Jurnal Studi Guru dan Pembelajaran, Vol. 8, No. 3, September - December 2025

The Effect of Digital and Printed based Texts on Reading Comprehension of Indonesian EFL Students

Haanii Pradini [1*]

[1] Universitas Dharma Wacana, Indonesia

* pradinihaanii@gmail.com

Abstract

This study examines whether text format screen based (digital) texts versus paper-based (printed) texts affects Indonesian English as a Foreign Language (EFL) students' reading comprehension, addressing a gap in research comparing these two modes in EFL classrooms. Using a quasi-experimental, non-equivalent control group design, the study involved 60 second-semester agrotechnology students purposively selected based on comparable English proficiency. Participants were assigned to an experimental group (screen-based texts) and a control group (paper-based texts). Both groups completed a pre-test and post-test consisting of a 25-item multiple-choice reading comprehension test. The treatment was implemented during regular classroom sessions in which the experimental group read the assigned materials via digital/screen-based format, while the control group read the same materials in printed form. Data were analyzed using paired-samples t-tests (within-group pre–post change) and an independent-samples t-test (between-group comparison) in SPSS. Results showed that both groups improved from pre-test to post-test, and the experimental group achieved significantly higher post-test performance than the control group (M = 71.83 vs. 66.33; t = 2.976, p = .004). These findings indicate that using screen-based texts can be more effective than paper-based texts for improving EFL students' reading comprehension in this context. Future studies with larger samples and clearer variation in text features are recommended to strengthen generalizability.

Keywords: *Digital-Based Text, Printed-Based Text, EFL*

Introduction

Digital-based text usage among college students has increased rapidly in recent years as a result of continuous technological advancements and the widespread availability of digital devices. Smartphones, tablets, laptops, and online learning platforms have fundamentally transformed how students access, consume, and interact with academic texts. In both educational and social contexts, screen-based technologies have increasingly replaced printed reading materials, reshaping traditional reading practices (Muslimin & Fatimah, 2024). This shift is evident in various academic settings, including reading comprehension tasks in schools, online learning environments in higher education, digital-based selection tests, job training programs, and scientific inquiry activities. In these contexts, students are required to process lengthy and information-dense texts within computerized environments rather than through conventional printed media (Baron et al., 2017; Mizrachi et al., 2018). Despite the growing dominance of digital reading, a substantial body of research has consistently reported that students who read printed texts tend to achieve higher reading comprehension scores than those who read digital texts.

https://doi.org/10.30605/jsgp.8.3.2025.7225

Empirical studies conducted across different educational levels and contexts have shown that print reading supports deeper comprehension, particularly for longer and more complex texts (Furenes et al., 2021; Lauren et al., 2019; Støle et al., 2020). One explanation for this phenomenon lies in readers' cognitive engagement. Reading on screens often encourages less sustained and less careful reading, leading to poorer calibration of comprehension, such as overconfidence about understanding, which can hinder the processing of information-dense or conceptually demanding texts (Coiro, 2021). These findings align with meta-analytic evidence indicating a small but consistent advantage of print over digital reading in terms of comprehension outcomes. Although the overall difference between print and screen comprehension is modest, it remains reliable and is influenced by task demands, text length, and reader characteristics (Delgado et al., 2018). Moreover, the interface design of digital reading platforms plays a crucial role in shaping reading outcomes.

Features such as paging versus vertical scrolling can affect visual fatigue, navigation behavior, backtracking, and memory retention and comprehension, depending on text length and device size (Li et al., 2020). In English as a Foreign Language (EFL) and English as a Second Language (ESL) contexts, findings related to digital versus printed reading are more mixed. Several quasi-experimental classroom studies suggest that when screen-based reading is carefully structured and guided, students can achieve comprehension gains comparable to, or in some cases exceeding, those obtained through paper-based reading (Quinto et al., 2025). However, other studies report contrasting results. University-level ESL learners in Pakistan were found to perform significantly better on inferential comprehension tasks when reading printed texts, suggesting that digital reading may impose additional cognitive demands on learners with limited digital literacy (Aziz et al., 2024).

