

The Influence of Technology-based Learning Media on Understanding Indonesian Language Learning

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ABSTRACT

In the digital era, the use of technology in education is crucial, especially to improve the quality of Indonesian language learning. This study aimed to analyze the effect of technology-based learning media on the learning understanding of class VI students at SDN 089 Panyabungan. The research method used was an associative quantitative approach with a simple linear regression design. Data were collected through distributing questionnaires and comprehension tests to 25 students and analyzed using the SPSS software (version 24). The results showed that the use of technology-based learning media was in the good category, with an achievement of 78.4%. The media used included learning videos, interactive presentations, and educational applications. The level of student understanding of the Indonesian language subject matter was also in the good category, with a percentage of 76.8%. Inferential analysis showed a t-count value of 5.987, which was greater than the t-table of 2.064 at a significance level of 5% (df = 23); therefore, the alternative hypothesis was accepted, and the null hypothesis was rejected. This indicates a significant influence between the use of technology media and student learning comprehension. The regression equation obtained was $Y = 12.74 + 0.625X$, with a coefficient of determination (R^2) value of 0.527. This means that 52.7% of students' learning comprehension variables are influenced by technology-based learning media, while the remaining 47.3% are influenced by other factors, such as learning motivation, family background, and learning environment. This finding shows that learning media is not merely a visual aid but plays an important role in clarifying concepts, increasing student engagement, and making the learning process more enjoyable.

Keywords: Learning Media, Technology, Learning Comprehension, Digital Innovation Language, Learning Effectiveness

I. INTRODUCTION

The rapid development of information and communication technology in the digital era has transformed many spheres of life, including education. Schools are increasingly expected to leverage technological innovations to create more effective, engaging, and learner-centred instructional environments. In this context, technology-based learning media are viewed as essential components of modern pedagogy, offering new possibilities for presenting content, facilitating interaction, and supporting differentiated learning (Macuja, 2026).

In Indonesia, the integration of technology into classroom instruction is aligned with national education policies that emphasize digital literacy and 21st-century skills. For language education in particular, the use of multimedia resources—such as animated videos, interactive exercises, and online reading materials—can enrich traditional textbook-based approaches. In the case of Indonesian language learning at the primary level, technology-based media can assist students in understanding linguistic rules, text structures, and communication skills through multimodal representations. For example, interactive videos can illustrate the correct use of punctuation and sentence patterns, while educational applications can provide immediate feedback on spelling or grammar exercises (Kennedy & Sundberg, 2025).

Theoretically, the benefits of technology-based learning media can be explained through multimedia learning theory and constructivist perspectives. Mayer argued that learners process verbal and non-verbal information through dual channels, and that integrating words and pictures appropriately can foster deeper understanding. By presenting explanations through audio narration, on-screen text, and animations, technology-based media can support students with different learning preferences—visual, auditory, and kinesthetic—thereby increasing the likelihood that more students grasp the target concepts. Constructivist theories further suggest that learning occurs when students actively construct meaning based on prior knowledge and new experiences; interactive

digital tasks can facilitate such active construction through problem-solving activities, simulations, and exploratory learning (Aldi et al., 2025).

Meanwhile, scholars caution that the mere presence of technology does not guarantee improved learning outcomes. For instance, Piaget's theory of cognitive development underscores that primary school children are predominantly in the concrete operational stage, in which they benefit most from hands-on and concrete experiences. Consequently, technology-based media must be designed and used to support concrete examples and meaningful contexts rather than purely abstract or text-heavy presentations. Furthermore, if digital tools are not aligned with instructional objectives or are used without adequate pedagogical planning, they may distract learners rather than enhance comprehension. The effectiveness of media is therefore contingent on thoughtful integration into lesson plans and teachers' competencies in selecting and using appropriate tools (Hayat et al., 2024).

