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The Effectiveness of Technology-Based Learning Methods on Literacy and Understanding of Fiction and Nonfiction Books Among Junior High School Students

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Abstract: This study aims to determine the effectiveness of the technology-based learning method in improving junior high school students' literacy and comprehension of fiction and non-fiction books. The research employed a quantitative approach with a quasi-experimental design (Nonequivalent Control Group Design), involving two classes: an experimental class using the technology-based learning method and a control class using conventional teaching methods. The research instrument was a reading literacy test consisting of 25 multiple-choice questions. Data were analyzed using the Kolmogorov-Smirnov normality test, Levene's test for homogeneity, independent-samples t-test, N-Gain calculation, and effect size measurement. The results showed a significant difference between the posttest scores of the experimental and control classes, with a significance value of 0.000 < 0.05. The average N-Gain score in the experimental class was 0.632 (moderate category) with an effectiveness level of 63.20%, while the control class scored 0.213 (low category). The effect size value of 1.255 was categorized as large, indicating a substantial influence of the technology-based learning method on improving students' literacy and reading comprehension. These findings suggest that technology-based learning is worth implementing as an alternative instructional strategy to enhance students' reading literacy in fiction and non-fiction materials.
Keywords: technology-based learning; reading literacy; fiction books; non-fiction.

Efektivitas Metode Technology-Based Learning terhadap Literasi dan Pemahaman Buku Fiksi dan Nonfiksi Siswa SMP

Abstrak: *Penelitian ini bertujuan untuk mengetahui efektivitas metode technology-based learning dalam meningkatkan literasi dan pemahaman siswa terhadap buku fiksi dan nonfiksi di tingkat SMP. Penelitian menggunakan pendekatan kuantitatif dengan desain kuasi eksperimen Nonequivalent Control Group Design, melibatkan dua kelas: kelas eksperimen yang menggunakan metode pembelajaran technology-based learning dan kelas kontrol yang menggunakan metode pembelajaran konvensional. Instrumen penelitian berupa tes literasi membaca yang terdiri dari 25 soal pilihan ganda. Data dianalisis menggunakan uji normalitas Kolmogorov-Smirnov, uji homogenitas Levene Test, uji independent-samples t-test, perhitungan N-Gain, dan effect size. Hasil penelitian menunjukkan adanya perbedaan signifikan antara hasil posttest kelas eksperimen dan kelas kontrol dengan nilai sig. 0,000 < 0,05. Nilai rata-rata N-Gain kelas eksperimen sebesar 0,632 dengan kategori sedang dengan tingkat keefektifan 63,20%, sedangkan kelas kontrol sebesar 0,213 dengan kategori rendah. Nilai effect size sebesar 1,255 termasuk kategori besar, yang mengindikasikan pengaruh besar metode technology-based learning terhadap peningkatan literasi dan pemahaman bacaan siswa. Temuan ini menunjukkan bahwa technology-based learning layak diterapkan sebagai strategi pembelajaran alternatif untuk meningkatkan literasi membaca siswa pada materi buku fiksi dan nonfiksi.*
Keywords*: technology-based learning; literasi membaca; buku fiksi; nonfiksi.*

1. Introduction

Reading literacy is a fundamental skill that significantly influences both intellectual and social development among students. As emphasized by Shelton & Wexler (2022), literacy should not be seen merely as the ability to comprehend texts, but as a means to cultivate critical thinking and communication skills. In line with this perspective, Cinganotto & Cuccurullo (2019) highlights that literacy in the 21st century is a multidimensional competence encompassing interpretation and evaluation of diverse information sources, including both fiction and nonfiction texts. Similarly, Akor (2024) argue that strong literacy skills are pivotal for long-term academic success and the mastery of 21st-century

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competencies such as collaboration and communication. Nevertheless, the Programme for International Student Assessment (PISA) has consistently reported that Indonesian students' reading performance remains below the international average (Bilad et al., 2024). According to Luo et al. (2024), this situation is primarily influenced by limited instructional media, monotonous teaching strategies, and students' low motivation to read.