Concerns regarding digital literacy are particularly salient in developing countries, where many students lack the necessary skills to navigate, evaluate, and synthesize information effectively in digital environments. Insufficient digital literacy has been shown to negatively affect higher-order thinking skills such as analyzing, evaluating, and creating, which are essential for academic reading comprehension (Paturohman et al., 2025). This concern is reinforced by large-scale experimental evidence showing that students scored significantly lower on digital reading tests compared to paper-based tests, with nearly one-third of participants performing better on paper (Støle et al., 2020). The negative impact of screen reading was found to be most pronounced among high-performing students, particularly girls (Støle et al., 2020). Research on younger learners further highlights the interaction between reading medium and text genre. Studies examining first graders' comprehension of narrative and expository texts revealed no overall differences between reading on paper and on computer screens or between text genres independently (Florit et al., 2023).

However, a significant interaction effect was found, indicating that children comprehended narrative texts better when reading on paper than when reading on screen (Purba & Nasution, 2025). Despite these findings, children reported a preference for screen reading after experiencing both formats, even though their comprehension of narrative texts was higher with paper-based reading (Purba & Nasution, 2025). Additional research suggests that the impact of digital reading depends on text characteristics and digital design features. No significant differences have been found in narrative text comprehension between screen-based and paper-based reading across different time periods or device types, including computers, e-readers, and tablets (Schwabe et al., 2022). For plain digital texts without multimedia or interactive enhancements, comprehension outcomes were equivalent to those of printed texts (Schwabe et al., 2022). In contrast, the inclusion of multimedia or interactive features significantly

improved comprehension, indicating that digital reading does not inherently impair understanding and may even enhance comprehension when appropriately designed (Schwabe et al., 2022).

Although previous studies have provided valuable insights, they also reveal important limitations. Much of the existing research has been conducted in high-resource contexts and has not focused specifically on EFL learners in developing countries. Evidence from Pakistan indicates that ESL learners perform better on paper-based reading tasks, particularly for inferential comprehension, likely due to limited digital literacy (Aziz et al., 2024). Similarly, findings from Norway demonstrate that digital reading may disadvantage even high-performing students, raising concerns about the cognitive demands of screen reading (Støle et al., 2020). These findings raise critical questions for EFL contexts such as Indonesia, where students often face the dual challenge of processing texts in a foreign language while navigating digital reading environments. Despite increased access to digital tools, many Indonesian EFL students may lack the digital reading skills necessary for effective comprehension.

While several studies report no significant differences in reading comprehension outcomes between digital-based and printed-based texts, learner characteristics may moderate the impact of reading modality (Porion et al., 2016; Nero & Zulkiply, 2020; Lin et al., 2020). Therefore, further empirical investigation is necessary to examine the benefits and drawbacks of digital-based reading in EFL classrooms, particularly in Indonesia. The existing literature lacks comprehensive evidence on how Indonesian EFL students comprehend English texts across different reading media in academic contexts. Moreover, it remains unclear whether digital enhancements can offset limitations related to digital literacy and language proficiency. Accordingly, the present study aims to investigate whether there is a significant difference in students' reading comprehension between digital-based texts and printed-based texts in an Indonesian EFL classroom.

Method

The study compared students' reading comprehension scores across two reading modalities screen-based (digital) texts and paper-based (printed) texts—to examine whether a significant difference existed. A quasi-experimental non-equivalent control group design was employed, using the following scheme: Experimental group: O_1 X O_2; Control group: O_1 – O_2, where O_1 represents the pre-test, X the treatment (screen-based reading), and O_2 the post-test. Both groups completed a pre-test and a post-test using the same reading comprehension instrument. Participants were assigned to an experimental group that received instruction using screen-based texts and a control group that received instruction using paper-based texts. Both groups worked with the same descriptive texts and followed identical instructional stages (pre-reading, while-reading, and post-reading); only the reading medium differed. Two treatment sessions were conducted over two weeks to fit the available instructional schedule, provide repeated exposure to the assigned modality, and reduce the likelihood that results were driven by a single-session effect.