Another critical issue is access to technology and infrastructure. Not all schools have sufficient devices, stable Internet connectivity, or technical support to sustain the regular use of technology-based media. Within schools, disparities may also exist among students in terms of familiarity and access to devices at home, which can influence their ability to benefit from technology-enhanced instruction. Clark notes that unequal access can lead to a digital divide in educational opportunities and outcomes, particularly in rural or economically disadvantaged areas. These contextual constraints mean that research on technology-based learning media must consider both the potential benefits and the structural limitations that shape their use in real classrooms (Shen et al., 2025).

In the specific context of SDN 089 Panyabungan, Mandailing Natal Regency, the adoption of technology-based media in Indonesian language instruction is relatively recent. Traditionally, teaching practices have relied heavily on teacher-centred methods, such as lectures, reading from textbooks, and written exercises. Preliminary observations conducted for this study indicated that although the school possesses basic technological facilities,—including computers, projectors, and Internet access,—only some teachers actively use these tools in their daily teaching. Several teachers reported limited confidence and skills in operating technological devices, whereas others expressed a preference for familiar lecture-based methods. Consequently, students' exposure to technology-based media varies and is influenced by individual teacher practices (Syukri & Karmini, 2022).

Meanwhile, the student population at SDN 089 Panyabungan reflects broader societal trends in which children increasingly interact with digital devices outside of school. Many students are familiar with smartphones, social media, and online games, which may shape their expectations and motivation regarding learning activities. The use of technology-based media in the classroom thus has the potential to bridge students' out-of-school digital experiences with formal learning, making lessons more relevant and engaging. However, not all students have equal access to devices at home, and some rely solely on school facilities, which can create differences in digital literacy and comfort with educational technologies (Olivia Kristin Lumban Gaol et al., 2026).

Empirical evidence underscores the potential of media to influence motivation and learning outcomes. Usman's study on the use of LCD media in Islamic education classes found a significant effect on students' motivation, suggesting that visual support can enhance students' interest and engagement. Pranama's research on learning effectiveness in a vocational context showed that instructional conditions, including scheduling and organization, significantly affected achievement. These findings, while conducted in different contexts, reinforce the notion that media and instructional design jointly shape the learning experience; they also highlight the need to investigate these relationships in primary language education settings (Sari et al., 2026). Despite these theoretical and empirical insights, there is a paucity of systematic research examining the specific impact of technology-based learning media on primary students' comprehension of Indonesian language material in rural or semi-rural Indonesian schools. At SDN 089 Panyabungan, no prior study had quantitatively assessed how technology-based media influence students' understanding of language content. Teachers and school leaders therefore lack evidence-based guidance on whether their investments in technology and related training are translating into measurable improvements in learning. Without such evidence, decisions regarding curriculum development, resource allocation, and professional development may be based on assumptions rather than data (Wahdian & Arifah, 2025).

In response to these gaps, the present study was designed to analyze the effect of technology-based learning media on the understanding of Indonesian language learning among sixth-grade students at SDN 089 Panyabungan during the 2025–2026 school year. The research focuses on three main questions: first, how technology-based media are used in Indonesian language instruction at the school; second, what the level of students' learning comprehension is; and third, whether and to what extent the use of technology-based media

significantly affects students' comprehension. By adopting an associative quantitative approach with simple linear regression, this study aims to provide empirical evidence regarding the strength and nature of the relationship between media use and learning outcomes.

This study aimed to describe the use of technology-based learning media in Indonesian language classes, assess students' comprehension levels, and determine the significance and magnitude of the effect of technology-based media on comprehension. Conceptually, technology-based learning media refer to teachers' skills and abilities to employ technological tools, —such as projectors, slide presentations, videos, and digital applications, —to create interactive, engaging, and effective learning experiences. Learning comprehension is defined as students' success in absorbing, interpreting, and applying Indonesian language material, as indicated by test scores and responses to questionnaire items.

