was conducted to determine whether the use of Digital Storybook media had an effect on students' literacy skills. In this study, the hypothesis was tested using the Paired Sample t-Test because the data originated from the same group measured before (pretest) and after (posttest) the treatment. The decision-making criteria were as follows:

1. If the Sig. (2-tailed) value < 0.05, H_0 is rejected and H_a is accepted.
2. If the Sig. (2-tailed) value > 0.05, H_0 is accepted and H_a is rejected.

Table 6. Paired Sample t-Test Results

Paired Samples Test								
	Paired Differences					t	df	Sig. (2-tailed)
		Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Literacy Skills	16,471	6,793	1,647	19,963	12,978	9,998	16	0,000

In line with this view, the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek, 2022) explains that literacy is a fundamental competency that students must possess to support lifelong learning. Students with strong literacy skills tend to understand learning materials more easily, demonstrate better critical thinking abilities, and communicate ideas effectively both orally and in writing. Furthermore, literacy plays an important role in enhancing problem-solving and decision-making skills needed in daily life.

The improvement in students' literacy skills found in this study can be explained through Jean Piaget's constructivist theory. According to Piaget, knowledge is actively constructed by learners through interaction with their environment and meaningful learning experiences. During learning activities using Digital Storybook media, students not only read texts but also observe illustrations, understand story plots, interpret messages contained in the stories, and relate them to their prior experiences. These activities encourage students to construct their own understanding, making the learning process more meaningful and positively influencing the development of literacy skills.

In addition to constructivist theory, the findings of this study are also supported by Jerome Bruner's cognitive development theory, which emphasizes that learning becomes more effective when students acquire experiences through various forms of representation: enactive, iconic, and symbolic. Digital Storybook media integrates visual elements in the form of images and symbolic elements in the form of text, helping students understand information more concretely. Attractive illustrations also assist students in interpreting reading materials, increasing learning focus, and facilitating concept formation in understanding story content.

The results of this study indicate that the use of Digital Storybook media can improve elementary school students' literacy skills. This improvement is reflected in students' ability to comprehend reading materials, identify important information, answer questions based on texts, and retell stories using their own words. These findings suggest that digitally based learning media designed in an engaging manner can create a more interactive and enjoyable reading experience, thereby encouraging active student participation during the learning process.

These findings are consistent with the study conducted by Nurlaila (2022), which concluded that the use of illustrated storybooks could improve elementary school students' reading comprehension skills. The study found that presenting learning materials in story form accompanied by illustrations helped students understand reading content more deeply than conventional learning methods. Relevant illustrations function as comprehension supports, enabling students to grasp the meaning of texts more easily.

Another study conducted by Rahmawati (2023) showed that the use of storybook media significantly improved students' reading interest and literacy skills. Students became more enthusiastic about participating in reading activities, were able to identify important information in texts, and demonstrated greater confidence in expressing information they had obtained. Storybook media also proved effective in creating a more enjoyable learning atmosphere, thereby enhancing students' learning motivation.

The findings of this study are also supported by research conducted by Putri Handayani (2024), which concluded that illustrated story media had a positive effect on improving elementary school students' literacy skills. The study revealed that the use of illustrated story media not only improved reading comprehension but also enriched vocabulary, enhanced critical thinking skills, and helped students develop better communication skills.

Furthermore, research conducted by Sari and Nugroho (2024) found that the use of interactive digital story-based media improved elementary school students' reading skills and information literacy. The results indicated that integrating text, images, animations, and interactive elements into digital media provided a more engaging learning experience, motivating students to read and explore available information. These findings reinforce the results of the present study, suggesting that Digital Storybooks can serve as an effective alternative learning medium for improving students' literacy skills.

Recent research by Pratiwi, Setiawan, and Lestari (2025) also demonstrated that the use of literacy-based digital storybooks improved reading comprehension, critical thinking skills, and student engagement in learning. Students who learned using digital story media achieved better outcomes than those who used conventional reading materials. This occurred because digital media presents information in a more attractive, interactive manner that aligns with the characteristics of today's digital generation.

In the context of elementary education, literacy development serves as a foundation for students' success in learning various subjects. According to Kemendikbudristek (2024), strong literacy skills help students understand learning materials more effectively, improve communication abilities, and foster a lifelong learning culture. Therefore, schools need to provide literacy-rich learning environments through the use of innovative and engaging learning media.

Recent research conducted by Sari and Kurniawan (2024) found that digital-based learning media could improve elementary school students' literacy skills by providing more interactive and enjoyable learning experiences. The study revealed that students who learned using digital media achieved greater improvements in reading comprehension than those who learned through conventional methods. These findings strengthen the argument that the integration of technology into learning can serve as an effective strategy for supporting literacy development in elementary schools.