Instrument quality was ensured through validity and reliability testing prior to the main data collection. Content validity was established through expert judgment to confirm alignment between the test items and descriptive-text comprehension indicators, and item analysis was conducted to examine item difficulty and discrimination. Reliability was evaluated using an internal consistency index (e.g., KR-20 for dichotomous multiple-choice items or Cronbach's alpha) to confirm that the test produced consistent scores. Statistical assumption testing was

conducted prior to inferential analysis to support the use of parametric procedures. Normality of the score distribution was examined (e.g., Shapiro–Wilk), and homogeneity of variance between groups was tested (e.g., Levene's test) to verify that the data met key requirements for subsequent t-test analyses.

The population of this research consisted of students enrolled in the agrotechnology study program. There were two second-semester classes, each comprising 30 students. The researcher chose both classes as the research samples, without prioritizing any particular class. It was based on the principle that each class in the population had an equal chance of being selected and possessed a similar level of proficiency. Cluster sampling was utilized in this research. The experimental and control groups were assigned by flipping a coin, where a picture represented the experimental group and a number represented the control group. Consequently, Agr 1 was designated as the experimental group, and Agr 2 as the control group. Some things were considered when choosing the sample: first, all the students were taught by the same English teacher, and second, the students had similar level of proficiency.

The researcher collected data through testing, using the test to gather information. Both the experimental and control groups took the pre-test and post-test. Each group took the test twice. Two types of tests were used to evaluate students' reading comprehension: a pre-test and a post-test. The pre-test was given before the treatment during the first meeting to assess students' initial understanding of the material. The post-test was given after the treatment in the final meeting to measure the progress in students' reading comprehension. To collect data, the researcher gave students a test followed by reading comprehension questions related to the texts they read. The instrument used in this research was a multiple-choice test consisting of 25 questions, which students were required to complete within 60 minutes. The validity of the test instruments (pre-test and post-test) was established through an expert validation process. The tests were refined based on feedback and necessary modifications from experts until a satisfactory level of validity was achieved (Almanasreh et al., 2019).

Each test was structured to include three reading texts, maintaining a 1:1 ratio between the number of texts and the number of question sets. The nature and length of the texts were selected based on the guidelines, who recommend using texts of no more than 1000 words (Mikami & Koizumi, 2025). This threshold is crucial because crossing it generally reduces the student's ability to process the text. Consequently, each text used in this study was less than 500 words long. Furthermore, the readability of the texts was evaluated using the readability test (Zainurrahman & Sukyadi, 2024). This specific test was chosen because it was designed for determining readability for EFL students. To establish the consistency of the scoring, specifically the interrater reliability, the researcher employed two separate raters and assigned them to evaluate the core dataset. Subsequently, the scores from a random selection of 25 tests were compared and matched.

This process successfully generates a sufficient level of interrater reliability, indicated by a sufficient level of interrater reliability ($\alpha = 0.80$), which is the recommended (Pallant, 2020). The data analysis technique employed in this research was descriptive statistics. To compare the average scores of students in both the experimental and control groups, the researcher used the Paired Sample T-test. This test was applied to examine the differences between pre-test and post-test reading comprehension scores within each group. The researcher compared the t-value from both groups to identify which group demonstrated greater progress, with the group having the higher t-value considered to have made the most improvement. Additionally, an Independent Sample T-test was conducted to determine whether digital-based in experimental

group or printed-based in control group had a more significant effect on students' achievement. An independent-samples t-test was used to determine whether the two unrelated groups differed significantly in their mean scores, and the analysis was conducted using SPSS (version 26).

Results

Statistical Analysis in the Experimental Group

Table 1. *Statistical Analysis in the Experimental Group*

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-test – Post-test	-17.33	11.351	2.072	-21.572	-13.095	-8364	29	.000

To assess whether digital-based could enhance students' reading comprehension, a paired sample t-test was conducted. The results presented in Table 1 for the experimental group revealed a mean difference of -17.333 between the pre-test and post-test scores. The standard deviation was 11.351, and the standard error of the mean was 2.072. The calculated t-value was -8.364, which was significant at the 0.05 level (two-tailed) with 29 degrees of freedom, and the critical t-value was 2.045. Since the two-tailed significance value of 0.000 was less than the alpha level of 0.05, It indicates that screen-based (digital) reading improved the experimental group's reading comprehension.