The rapid advancement of information and communication technology provides new opportunities to overcome these challenges through more innovative learning strategies. Bruglera (2024) identify technology-based learning as a promising approach that integrates digital devices, applications, and online platforms to enhance teaching and learning effectiveness. V (2024) report that digital pedagogy promotes higher student engagement, particularly because it aligns with the interactive nature of digital-native learners. In addition, Ferreira et al. (2019) demonstrate that the use of visualization and simulation in digital media makes abstract concepts more comprehensible. Faza & Lestari (2025) further argue that the flexibility of self-regulated learning in digital environments constitutes another major advantage, while Shoily (2024) underscores the significance of digital feedback systems in enabling teachers to monitor students' progress in real time. Taken together, these findings suggest that technology-based learning is not merely a supplementary method, but a transformative approach capable of enhancing motivation and overall learning effectiveness.

In the context of reading fiction and nonfiction, technology integration has been widely recognized as a powerful tool to strengthen literacy skills. Alfaruque et al. (2022) found that when digital platforms are designed with audiovisual support, students show greater comprehension and engagement with texts. In line with this, Ashford (2024) argued that interactive applications serve as an effective guide for helping learners distinguish the structural and stylistic features of fiction and nonfiction works. Similarly, Bernal & Dominguez (2023) emphasized that literacy discussions conducted through online platforms contribute to the cultivation of students' critical thinking abilities, while Gulay & Pontillas (2024) noted that digital reading environments tend to foster stronger motivation compared to conventional classrooms. At the same time, Agojo & Cabral (2024) warned that without thoughtful design, the integration of technology in literacy learning may only produce symbolic rather than substantive effects. Considering that Indonesian junior high school students still perform below international literacy benchmarks, this study offers novelty by focusing on the effectiveness of technology-based learning in the local context. Therefore, the research seeks to answer whether technology-based learning can significantly improve students' literacy and comprehension of fiction and nonfiction texts, aiming to provide empirical evidence and practical recommendations for schools and policymakers to enhance sustainable literacy development.

2. Methods

This study adopted a quantitative approach using a quasi-experimental method with a Nonequivalent Control Group Design. According to Sugiyono (2006), this design is appropriate when researchers cannot randomly assign subjects but still need to compare experimental and control groups that already exist in a natural classroom setting. In line with this view, the research involved two seventh-grade classes at SMP Negeri 13 Malang, selected through purposive sampling to ensure relatively similar academic characteristics. One class served as the experimental group, receiving instruction through technology-based learning, while the other acted as the control group, taught with conventional methods. Both groups were administered a pre-test before the intervention and a post-test afterward. The implementation consisted of several stages: preparation, lesson delivery, reflection, and evaluation. In the experimental class, teachers utilized laptops, internet access, and Google Sites to deliver digital reading materials enriched with texts, images, videos, and interactive quizzes. Students engaged in small group discussions and received immediate feedback through online platforms, while assignments and additional readings were accessed digitally. Conversely, the control class relied on printed textbooks and worksheets, traditional teacher explanations, and manual assessment. Pre-tests and post-tests were conducted in both groups, with the experimental group's results analyzed automatically through digital systems, while the control group's results were corrected manually by the teacher.

The primary instrument used was a reading literacy test consisting of 25 multiple-choice items measuring comprehension of fiction and nonfiction texts. The test was developed based on literacy indicators such as understanding, extracting information, acquiring new knowledge, reflecting, and evaluating (Nurhayati

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et al., 2023). Validity and reliability tests were carried out before implementation. Data analysis involved multiple statistical procedures. Normality was tested using the Kolmogorov-Smirnov test, and homogeneity was verified through Levene's test. Independent-samples t-tests were employed to compare mean differences between the experimental and control groups (Al-Kassab & Majeed, 2022). To determine the effectiveness of the intervention, normalized gain (N-Gain) values were calculated and interpreted based on Hake (1998) criteria, while the effect size was measured using Cohen (2019) formula. These analytical techniques were applied to provide comprehensive evidence regarding the impact of technology-based learning on literacy and comprehension of fiction and nonfiction texts among junior high school students.