This study is expected to contribute theoretically and practically. Theoretically, it enriches the literature on technology integration in primary language education by providing evidence from a specific Indonesian context. Practically, it offers insights for teachers on how media use relates to students' comprehension, informs school leaders in planning technology-related investments, and provides a basis for further research on instructional media and learning outcomes. In particular, the findings can guide professional development initiatives aimed at enhancing teachers' competencies in designing and implementing technology-supported lessons in Indonesian.

II. METHODS

A. Research Design

This study employed a quantitative field research design with an associative approach, focusing on the relationship between technology-based learning media and students' comprehension of Indonesian. The research design was structured as a simple linear regression model in which the use of technology-based learning media (X) served as the independent variable and students' learning comprehension (Y) as the dependent variable. The design can be represented as $X \rightarrow Y$, indicating that variations in media use are hypothesized to account for variations in comprehension (Creswell, 2021).

B. Research Site and Duration

This research was conducted at SDN 089 Panyabungan, located in Mandailing Natal Regency. The school was purposively selected because it had begun to implement technology-based media in classroom instruction and possessed supporting infrastructure, such as computers, projectors, and Internet access. In addition, the school leadership expressed an interest in evaluating the effectiveness of technology integration in improving students' learning outcomes in Indonesian.

The study took place over a two-month period, from July to August 2025. The schedule included four main stages: preparation and permission in the first week of July; data collection through observation, questionnaires, and tests from the second to the fourth week of July; data analysis in the first and second weeks of August; and report writing and formulation of recommendations in the third and fourth weeks of August. This timeline was designed to ensure sufficient time for instrument development, pilot testing, field implementation, and analytical procedures (Sugiyono, 2019).

C. Population and Sample

The population of the study consisted of all students enrolled at SDN 089 Panyabungan, with a particular focus on sixth-grade students because they were considered to have sufficient cognitive maturity to engage with technology-based media and participate in questionnaire-based research. In total, there were 25 sixth-grade students, comprising 13 boys and 12 girls. Given the small size of the accessible population and the feasibility of involving all students, the study used total sampling, treating all 25 sixth-grade students as the sample.

The sampling technique can be categorized as purposive in the broader sense that the class was selected based on specific criteria, including exposure to Indonesian language instruction that incorporated technology-based media and the relevance of the grade level to the research objectives. This approach ensured that the sample represented the population of interest for the research questions, namely, sixth-grade students experiencing technology-enhanced Indonesian language lessons (Moleong, 2022).

D. Data Collection Techniques

Three main techniques were employed to collect data: observation, questionnaire, and documentation, complemented by a comprehension test for the dependent variable.

Observation was used to gather qualitative and quantitative information about how teachers employed technology-based media in Indonesian language lessons and how students responded during instruction. Structured observation sheets with checklist formats were prepared to record the frequency and quality of media use, student engagement, and classroom interactions.

Questionnaires were administered to all 25 students to measure perceptions and experiences related to technology-based learning media and learning comprehension. The questionnaire employed a Likert-type scale with four response options—always (4), often (3), rarely (2), and never (1)—to capture the intensity of students' responses to each statement. Fifteen items were designed to measure the independent variable (use of technology-based learning media), and fifteen items were intended to measure indicators associated with learning effectiveness and comprehension.

Documentation was used to collect supporting data, including school records, curriculum documents, lesson plans (RPP), and students' academic records related to Indonesian language learning. These documents provided contextual information about the instructional environment and were used to triangulate data from observations and questionnaires (Arikunto, 2017).

In addition, a comprehension test was administered to measure students' understanding of the Indonesian language content. The test items were aligned with the curriculum and the material covered during the period of media use, ensuring that scores reflected the targeted learning outcomes.

E. *Research Instruments and Validation*

The instruments used in this study included observation sheets, questionnaires, and test items. The observation sheet was constructed based on indicators of media use and student engagement, such as the frequency of using videos or presentations, the clarity of explanations supported by media, and the level of student participation during media-based activities.