Moreover, research conducted by Prasetyo and Handayani (2025) showed that visual-based digital story media could improve reading comprehension, enrich vocabulary, and develop students' critical thinking skills. The presence of illustrations, animations, and interactive features in digital media helps students understand reading materials more concretely, making learning more meaningful. Therefore, the use of Digital Storybook media represents a relevant educational innovation for supporting literacy improvement among elementary school students.

Based on various theories and previous research findings, it can be concluded that the use of Digital Storybook media is an effective instructional strategy for improving elementary school students' literacy skills. This media provides engaging, interactive, and meaningful learning experiences that help students understand information, increase reading interest, enrich vocabulary, and develop critical thinking skills. Thus, the findings of this study further strengthen the importance of utilizing Digital Storybook media as an innovative learning tool to support literacy development at the elementary school level.

During the implementation of this study at SD Negeri 1 Peusangan Selatan, the researcher observed positive changes in students' learning behavior after the use of Digital Storybook media. During classroom activities, students appeared more enthusiastic about participating in reading activities compared to before the treatment was administered. Students were also more active in answering questions, expressing opinions, retelling reading content, and discussing stories with their peers. These conditions indicate that Digital Storybook media not only improves students' literacy skills but also enhances motivation and participation in the learning process.

Overall, the findings of this study demonstrate that Digital Storybook media has several advantages in improving students' literacy skills, namely:

1. Helping students understand reading materials through a combination of text and illustrations.
2. Increasing students' interest and motivation to read.
3. Facilitating students in identifying important information from reading materials.
4. Assisting students in developing critical thinking skills and the ability to draw conclusions from stories.
5. Creating a more engaging, active, and enjoyable learning environment.
6. Helping students enrich their vocabulary and improve communication skills.

Based on the statistical analysis, relevant theories, and previous research findings, it can be firmly stated that the use of Digital Storybook media has a positive and significant effect on improving the literacy skills of students at SD Negeri 1 Peusangan Selatan. Digital Storybook media has proven to be an effective learning tool in supporting literacy enhancement programs in elementary schools, as it improves reading comprehension, broadens students' knowledge, and develops critical thinking skills needed in the learning process. Therefore, Digital Storybook media is worthy of being adopted as an alternative literacy learning medium that can be implemented sustainably in elementary schools.

CONCLUSION

Based on the results and discussion regarding the effect of Digital Storybook media on the literacy skills of fifth-grade students at SD Negeri 1 Peusangan Selatan, the following conclusions can be drawn:

1. The use of Digital Storybook media has a positive and significant effect on improving the literacy skills of fifth-grade students at SD Negeri 1 Peusangan Selatan. This is evidenced by the increase in students' average scores from the pretest to the posttest, the N-Gain value which falls within the moderate category, and the hypothesis testing results showing a significance value of $0.000 < 0.05$.
2. The use of Digital Storybook media contributes positively and significantly to the enhancement of students' literacy skills. Digital Storybook media helps students understand story content, identify important information, improve concentration while listening, and develop their ability to comprehend and interpret information obtained from reading materials and stories presented during the learning process.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the authors used ChatGPT (OpenAI) to assist with language refinement, grammatical corrections, and the organization of the text. The authors have reviewed and edited the AI-assisted content and take full responsibility for the accuracy, originality, and integrity of the published work.

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AUTHOR CONTRIBUTIONS

Author 1: Conceptualization, research design, methodology, and manuscript drafting.
Author 2: Data collection, data analysis, and interpretation of findings.
Author 3: Validation, manuscript review, editing, and supervision. All authors reviewed and approved the final version of the manuscript and agreed to be accountable for its content.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known financial or non-financial competing interests that could have influenced the research, analysis, or publication of this manuscript.

REFERENCES

Asniza, I. N., Zuraidah, M. O. S., Baharuddin, A. R. M., Zuhair, Z. M., & Nooraida, Y. (2021). Online game-based learning usıng kahoot! to enhance pre-universıty students' active learning: A students' perception in biology classroom. *Journal of Turkish Science Education*, *18*(1), 145–160. https://doi.org/10.36681/tused.2021.57

Azim, H. M., Lee, R. Y., Sprague, A. V., & Near, C. P. (2026). A primer on critical constructivism and its relevance to medical education. *Discover Education*, *5*(1), 873. https://doi.org/10.1007/s44217-026-02141-1

Di Leo, G., & Sardanelli, F. (2020). Statistical significance: P value, 0.05 threshold, and applications to radiomics—reasons for a conservative approach. *European Radiology Experimental*, *4*(1), 18. https://doi.org/10.1186/s41747-020-0145-y

Habibi, M. W., Wardah, E., & Septiyanti, N. D. (2026). Enhancing Students' Computational Thinking through IoT Stater Kits: A Quasi Experimental Study Using a Pretest-Posttest Control Group Design. *SAR Journal - Science and Research*, *9*(1), 24. https://doi.org/10.18421/SAR91-03