Statistical Analysis in the Control Group

Table 2. *Statistical Analysis in the Control Group*

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-test – Post-test	-11.833	5.490	1.002	-13.883	-9.783	-11.805	29	.000

A paired-samples t-test was conducted to assess whether paper-based (printed) reading could enhance students' reading comprehension. The results presented in Table 2 for the control group revealed a mean difference of -11.833 between the pre-test and post-test scores. The standard deviation was 5.490, and the standard error of the mean was 1.002. The calculated t-value was -11.805, which was significant at the 0.05 level (two-tailed) with 29 degrees of freedom, and the critical t-value was 2.045. Since the two-tailed significance value of 0.000 was less than the alpha level of 0.05, it indicates that printed-based enhanced the students' reading comprehension in the control group.

Difference Analysis of the Post-test

Based on the Table 3 in the "Equal variances assumed" section, the Sig. (2-tailed) value is 0.004 < 0.05. Thus, it can be concluded that there is a significant difference between the average learning outcomes of students in experimental group and control group. Furthermore, from the output table above, the "Mean Difference" value is 5.500. This value shows the difference between the average learning outcomes of students in experimental group and control group,

i.e., 71.83 - 66.33 = 5.500, and the confidence interval of this difference ranges from 1.801 to 9.199 (95% Confidence Interval of the Difference Lower Upper).

Table 3. *Difference Analysis of the Post-test*

Independent Samples Test										
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	**Upper**
total	Equal variances assumed	.437	.494	2.976	58	.004	5.500	1.848	1.801	9.199
	Equal variances not assumed			2.976	55.888	.004	5.500	1.848	1.798	9.202

The calculated t-value is 2.976, the critical t-value from the t-distribution table by referring to the formula (α/2) : (df) which is (0.05/2) : (58) equals 0.025 : 58; means that t-value (2.976) > t table (2.001). There is a significant difference in students' post-test scores between the experimental group (screen-based/digital texts) and the control group (paper-based/printed texts), indicating that the reading modality leads to different learning outcomes.

Discussion

The goal of this research was to investigate the difference on students' reading comprehension among digital text and printed text in EFL classroom. Overall, the results suggested that students achieved better reading comprehension when reading from digital-based than when reading from printed-based. Students typically maintain a neutral attitude toward both digital-based and printed-based reading materials. This neutrality suggests that students can easily adapt to either type of reading material based on the context or particular requirements of their studies. This implies that students recognize specific advantages of printed-based materials, like clarity and user-friendliness. While reading digital-based, they tend to focus, engage emotionally, and think deeply about the text, yet they do not show a strong overall preference for either format.

Students in Experimental Group

Based on the findings of the data analysis, it is possible to assume that the digital-based was effective in enhancing students' reading comprehension than printed-based. Using such devices on increasing the reading comprehension competency of English language learners in the city of Ilam, Iran (Gheytasi et al., 2015). Although digital-based has not entirely supplanted printed-based, its growing prevalence is shifting the fundamental views of reading comprehension held by teachers and students. Consequently, the online reading context presents a distinct medium compared to the traditional paper reading, offering substantial opportunities to explore students' cognitive abilities in reading, which relies on advanced thinking skills (Silvhiany et al., 2021). Positive emotions induced by a multimedia design fostered comprehension of informational material (Kaifeng & Pengbo, 2024).