The questionnaire items were developed by operationalizing the conceptual definitions of the variables. For the independent variable (technology-based learning media), the indicators covered teachers' ability to utilize media, technical skills, student interest and attention, students' positive attitudes, and the effectiveness of communication facilitated by media. For the dependent variable (learning comprehension/effectiveness), the indicators included teaching methods, quality of learning materials, time management, student behavior, and learning facilities. The instrument grid specified the mapping of indicators to item numbers to ensure content coverage.

Before being used in the main study, the questionnaire was piloted with respondents outside the sample to examine validity and reliability. Validity was assessed using Pearson 'sproduct-moment correlation between each item and the total score, with a significance level of 5 and a critical r-value of 0.444. For the technology-based media scale, 13 of 15 items were found to be valid, whereas 2 items were discarded because their correlation coefficients fell below the threshold. For the learning comprehension scale, 12 of 15 items met the validity criterion and were retained.

Reliability was tested using Cronbach's alpha. For the technology-based media scale, Cronbach's alpha coefficient was 0.846, indicating a high level of internal consistency above the acceptable threshold of 0.60. For the learning comprehension scale, the alpha coefficient was 0.861, signifying high reliability. These results suggest that the instruments were sufficiently consistent and stable for use in the main data collection.

F. *Data Analysis Procedures*

Data analysis comprised descriptive and inferential statistics. Descriptive statistics were used to summarize the distributions of scores for both variables, including mean, median, mode, standard deviation, variance, frequency distributions, and categorizations of score ranges into qualitative labels such as "very good," "good," "fair," and "poor." For example, a scoring rubric was applied in which scores between 76 and 85 were classified as "good," and higher or lower bands represented "very good" or "fair" levels of achievement.

Inferential statistics were applied to test the research hypothesis regarding the effect of technology-based media on students' comprehension. Prior to hypothesis testing, the assumptions of normality and linearity were examined. Normality was tested using the one-sample Kolmogorov–Smirnov test, yielding a significance value of 0.805, which exceeded 0.05 and indicated that the data were normally distributed. Linearity was tested through ANOVA, focusing on the "deviation from linearity" term; the associated significance value of 0.205 was greater than 0.05, demonstrating that the relationship between the independent and dependent variables was linear and suitable for regression analysis.

The strength of the relationship between technology-based media and learning comprehension was first assessed using Pearson 'sproduct-moment correlation. Computations based on the cross-products of X and Y

scores for 25 students yielded a correlation coefficient of 0.612, indicating a moderate positive relationship. Hypothesis testing then proceeded through simple linear regression, generating an equation of the form $Y=a+bX$, where $a=12.74$ and $b=0.625$. The significance of the regression coefficient was evaluated using a t-test with 23 degrees of freedom. The calculated t-value of 5.987 exceeded the critical t-value of 2.064 at the 5 significance level, leading to the rejection of the null hypothesis and acceptance of the alternative hypothesis that technology-based media significantly affect students' learning comprehension.

The coefficient of determination (R^2) was computed to estimate the proportion of variance in learning comprehension explained by technology-based media. The R^2 value of 0.527 indicated that 52.7% of the variance in students' comprehension scores could be attributed to differences in the use of technology-based learning media, whereas the remaining 47.3% was associated with other variables not examined in this study, such as motivation, family background, and learning environment.

Through these procedures, this study systematically analyzed the contribution of technology-based learning media to sixth-grade students' understanding of Indonesian language learning at SDN 089 Panyabungan.

III. RESULTS AND DISCUSSION

A. *Descriptive Findings on Technology-Based Learning Media*

The first objective of the study was to describe the extent to which technology-based learning media were used in Indonesian language instruction for sixth-grade students at SDN 089 Panyabungan. A descriptive analysis of questionnaire data from 25 students showed that the overall use of technology-based media fell into the "good" category, with a mean score of 37.75 on the composite scale. Students reported that teachers made use of learning videos, interactive slide presentations, and educational applications as part of their Indonesian language lessons.