Kao, G. Y.-M., Tsai, C., Liu, C.-Y., & Yang, C.-H. (2016). The effects of high/low interactive electronic storybooks on elementary school students' reading motivation, story comprehension and chromatics concepts. *Computers & Education*, *100*, 56–70. https://doi.org/10.1016/j.compedu.2016.04.013

Kwak, S. (2023). Are Only *p* -Values Less Than 0.05 Significant? A *p* -Value Greater Than 0.05 Is Also Significant! *Journal of Lipid and Atherosclerosis*, *12*(2), 89. https://doi.org/10.12997/jla.2023.12.2.89

Laaksonen, J., Vainio, A., & Korhonen, H. (2026). Generative AI-Assisted Competitive Microlearning Strategy: Development and Validation of the Plomp Model in Classroom Teacher Education in Finland. *Journal of Paddisengeng Technology*, *2*(3), 156–168. https://doi.org/10.65224/jopate.v2i3.284

Laili, W. R., & Sutomo, M. (2026). *Application of Padi Media (Diagram Board) in Improving Learning Motivation and Mathematics Learning Outcomes of Class V Students of Madrasah Ibtidaiyah*. *10*(6).

Liang, C., Zhang, L., & Sun, J. (2025). The Comparative Impact of Digital and Print Storybook Readingon Preschool Children's Comprehension and Vocabulary Learning: A Two-Decade Meta-Analysis. *International Journal of Early Childhood*, *57*(2), 547–573. https://doi.org/10.1007/s13158-024-00410-4

Ling Shi. (2026). An Analysis of Constructivist Theory in Chinese Literacy Education and Policy. *International Educational Research*, *9*(4), p10. https://doi.org/10.30560/ier.v9n4p10

Liu, L., & Shen, H. (2026). Fostering Critical Thinking Through STEM Undergraduate Research: Mechanisms and Challenges in a Chinese Research University. *Thinking Skills and Creativity*, *61*, 102173. https://doi.org/10.1016/j.tsc.2026.102173

Lu, Y., Hwang, G., & Tu, Y. (2026). Self-Explanation-Guided Virtual Museum Learning for Knowledge Co-Construction Based on the Constructivist Framework: A Randomised Control Study. *Journal of Computer Assisted Learning*, *42*(4), e70296. https://doi.org/10.1002/jcal.70296

Meniado, J. C. (2026). Artificial Intelligence Pollution in Digital Environments: Mitigating Adverse Impacts on Language Education through Multiliteracies Integration. *RELC Journal*, *57*(2), 287–295. https://doi.org/10.1177/00336882261458037

Polomoshnov, J., Masso, A., & Lobanova, K. (2026). Comparing Digital, Data, and AI Literacy: A Narrative Review. *Information Polity*, *31*(1), 13–26. https://doi.org/10.1177/15701255251401863

Pong, M., Dara, S., & Jayasundara, N. S. (2026). ChatGPT, Achievement Motivation, and Problem-Solving: Evidence from Thai and Cambodian Undergraduates. *Journal of Paddisengeng Technology*, *2*(3), 212–223. https://doi.org/10.65224/jopate.v2i3.289

Sari, N. K., Mahanal, S., & Lestari, S. R. (2026). Exploring the conceptual of human physiology literacy: A systematic literature review. *Social Sciences & Humanities Open*, *13*, 102581. https://doi.org/10.1016/j.ssaho.2026.102581

Slobodiak, S. (2026). Teaching listening as a key competency for developing communication skills in English. *Scientific Bulletin of the Izmail State University of Humanities Section «Pedagogical Sciences»*, (74), 246. https://doi.org/10.31909/26168812.2026-(74)-25.246-253

Troha, L., Šraj, B., Par, M., Simeon, P., Haugen, H. J., Tarle, Z., Marciuš, M., & Marovic, D. (2026a). Filler amount influences long-term mechanical stability of experimental dental composites. *Dental Materials*, *42*(6), 1020–1030. https://doi.org/10.1016/j.dental.2026.02.012

Troha, L., Šraj, B., Par, M., Simeon, P., Haugen, H. J., Tarle, Z., Marciuš, M., & Marovic, D. (2026b). Filler amount influences long-term mechanical stability of experimental dental composites. *Dental Materials*, *42*(6), 1020–1030. https://doi.org/10.1016/j.dental.2026.02.012

Zanki, A. S., Erwin, E., Flores, J., & Malik, F. (2026). Re-authoring Resilience: Narrative Counseling Approaches for Supporting Students in Post-Crisis Educational Settings. *International Journal of Educational Narratives*, *4*(5), 1797–1816. https://doi.org/10.70177/ijen.v4i5.4445

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