3. Result and Discussion

The descriptive analysis provided a comprehensive overview of students' literacy and comprehension performance across both groups. As shown in Table 1, the mean score of the experimental class rose substantially from 62.17 in the pre-test to 86.17 in the post-test, while the control class improved from 58.97 to 72.23. This result indicates that although both groups demonstrated progress, the experimental class achieved significantly greater improvement after being exposed to technology-based learning. Beyond the increase in the mean score, the experimental class also exhibited a reduction in the standard deviation from 14.203 to 8.532, suggesting that students' learning outcomes were not only higher but also more evenly distributed. This phenomenon demonstrates that technology-based learning enhanced the overall class achievement while simultaneously reducing disparities between high-performing and low-performing students. Duterte (2024) found similar results, arguing that digital instructional tools reduce achievement gaps by providing more personalized and engaging content. Likewise, Uzorka & Odebiyi (2025) emphasized that the equalizing effect of digital media ensures that students with different initial abilities can still achieve comparable levels of comprehension. Taken together, the descriptive findings highlight that technology-based learning not only supports academic improvement but also promotes equity in the classroom.

The results of assumption testing further confirmed the robustness of the data. As displayed in Table 2, the Kolmogorov-Smirnov test indicated that all pre-test and post-test data were normally distributed ($p > 0.05$). Furthermore, the homogeneity test using Levene's statistic showed a significance value of 0.062 (> 0.05), meaning that the variance across groups was homogeneous. Meeting these assumptions was crucial, as it validated the reliability of subsequent parametric analyses such as the independent samples t-test. Hu & Plonsky (2021) emphasized that the validity of statistical inference in educational studies relies heavily on the fulfillment of assumptions, since violation may lead to misleading interpretations. In this study, the satisfaction of both normality and homogeneity requirements suggests that the differences observed in outcomes were not statistical artifacts but genuine effects of the intervention. This strengthens the claim that technology-based learning is a reliable and effective instructional approach when rigorously evaluated.

Table 1. Descriptive Statistics of Pre-test and Post-test

Group	N	Minimum	Maximum	Mean	Std. Deviation
Experimental Pre-test	35	36	92	62.17	14.203
Experimental Post-test	35	72	100	86.17	8.532
Control Pre-test	35	36	88	58.97	13.136
Control Post-test	35	32	96	72.23	13.193

Table 2. Kolmogorov-Smirnov Normality Test

Group	Statistic	df	Sig.	Result
Experimental Pre-test	0.134	35	0.111	Normal
Experimental Post-test	0.141	35	0.078	Normal
Control Pre-test	0.125	35	0.179	Normal
Control Post-test	0.102	35	0.200	Normal

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Subsequent hypothesis testing confirmed the significance of the intervention. The independent samples t-test, as presented in Table 3, revealed a significance value of 0.000 (< 0.05), indicating a statistically significant difference between the experimental and control groups in their post-test results. The strength of this finding shows that students exposed to technology-based learning substantially outperformed those taught through conventional instruction. This is consistent with the work of Dahl-Leonard et al. (2024), who observed significant gains in reading comprehension when digital media were integrated into instruction. Similarly, Noordan & Md. Yunus (2022) found that technology-supported reading activities enhanced students' interpretative skills by combining text with visual and auditory support. The evidence from this study thus reinforces the claim that digital integration has a transformative impact on reading literacy, far beyond what is typically achieved through teacher-centered methods alone.