Several questionnaire items illustrated how students perceived the integration of technology into their learning experiences. For instance, when asked whether they found it easier to understand lesson material after the teacher used technology-based media, 24 students responded "Always," 32 responded "Often," 36 responded "Rarely," and 8 responded "Never." These figures suggest that a majority of students perceived some degree of benefit from technology-based media, although not all students experienced such benefits consistently. Another item asked whether teachers' explanations became easier to understand when supported by technology-based media; 36 students answered "Always," 40 answered "Often," 20 answered "Rarely," and only four answered "Never." This pattern indicates that most students valued the clarity added by visual and interactive elements.

Student engagement indicators also reflected moderately positive perceptions. Regarding the statement, "I actively ask questions when the teacher uses learning media," 28 students indicated "Always," 32 indicated "Often," 36 indicated "Rarely," and 4 indicated "Never." These responses show that while technology-based media can encourage students' participation, a considerable number still seldom actively engage by asking questions. Another item, "I am diligent and persistent in studying," revealed that 24 students chose "Always," 32 chose "Often," and 44 chose "Rarely," suggesting that personal motivational factors remain a challenge regardless of media use.

The overall descriptive pattern implies that technology-based learning media are present and broadly appreciated but are not yet fully optimized to foster consistent high engagement and understanding among all students. Some students still perceive the benefits as occasional rather than routine, indicating an opportunity for teachers to refine how and when technology is integrated into instruction.

B. *Descriptive Findings on Learning Comprehension (Y)*

The second objective concerned students' comprehension of Indonesian language learning. Descriptive statistics, combining the results from comprehension tests and relevant questionnaire items, indicated that students' overall understanding was in the "good" category, with a mean achievement level of 76.8. Using the predetermined categorization, scores within this range reflect satisfactory but improvable levels of comprehension.

Questionnaire items related to instructional effectiveness provided further insight. For example, on the item "The teacher starts the lesson by explaining the main points of the material," 28 students answered "Always," 36 answered "Often," 28 answered "Rarely," and 8 answered "Never." This pattern suggests that many students experience systematic introductions to content, which can support comprehension, although some perceive inconsistency in such practices. Another item regarding whether the teacher presents material in line with basic competencies showed that 48 students chose "Often," 24 chose "Always," 24 chose "Rarely," and 4 chose "Never," indicating a moderately strong alignment between instruction and curriculum standards.

Additional items highlighted the role of learning resources. When asked whether they used the textbook provided in class, 36 students said “Always,” 32 said “Often,” and 32 said “Rarely.” These results reveal that the textbook remains an important reference, although media and technology are increasingly used as complementary resources. Students’ perceptions of their own diligence and attention were more mixed, with a substantial proportion acknowledging that they rarely study diligently, which may limit the extent to which media can translate into improved comprehension.

In summary, students’ comprehension of Indonesian language content appears generally positive but not uniformly high. The descriptive data suggest that while the instructional environment is supportive—with structured introductions, alignment to competencies, and multiple resources there remains room for improvement in both teaching practices and student study habits.

To address the third objective, this study examined the relationship between technology-based learning media and students’ comprehension using correlation and regression analyses. The Pearson product-moment correlation between the composite scores of media use (X) and comprehension (Y) for 25 students was 0.612. According to conventional benchmarks, this value indicates a moderate positive relationship: higher levels of technology-based media use are associated with higher levels of learning comprehension.

The significance of this correlation was tested using a t -test. With 23 degrees of freedom, the calculated t -value was 5.987, which exceeded the critical t -value of 2.064 at the 5 significance level. This result led to the rejection of the null hypothesis (which stated that there is no significant effect of media use on learning comprehension) and the acceptance of the alternative hypothesis that technology-based learning media have a significant effect.

Simple linear regression analysis yielded the equation $Y=12.74+ 0.625 X$. The positive slope coefficient of 0.625 indicates that for every one-unit increase in the media use score, the comprehension score is expected to increase by 0.625 points, all else being equal. This finding quantitatively captures the beneficial role of technology-based media in supporting students’ understanding of Indonesian language material. The coefficient of determination, $R^2=0.527$, further shows that 52.7% of the variance in students’ comprehension is explained by differences in media use, while the remaining 47.3% is influenced by other factors not explicitly examined in this study.