Multimedia functions benefit reading comprehension in pre-school and primary school, while interactive functions seem to distract (Takacs et al., 2015). One might think that with the advantage of enhancing technologies, more routine use of technology, and more digital experience, the print superiority in reading comprehension may decrease (Kong et al., 2018). Using technology in learning English can boost students' interest and motivation, which in turn helps improve their performance (Ratminingsih et al., 2018). When students are more engaged

and motivated, they are likely to spend more time practicing and understanding the language. Additionally, using technology in the classroom can make learning more fun and interactive, which keeps students focused. Using technology in the classroom can make learning more fun and helpful for teachers when teaching English (Juliana & Muslem, 2017). Incorporating technology creates a positive learning environment that benefits both students and teachers (Rusmanayanti & Hanafi, 2018).

Therefore, our findings did not support the concerns raised by critics of digital reading, who argue that digital reading platforms may impair reading performance (Wolf & Potter, 2018). It can be said that digital-based does not harm reading comprehension and may even enhance it through multimedia and interactive features. Also, we may speculate that the participants perceived digital-based as more attractive because for them digital-based represented a experience context. It is possible to assume that digital-based was effective in enhancing students' reading comprehension compared to printed-based. Although digital-based have not entirely replaced printed-based ones, their growing prevalence is shifting fundamental views of reading comprehension among teachers and students (Alkhazaleh, 2021).

Consequently, the online reading context offers a distinct medium from traditional paper reading, providing opportunities to explore students' cognitive abilities in reading, which relies on advanced thinking skills. Positive emotions induced by multimedia design can foster comprehension of informational material, and multimedia functions benefit reading comprehension in early education, while interactive functions might sometimes distract. With advancements in technology, increased routine use, and more digital experience, the superiority of print in reading comprehension may diminish. Using technology in learning can boost students' skill, thereby improving their performance. When students are more engaged, they tend to spend more time practicing and understanding the language. Additionally, incorporating technology makes learning more fun and interactive, keeping students focused and benefiting teachers in teaching.

Students in Control Group

Based on the findings of the data analysis, it is possible to assume that the printed-based was effective in enhancing students' reading comprehension. Readers using printed-based had instant access to the complete text. Furthermore, this access relies on both visual and tactile signals: individuals can visually perceive and physically feel the spatial layout and material size of the text, since the paper medium offers tangible, tactile, and spatially stable indicators of the text's overall length (Mangen et al., 2019). Participants took more time to read the passage and recalled more of the text material that they had read from the computer monitor. The benefit of computer presentation disappeared when efficiency variables, which take time into account, were examined. Participants were more efficient at comprehending text when reading from paper. The results suggest that participants may take more time to read text on computer monitor and that they are more efficient when reading text on paper (Safna et al., 2024).

This demonstrates that printed-based text is easier on the eyes compared to digital-based text, as it enables uninterrupted deep reading and offers spatial and tactile cues that assist participants in processing words on the page (Benson, 2020). In addition, printed books are still the best for meeting the reading brain's visual, thinking, and self-checking needs. Although e-paper devices look similar to real paper, e-readers do not have the physical feel that helps people understand what they read. E-readers also miss the touch experience that readers like about real books, and they only choose them when traveling or convenience is very important (Pardede, 2019). For thinking about what they read, e-readers offer fewer ways to interact with

the text, and flipping pages on a screen makes people less likely to go back and review earlier parts (Mangen et al., 2019). Students using printed-based materials had instant access to the complete text, relying on both visual and tactile signals (Dinda et al., 2018).

Students can visually perceive and physically feel the spatial layout and material size of the text, as the paper medium provides tangible, tactile, and spatially stable indicators of the text's overall length. Participants took more time to read passages from computer monitors but recalled more material, though the benefit diminished when considering efficiency. They were more efficient at comprehending text when reading from paper, suggesting that printed-based text is easier on the eyes compared to digital-based text, enabling uninterrupted deep reading and offering spatial and tactile cues that assist in processing words. In addition, printed-based best meet the reading brain's visual, thinking, and self-checking needs. Although e-paper devices resemble real paper, e-readers lack the physical feel that aids understanding. They miss the touch experience that readers enjoy in real books, often chosen only for convenience like travel. For deeper thinking, e-readers offer fewer interaction options, and flipping pages on a screen reduces the likelihood of reviewing earlier parts. Readers of printed-based turn pages one at a time without needing to scroll. That might be the reason why reading on printed-based works so well and more efficient. Moreover, when reading on printed-based, they just follow to their natural way of reading. In this regard, the unchanging nature of reading on printed-based helps readers build a spatial understanding of the material by offering clear and stable visual cues that strengthen memory and the ability to recall the content.