Effectiveness was further measured using normalized gain (N-Gain). As presented in Table 4, the experimental group achieved a mean N-Gain of 0.632, categorized as moderate effectiveness (63.20%), while the control group only achieved 0.213, classified as low effectiveness (21.35%). This significant difference indicates that the technology-based learning approach provided much greater educational benefits. Gameil & Al-Abdullatif (2023) argued that digital instructional design enables students to engage in active learning cycles, resulting in higher gain scores compared to traditional practices. Rahmawati et al. (2024) suggested that digital literacy practices stimulate students to reflect critically on texts, further enhancing comprehension. The results of this study therefore confirm that technology-based learning does not only improve scores statistically but also has tangible educational impact, categorized as moderately effective for literacy development.

The effect size analysis provided further confirmation of the strength of the treatment. The calculated Cohen's d value was 1.255, which is classified as large, suggesting that the difference between the experimental and control groups was not only statistically significant but also practically meaningful. According to Venkatapuram (2025), effect sizes above 0.8 indicate a transformative rather than incremental effect in educational interventions. Similarly, Di Pietro & Castaño Muñoz (2025) observed that effect sizes in technology-mediated literacy instruction often surpass those of traditional approaches due to the multimodal nature of digital resources. The strong effect size found in this study reinforces the claim that technology-based learning creates deep and lasting impacts on literacy and comprehension skills, not just superficial improvements.

Taken together, these findings demonstrate convincingly that technology-based learning is substantially more effective than conventional teaching in improving students' literacy and comprehension of fiction and nonfiction texts. Improvements in mean scores, reductions in variability, higher N-Gain values, and the large effect size all converge to affirm its superiority. Furthermore, the findings highlight the pedagogical importance of integrating multimedia elements, interactive quizzes, and digital platforms into instruction, which enhance student engagement, critical analysis, and equitable learning outcomes. Schmitz et al. (2025) emphasized that technology integration transforms reading from a passive to an active process, allowing learners to construct meaning collaboratively. At the same time, as Liu et al. (2024) cautioned, the success of digital interventions depends heavily on meaningful application, supported by teacher training and institutional readiness.

Table 3. Independent Samples t-Test Results

Assumption	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	3.622	0.061	5.250	68	0.000
Equal variances not assumed			5.250	58.204	0.000

Table 4. N-Gain Test Results

Group	Mean Pre-test	Mean Post-test	Mean N-Gain	Category	Effectiveness (%)	Interpretation
Experimental	62.17	86.17	0.632	Medium	63.20%	Moderately Effective
Control	58.97	72.23	0.213	Low	21.35%	Not Effective

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Without thoughtful design, technology may remain symbolic rather than truly transformative. Thus, while this study validates the potential of technology-based learning, it also underscores the need for sustainable strategies that ensure long-term improvements in literacy and comprehension across diverse educational contexts.

4. Conclusion and Suggestions

The results of this study confirm that technology-based learning is highly effective in enhancing literacy and comprehension of fiction and nonfiction texts among junior high school students. The experimental group's mean score improved substantially from 62.17 in the pre-test to 86.17 in the post-test, while the control group only increased from 58.97 to 72.23. Statistical analysis revealed a significant difference between groups ($p < 0.05$), with an N-Gain value of 0.632 in the experimental class (moderate) compared to 0.213 in the control class (low). The effect size of 1.255 further indicated a strong treatment impact. These findings suggest that technology-based learning not only improves achievement but also supports equity across student abilities. Schools are encouraged to integrate digital learning, provide teacher training, and expand classroom innovation. Future research should examine long-term sustainability, implementation across subjects and levels, and qualitative dimensions such as motivation and critical thinking.