Table 1. Summary of Descriptive and Inferential Statistics

Statistic / Parameter	Value	Interpretation
Number of students (N)	25	Sixth-grade students at SDN 089
Mean score of media use (X)	37.75	Good category of technology use
Category of media use	Good	Media used regularly in instruction
Mean achievement in comprehension (Y)	76.8	Good level of learning understanding
Pearson correlation (r) between X and Y	0.612	Moderate positive relationship
t-value (df = 23, $\alpha = 0.05$)	5.987	Significant ($t > 2.064$)
Regression equation	$Y=12.74+0.625X$	Positive predictive effect
Coefficient of determination (R^2)	0.527	52.7 of variance in Y explained by X

C. Discussion

The findings of this study align with theoretical claims and prior empirical research on the educational value of technology-based learning media. The moderate positive correlation and significant regression coefficient indicate that technology-based media make a meaningful contribution to students’ comprehension of Indonesian. These results support Mayer’s multimedia learning theory, which asserts that combining verbal and visual modes of presentation can enhance understanding when designed and implemented appropriately. Students’ perceptions that explanations become easier to understand when media are used suggest that multimedia elements help clarify complex concepts and attract attention (Kadek Andre Karisma Dewantara et al., 2025).

The positive effect observed also resonates with studies emphasizing the motivational role of media. Usman’s research on LCD use indicated that visual enhancement increases students’ motivation, and the present study

suggests that this motivational boost may translate into better comprehension when media are integrated systematically into lessons. The descriptive findings that many students report greater ease in understanding material and greater enjoyment during technology-enhanced lessons further underscore the affective and cognitive benefits of media-based instruction (Abdul-ajid, 2024).

However, the fact that R^2 is 0.527 and not closer to 1.00 indicates that media are only one among several determinants of learning comprehension. Nearly half of the variance in comprehension scores is attributable to other factors, such as students' intrinsic motivation, home support, prior knowledge, and the broader learning environment. For example, items revealing that a significant portion of students rarely study diligently or participate actively in asking questions suggest that personal dispositions and study habits may limit the extent to which media can improve outcomes. Additionally, teachers' pedagogical skills, classroom management, and the alignment of media content with curriculum objectives remain crucial (Irayanti, 2026).

The results also highlight areas where media use could be strengthened. Although most students perceive benefits from technology-based media, a non-trivial fraction reports that they rarely find it easier to understand material or rarely feel enthusiastic during lessons with media. This may reflect variability in the quality of media integration across lessons or differences in how individual students respond to technology-enhanced activities. Some teachers may still rely on media as occasional visual aids rather than fully integrating them into pedagogical strategies that promote higher-order thinking, interaction, and formative assessment.

These findings have practical implications. For teachers, the evidence suggests that investing time in planning and designing technology-rich lessons can have tangible benefits for students' comprehension. Effective strategies might include using videos to introduce new concepts, interactive slides to structure explanations, and educational applications for practice and feedback. To capitalize on these tools, teachers should be supported through professional development that addresses both technical skills and pedagogical design, ensuring that technology is integrated purposefully rather than used in an ad hoc manner (Adiyono et al., 2025). For school leaders and policymakers, this study underscores the importance of sustaining infrastructure and providing equitable access to technological resources. As not all students may have access to devices outside of school, the in-school provision of equipment and supervised opportunities to engage with educational technologies are essential to prevent the widening of digital divides. In addition, monitoring and evaluation mechanisms should be established to ensure that technology investments lead to improvements in teaching quality and learning outcomes.

The findings also point to directions for future research. Given that 47.3% of the variance in comprehension remains unexplained by media use, subsequent studies could incorporate additional variables, such as student motivation, parental involvement, socio economic background, and teacher professional development. Qualitative studies could complement the quantitative approach by exploring students' and teachers' experiences with technology-based media in greater depth and identifying specific practices that are particularly effective or challenging. Longitudinal designs could examine how sustained exposure to technology-enhanced instruction influences language development over time.