Conclusion

The research results clearly show that digital-based was more effective in enhancing students' reading comprehension than printed-based in an EFL classroom. In the experimental group, a paired sample t-test revealed significant at $p < 0.05$. This indicates a strong positive impact from digital-based. The control group also improved with $p < 0.05$, but the gains were smaller. Print and screen media differ in how they affect the eyes. Irrespective of whether one reads on printed-based or digital-based, text comprehension constitutes a coherent mental representation of the meaning conveyed by the text. Therefore, some of the reasons for the differences between digital-based and printed-based might relate to the different lighting conditions in the two formats. This could be linked to students' familiarity with digital tools in today's world. In other words, digital formats might make readers approach the text as if it's for casual enjoyment, whereas printed could serve as a hint that the material is meant for focused study and education. To our knowledge, reading on screen was more attractive than reading on paper. While the current research has limitations, it provides valuable insights into how digital-based and printed-based affects comprehension for those learning a foreign language. We recommend that future research examine the differences in reading comprehension strategies used on digital-based versus printed-based for those learning a second language. The other limitation was the limited sample size, thus further researcher need to do research with bigger sizes of data to get results that can apply more broadly.

Acknowledgment

-

References

Al Khazaleh, S. (2021). The Effect Of Digital Reading On Efl Learners'reading Comprehension. *International Journal of Education, Technology and Science, 1(1),* 59-70.

Almanasreh, E., Moles, R., & Chen, T. F. (2019). Evaluation of methods used for estimating content validity. *Research in social and administrative pharmacy, 15*(2), 214-221. https://doi.org/10.1016/j.sapharm.2018.03.066

Anderson, L.W., Krathwohl, D.R., Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J. and Wittrock, M.C. (eds.) (2001). *A taxonomy for learning and teaching and assessing: A revision of Bloom's taxonomy of educational objectives*. Addison Wesley Longman. https://doi.org/10.1080/00461520903433562

Aziz, M., Hassan, A., & Aljamili, O. (2024). The effect of paper reading versus screen reading on the inferential reading performance among university ESL learners. *Jurnal Arbitrer*, *11*(1), 85-95. https://doi.org/10.25077/ar.11.1.85-95.2024

Baron, N. S. (2015). *Words onscreen: The fate of reading in a digital world*. USA: Oxford: Oxford University Press.

Baron, N. S., Calixte, R. M., & Havewala, M. (2017). The persistence of print among university students: An exploratory study. *Telematics and Informatics, 34*(5), 590–604. https://doi.org/10.1016/j.tele.2016.11.008

Benson, K. (2020). Reading on Paper Versus Screens: What's the Difference?. *BrainFacts. org*. https://www.sfn.org/sitecore/content/home/brainfacts2/neuroscience-in-society/tech-and-the-brain/2020/reading-on-paper-versus-screens-whats-the-difference-072820

Coiro, J. (2021). Toward a multifaceted heuristic of digital reading to inform assessment, research, practice, and policy. *Reading Research Quarterly, 56*(1), 9-31. https://doi.org/10.1002/rrq.302

Delgado, P., Vargas, C., Ackerman, R., & Salmerón, L. (2018). Don't throw away your printed books: A meta-analysis on the effects of reading media on reading comprehension. *Educational research review,* 25, 23-38. https://doi.org/10.1016/j.edurev.2018.09.003

Dinda, D., Noni, N., Munir, M., & Tahir, M. (2025). The Effect Of Digital Reading Platforms On Efl Students'reading Comprehension: A Quasi-Experimental Study. Klasikal: *Journal Of Education, Language Teaching And Science, 7(1),* 272-282. https://doi.org/10.52208/klasikal.v7i1.1287