References

Agojo, H. P. C., & Cabral, D. M. (2024). A Study on Literacy Enhancement: Assessing the Impact of Technology-Assisted Reading Instruction on English Language Learners. *Journal of Contemporary Educational Research*, *8*(12), 106–120. https://doi.org/10.26689/jcer.v8i12.7662

Akor, S. O. (2024). Measuring the impact of information literacy programs on student success: a review. *Seminars in Medical Writing and Education*, *3*, 74. https://doi.org/10.56294/mw202474

Alfaruque, S. Y., Sultana, S., Rastogi, R., & Jabeen, Z. (2022). Integrating Literature with Technology and Use of Digital Tools: Impact on Learning Outcomes. *World Journal of English Language*, *13*(1), 278. https://doi.org/10.5430/wjel.v13n1p278

Al-Kassab, M. M., & Majeed, A. H. (2022). The Use Of Two-Sample T-Test In The Real Data. *Advances and Applications in Statistics*, *81*, 13–22. https://doi.org/10.17654/0972361722071

Ashford, R. (2024). The Role of Interactive Reading Strategies in Enhancing Reading Comprehension of Lower Primary Students. *Research and Advances in Education*, *3*(12), 46–53. https://doi.org/10.56397/RAE.2024.12.07

Bernal, Y. M. A., & Dominguez, D. S. L. (2023). Critical Literacy In An EFL Learning Virtual Course. *Ciencia Latina Revista Científica Multidisciplinar*, *7*(3), 5278–5299. https://doi.org/10.37811/cl_rcm.v7i3.6549

Bilad, M. R., Zubaidah, S., & Prayogi, S. (2024). Addressing the PISA 2022 Results: A Call for Reinvigorating Indonesia's Education System. *International Journal of Essential Competencies in Education*, *3*(1), 1–12. https://doi.org/10.36312/ijece.v3i1.1935

Bruglera, P. (2024). The Effectiveness of Digital Learning Platforms in Enhancing Student Engagement and Academic Performance. *Journal of Education, Humanities, and Social Research*, *1*(1), 26–36. https://doi.org/10.70088/xq3gy756

Cinganotto, L., & Cuccurullo, D. (2019). Rethinking literacy in the 21st century: A pluriliteracies approach to CLIL. *Lublin Studies in Modern Languages and Literature*, *43*(3), 3. https://doi.org/10.17951/lsmll.2019.43.3.3-11

Cohen, Y. (2019). The Handbook of Cognition and Assessment; Frameworks, Methodologies, and Applications. *Assessment in Education: Principles, Policy & Practice*, *26*(5), 630–635. https://doi.org/10.1080/0969594X.2019.1597679

Dahl-Leonard, K., Hall, C., & Peacott, D. (2024). A meta-analysis of technology-delivered literacy instruction for elementary students. *Educational Technology Research and Development*, *72*(3), 1507–1538. https://doi.org/10.1007/s11423-024-10354-0

Di Pietro, G., & Castaño Muñoz, J. (2025). A meta-analysis on the effect of technology on the achievement of less advantaged students. *Computers & Education*, *226*, 105197. https://doi.org/10.1016/j.compedu.2024.105197

Duterte, J. P. (2024). Technology-Enhanced Learning Environments: Improving Engagement and Learning. *International Journal of Research and Innovation in Social*

p-ISSN 2527-5712 ; e-ISSN 2722-2195 DOI : https://doi.org/10.51169/ideguru.v10i3.2099

Science, *VIII*(X), 1305–1314. https://doi.org/10.47772/IJRISS.2024.8100111

Faza, A., & Lestari, I. A. (2025). Self-Regulated Learning in the Digital Age: A Systematic Review of Strategies, Technologies, Benefits, and Challenges. *The International Review of Research in Open and Distributed Learning*, *26*(2), 23–58. https://doi.org/10.19173/irrodl.v26i2.8119

Ferreira, H., de Oliveira, G. P., Araújo, R., Dorça, F., & Cattelan, R. (2019). Technology-enhanced assessment visualization for smart learning environments. *Smart Learning Environments*, *6*(1), 14. https://doi.org/10.1186/s40561-019-0096-z

Gameil, A. A., & Al-Abdullatif, A. M. (2023). Using Digital Learning Platforms to Enhance the Instructional Design Competencies and Learning Engagement of Preservice Teachers. *Education Sciences*, *13*(4), 334. https://doi.org/10.3390/educsci13040334