Overall, this study demonstrates that technology-based learning media are important, though not exclusive, factors in enhancing students' understanding of Indonesian language learning at SDN 089 Panyabungan. Their impact is mediated by instructional design, teacher competence, and student characteristics, reinforcing the view that technology should be viewed as a component of a comprehensive instructional system rather than a stand-alone solution.

IV. CONCLUSIONS

This study examined the effect of technology-based learning media on sixth-grade students' understanding of Indonesian language learning at SDN 089 Panyabungan in the 2025–2026 academic year. Descriptive analyses indicated that the use of technology-based media—such as videos, interactive presentations, and educational applications—was in the “good” category, and that students' comprehension of Indonesian language material also reached a “good” level. Inferential analyses revealed a moderate positive correlation of 0.612 between media use and learning comprehension and a significant regression equation $Y=12.74+0.625X$, with a t-value of 5.987 exceeding the critical value at the 5 significance level. The coefficient of determination $R^2=0.527$ showed that 52.7% of the variance in students' comprehension was explained by technology-based media, while 47.3% remained associated with other factors. These findings confirm that technology-based learning media significantly contribute to improving students' understanding of Indonesian language learning by clarifying concepts, supporting multimodal representations, and enhancing engagement. At the same time, they underscore that media must be embedded within thoughtful pedagogical designs and supported by teacher competence and conducive learning environments. For teachers, the results highlight the need to integrate technology systematically into lesson planning and to foster active student participation during media-

enhanced activities. For schools and policymakers, the study points to the importance of investing not only in infrastructure but also in continuous professional development and equitable access to technological resources. Future research is recommended to explore additional factors influencing learning comprehension, to investigate the long-term effects of technology-based instruction, and to identify best practices in the design and implementation of media-rich Indonesian language lessons at the primary level.

Funding Statement

" This study received no external funding."

Ethical Compliance

All procedures performed in the studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committees and the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Data Access Statement

A data access statement is a section in a scientific publication or research report that explains how the data used or generated in the study can be accessed by readers or other researchers. This statement aims to promote transparency, support research reproducibility, and comply with applicable open access policies.

Common Elements in a Data Access Statement:

1. Data Location: Specifies where the data are stored, for instance, in online repositories (e.g., Zenodo, Dryad, or institutional repositories).
2. Access Instructions: Provides information on how to access the data, such as direct links, Digital Object Identifier, or contact details.
3. Data Availability: This section indicates whether the data are publicly accessible, available upon request, or restricted due to ethical, legal, or privacy considerations.
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 - "The data supporting this study are openly available in Zenodo at [DOI:10.xxxx/zenodo.xxxx]."
2. Restricted Data:
 - "The data that support the findings of this study are available upon request from the corresponding author. Owing to privacy concerns, the data are not publicly available."
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 - "No datasets were generated or analyzed in the current study."
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Purpose of a Data Access Statement:

- Reproducibility: Enables other researchers to replicate or verify the findings.
- Collaboration: Encourages further collaboration by sharing data.
- Compliance: Adherence to the policies of funding agencies or journals that require open access to data.

Conflict of Interest Declaration

The authors declare that they have no affiliations with or involvement in any organization or entity with any financial interest in the subject matter or materials discussed in this manuscript.