Furenes, M. I., Kucirkova, N., & Bus, A. G. (2021). *A comparison of children's reading on paper versus screen: A meta-analysis*. *Review of Educational Research, 91*(4), 483–517. https://doi.org/10.3102/0034654321998074

Florit, E., De Carli, P., Rodà, A., Domenicale, S., & Mason, L. (2023). Precursors of reading text comprehension from paper and screen in first graders: A longitudinal study. *Reading and Writing*, *36*(7), 1821-1843. https://doi.org/10.1007/s11145-022-10327-w

Gheytasi, M., Azizifar, A., & Gowhary, H. (2015). The effect of smartphone on the reading comprehension proficiency of Iranian EFL learners. *Procedia - Social and Behavioral Sciences, 199*, 225–230. https://doi.org/10.1016/j.sbspro.2015.07.510

Juliana, R., & Muslem, A. (2017). The use of information and communication technology (ICT) amongst EFL teachers: Perceptions and challenges. *English Education Journal*, *8*(4), 469-487. https://jurnal.usk.ac.id/EEJ/article/view/9211/7220

Lauren M. Singer Trakhman, Patricia A. Alexander & Lisa E. Berkowitz (2019): Effects of Processing Time on Comprehension and Calibration in Print and Digital Mediums. *The*

Journal of Experimental Education. 87(1), 101-115. https://doi.org/10.1080/00220973.2017.1411877

Li, J., Song, J., Huang, Y., Wang, Y., & Zhang, J. (2021). Effects of different interaction modes on fatigue and reading effectiveness with mobile phones. *International Journal of Industrial Ergonomics*, 85, 103189. https://doi.org/10.1016/j.ergon.2021.103189

Kaifeng, L., & Pengbo, S. (2024). Effectiveness of facial anthropomorphism design for improving multimedia learning outcomes: systematic review and meta-analysis. *Smart Learning Environments, 11*(1), 42. https://doi.org/10.1186/s40561-024-00332-7

Kong, Y., Seo, Y. S., & Zhai, L. (2018). Comparison of reading performance on screen and on paper: A meta-analysis. *Computers & Education,* 123, 138-149. https://doi.org/10.1016/j.compedu.2018.05.005

Lin, C. C., Lin, V., Liu, G. Z., Kou, X., Kulikova, A., & Lin, W. (2020). Mobile-assisted reading development: a review from the Activity Theory perspective. *Computer Assisted Language Learning*, *33*(8), 833-864. https://doi.org/10.1080/09588221.2019.1594919

Mangen, A. (2010). Point and click: Theoretical and phenomenological reflections on the digitization of early childhood education. *Contemporary Issues in Early Childhood*, *11*(4), 415-431. http://dx.doi.org/10.2304/ciec.2010.11.4.415

Mangen, A., Olivier, G., & Velay, J. L. (2019). Comparing comprehension of a long text read in print book and on Kindle: Where in the text and when in the story?. *Frontiers in psychology*, 10, 38. https://doi.org/10.3389/fpsyg.2019.00038

Mikami, Y., & Koizumi, R. (2025). Characteristics of the multiple text reading format in the Common Test of University Admission in Japan. *Language Testing in Asia, 15*(1), 43. https://doi.org/10.1186/s40468-025-00380-x

Mizrachi D, Salaz AM, Kurbanoglu S, Boustany J, on behalf of the ARFIS Research Group (2018) Academic reading format preferences and behaviors among university students worldwide: A comparative survey analysis. *PLoS ONE 13*(5): e0197444. https://doi.org/10.1371/journal.pone.0197444

Muslimin, T. P., & Fatimah, A. A. B. (2024). Peningkatan Kemampuan Literasi Siswa UPT SPF SDN Sangir melalui Modul Ajar Digital Berbasis Budaya. *Jurnal Dieksis ID*, *4*(2), 101–113. https://doi.org/10.54065/dieksis.4.2.2024.529

Nero, C. A., & Zulkiply, N. (2020). The Effects of Gender and Reading Mediums on Reading Comprehension. *Journal of Cognitive Sciences and Human Development, 6(1),* 1–11. https://doi.org/10.33736/jcshd.1704.2020

Pardede, P. (2019). Print vs Digital Reading Comprehension in EFL. *Journal of English Teaching, 5(2),* 77-90.