Gulay, S. M. E., & Pontillas, P. V. (2024). Reading Motivation and Engagement among Grade IV Learners of Opol West District Schools. *International Journal Of Multidisciplinary Research And Analysis*, *07*(08). https://doi.org/10.47191/ijmra/v7-i08-40

Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. *American Journal of Physics*, *66*(1), 64–74. https://doi.org/10.1119/1.18809

Hu, Y., & Plonsky, L. (2021). Statistical assumptions in L2 research: A systematic review. *Second Language Research*, *37*(1), 171–184. https://doi.org/10.1177/0267658319877433

Liu, S., Reynolds, B. L., Thomas, N., & Soyoof, A. (2024). The Use of Digital Technologies to Develop Young Children's Language and Literacy Skills: A Systematic Review. *Sage Open*, *14*(1). https://doi.org/10.1177/21582440241230850

Luo, S., King, R. B., Wang, F., & Leung, S. on. (2024). English digital reading achievement for East Asian students: identifying the key predictors using a machine learning approach. *Asia Pacific Journal of Education*, 1–17. https://doi.org/10.1080/02188791.2024.2398120

Noordan, M. N. H. bin, & Md. Yunus, M. (2022). Using Digital Comprehension to Improve Reading Comprehension Skills among Young Learners. *International Journal of Academic Research in Progressive Education and Development*, *11*(2). https://doi.org/10.6007/IJARPED/v11-i2/13208

Nurhayati, Ernalida, Syarifuddin, Sholikhah, H. A., & Firanata, A. (2023). Development of Reading Literacy Assessment Questions: An Effort to Improve Students' Critical Thinking. *Journal of Higher Education Theory and Practice*, *23*(2). https://doi.org/10.33423/jhetp.v23i2.5810

Rahmawati, S., Abdullah, A. G., & Widiaty, I. (2024). Teachers' digital literacy overview in secondary school. *International Journal of Evaluation and Research in Education (IJERE)*, *13*(1), 597. https://doi.org/10.11591/ijere.v13i1.25747

Schmitz, M.-L., Antonietti, C., Consoli, T., Gonon, P., Cattaneo, A., & Petko, D. (2025). Enhancing teacher collaboration for technology integration: the impact of transformational leadership. *Computers & Education*, *234*, 105331. https://doi.org/10.1016/j.compedu.2025.105331

Shelton, A., & Wexler, J. (2022). The Development of Reading Comprehension in Adolescents With Literacy Difficulties. In *Handbook of Special Education Research, Volume I* (pp. 272–284). Routledge. https://doi.org/10.4324/9781003156857-23

Shoily, R. A. (2024). Classroom Feedback In The Digital Age: A Comprehensive Analysis. *IOSR Journal of Humanities and Social Science*, *29*(10), 01–04. https://doi.org/10.9790/0837-2910060104

Sugiyono. (2006). Metode Penelitian Pendidikan Pendekatan Kualitatif. In *Alfabeta*. ALFABET. https://digilib.unigres.ac.id/index.php?p=show_detail%5C&id=43

Uzorka, A., & Odebiyi, O. A. (2025). Impact of Digital Learning Tools on Student Engagement and Achievement. *Journal Of Digital Learning And Distance Education*, *4*(1), 1436–1445. https://doi.org/10.56778/jdlde.v4i1.511

V, P. (2024). Impact of Digital Pedagogy on Student Engagement in Higher Education. *International Journal of Teacher Education Research Studies (IJTERS)*, 19–24. https://doi.org/10.63090/IJTERS/3049.1614.0004

Venkatapuram, S. S. (2025). The Transformative Impact: Use of Technology in Elementary Education. *International Journal of Research Publication and Reviews*, *6*(1), 2236–2240. https://doi.org/10.55248/gengpi.6.0125.0424