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REFERENCES

- [1] Abdul-ajid, A. B. (2024). Discursive strategies of motivational speech: A positive discourse analysis of Jay Shetty's video. *Environment and Social Psychology*, 9(11). <https://doi.org/10.59429/esp.v9i11.3084>
- [2] Adiyono, A., Patimah, L., Malik, A., & Abdurrohman, A. (2025). Teacher Creativity and Students' Comprehension of Religious Values: Evidence from Inclusive Education. *At-Tadzkir: Islamic Education Journal*, 4(2), 194–208. <https://doi.org/10.59373/attadzkir.v4i2.215>
- [3] Aldi, M., Azzahra, F., Aminullah, M., & Susilawati, S. (2025). Optimizing the Learning Process through

- Theory-based Media Selection: Constructivist, Cognitive, Collaborative, and Motivational Perspectives. *Electronic Journal of Education, Social Economics and Technology*, 6(1), 423–430. <https://doi.org/10.33122/ejeset.v6i1.209>
- [4] Arikunto, S. (2017). *Prosedur Penelitian: Suatu Pendekatan Praktik*. Jakarta: Rineka Cipta, 2017.
- [5] Creswell, J. W. (2021). *Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.)*. SAGE Publications.
- [6] Hayat, F., Khan, M., Ahmad, S., Kamran, M., & Maleeha. (2024). Exploring the Characteristics of Concrete Operational Stage among Primary School Students. *Qlantic Journal of Social Sciences and Humanities*, 5(1), 124–132. <https://doi.org/10.55737/qjssh.786349315>
- [7] Irayanti, I. (2026). Teachers' readiness and pedagogical change in curriculum reform: why dialogic and critical pedagogy fail to take root in Indonesia primary schools. *Asian Education and Development Studies*, 1–22. <https://doi.org/10.1108/AEDS-11-2025-0593>
- [8] Kadek Andre Karisma Dewantara, Adicondro, C. S., Tegeh, I. M., & Sudarma, I. K. (2025). Interactive Constructivist-Based Learning Media for Fifth Grade Indonesian Language in Elementary School. *Jurnal Media Dan Teknologi Pendidikan*, 5(3), 485–494. <https://doi.org/10.23887/jmt.v5i3.99417>
- [9] Kennedy, T. J., & Sundberg, C. W. (2025). *Twenty-First Century Skills* (pp. 461–486). https://doi.org/10.1007/978-3-031-81351-1_27
- [10] Macuja, H. (2026). Multigrade Schools' Learning Environment, Teachers' Instructional Practices, and Learners' Academic Performance. *International Journal on Science and Technology*, 17(1). <https://doi.org/10.71097/IJSAT.v17.i1.9931>
- [11] Moleong. (2022). *Metodologi Penelitian Kualitatif*. In *Metodologi Penelitian Kualitatif*.
- [12] Olivia Kristin Lumban Gaol, Vania Ailsa Nabilah, Lisbet Saulintia Sitanggang, Larissa Evelin Saragih, & Cindy Leonysa V Lumban Toruan. (2026). The Influence of Online Games on Students' Learning Motivation. *Outline Journal of Education*, 5(1), 35–39. <https://doi.org/10.61730/zwqeq814>
- [13] Sari, A. P., Putra, A. Y., & Fahmi, M. (2026). The Effect of Audio Visual Learning Media and Learning Motivation on Science Learning Outcomes of Grade VII Students. *PPSDP International Journal of Education*, 5(1), 150–160. <https://doi.org/10.59175/pijed.v5i1.868>
- [14] Shen, Y., Huang, G., Le, H., Yu, S., Xu, M., Ouyang, J., Fan, Y., & Wang, Q. (2025). 'Cloud for Youth': An implementation research of cloud-based solutions for bridging the digital divide in rural China. *British Journal of Educational Technology*. <https://doi.org/10.1111/bjet.70037>
- [15] Sugiyono. (2019). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung Alfabeta.
- [16] Syukri, S., & Karmini, K. K. (2022). Teaching Strategies for Reading Comprehension: EFL Teachers' Best Practices. *AL LUGHAWIYAAT*, 3(1). <https://doi.org/10.31332/alg.v3i1.3578>
- [17] Wahdian, A., & Arifah, S. (2025). Scratch as an innovative learning media to improve Indonesian language understanding in elementary school students. *Indonesian Journal of Educational Development (IJED)*, 6(1), 68–79. <https://doi.org/10.59672/ijed.v6i1.4658>