Pallant, J. (2020). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS*. Routledge. https://doi.org/10.4324/9781003117452

Paturohman, P., Aprilia, N. H., & Insani , S. K. (2025). Analisis Penerapan Model Blended Learning dalam Meningkatkan Literasi Digital Siswa. *Jurnal Literasi Digital*, *5*(3), 264–273. https://doi.org/10.54065/jld.5.3.2025.849

Porion, A., Aparicio, X., Megalakaki, O., Robert, A., & Baccino, T. (2016). The impact of paper-based versus computerized presentation on text comprehension and

memorization. *Computers in Human Behavior*, *5(4)*, 569-576. https://doi.org/10.1016/j.chb.2015.08.002

Purba, A. A. E., & Nasution, M. I. P. (2025). Business Intelligence dalam Era Ekonomi Digital: Kajian Sistematis atas Strategi dan Implementasi. *Journal Artificial: Informatika Dan Sistem Informasi*, *3*(2), 161–171. https://doi.org/10.54065/artificial.753

Quinto, J. P., Catacutan, M. M., & Alda, R. (2025). Students' Reading Comprehension in Digital and Printed Instructional Formats. *Journal of English Language Teaching, 67*(2), 25–31. https://journals.eltai.in/jelt/article/view/JELT670206

Ratminingsih, N. M., Mahadewi, L. P. P., & Divayana, D. G. H. (2018). ICT-Based Interactive Game in TEYL: Teachers' Perception, Students' Motivation, and Achievement. *International Journal of Emerging Technologies in Learning*, *13*(9). https://doi.org/10.3991/ijet.v13i09.8170

Rusmanayanti, A., & Hanafi, M. L. (2018). Teaching Reading Comprehension by Using Computer-Based Reading: An Experimental Study in Indonesian English Language Teaching. *Arab World English Journal (AWEJ) Special Issue on CALL, (4).*

Safna, R., thohir, L., amin, M., & elmiana, D. (2024). The Use Of Printed And Digital Reading Materials In English Language Learning At Mts Nurul Haramain: A Comparative Analysis. *EDUTECH: Jurnal Inovasi Pendidikan Berbantuan Teknologi, 4(3)*, 219-227.

Silvhiany, S., Huzaifah, S., & Ismet, I. (2021). Critical digital literacy: EFL students' ability to evaluate online sources. *Indonesian Journal of EFL and Linguistics, 6*(1), 249. http://dx.doi.org/10.21462/ijefl.v6i1.364

Schwabe, A., Brandl, L., Boomgaarden, H. G., & Stocker, G. (2021). Experiencing literature on the E-reader: The effects of reading narrative texts on screen. *Journal of Research in Reading*, *44*(2), 319-338. https://doi.org/10.1111/1467-9817.12337

Schwabe, A., Lind, F., Kosch, L., & Boomgaarden, H. G. (2022). No negative effects of reading on screen on comprehension of narrative texts compared to print: A meta-analysis. *Media Psychology*, *25*(6), 779-796. https://doi.org/10.1080/15213269.2022.2070216

Støle, H., Mangen, A., & Schwippert, K. (2020). Assessing children's reading comprehension on paper and screen: A mode-effect study. *Computers & Education*, *151*, 103861. https://doi.org/10.1016/j.compedu.2020.103861

Tanner, M. J. (2014). Digital vs. print: Reading comprehension and the future of the book. *School of Information Student Research Journal*, *4*(2), 6. https://doi.org/10.31979/2575-2499.040206

Wolf, M. (2018). *Reader, come home: The reading brain in a digital world*. Harper, an imprint of HarperCollinsPublishers.

Zainurrahman, Z., Yusuf, F. N., & Sukyadi, D. (2024). Text readability: its impact on reading comprehension and reading time. *Journal of Education and Learning (EduLearn), 18*(4), 1422-1432. https://doi.org/10.11591/edulearn.v18i4.21724