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Comparing the Impact of Printed versus Digital Reading Materials on Student Performance in Literature Courses: A Quantitative Study

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Abstract*:* This study investigated the impacts of print and digital reading materials on the performance in comprehension, and engagement of literature students in their major classes. Specifically, the study aimed to discover the influence of the shift from physical books to digital texts on the academic outcomes and student interaction with reading materials, in the broader educational landscape of literary studies. The study utilized a quasi-experimental quantitative research design and conducted pre-test and post-test to evaluate the significance of differences in academic outcomes before and after exposure to both formats. Participants were distributed randomly to either the print-based or digital-based reading material groups. Findings showed that students using printed materials achieved significantly higher comprehension scores (M = 21.00, SD = 4.44) compared to those exposed in the digital materials (M = 18.14, SD = 4.52, p = 0.022). The performance metrics of students engaging with digital materials did not demonstrate statistically significant improvements. Based from the results, it is suggested that print resources must also be continuously emphasized to foster deeper comprehension and learning. Further, the need for a balanced integration of both print and digital formats to maximize student engagement and optimization of performance be underscored especially in major courses. The proposed teaching strategies are designed to improve the strengths of each medium and to enhance students' interest, critical reading abilities, and overall learning experiences. Furthermore, the utilization of the output of the study is recommended for educators to effectively incorporate both printed and digital resources in their lessons; thus, improving student engagement and advancing the attainment of course learning outcomes.

Keywords: *Comprehension, Digital materials, Engagement, Printed materials, Student performance.*

INTRODUCTION

The evolution of digital technologies has dramatically changed the learning settings, particularly in how students read literature (Lilis, Sudarsih. 2024). The shift from printed materials to digital ones has brought anxiety over its effect on the performance of the leaners

most especially in literature classes where comprehension and critical thinking are priorities (Pardede, 2019). Digital teaching materials have shown significant improvements in literary literacy skills among students. For instance, a study found that students using digital resources increased their average scores from 45 to 72, compared to a mere increase from 43 to 55 in traditional settings (Saputra et al., 2024). The debate over print versus digital reading materials has received considerable attention in educational research (Kareva, 2024). According to Rosenblatt's Transactional Theory, meaning is created by interaction between the reader and the text, implying that the medium is significant. This study supports the theory by demonstrating that students who used printed materials had better understanding and retention, most likely due to deeper engagement through annotation and maintained focus.

In contrast, digital reading appeared to foster greater surface-level interaction, influencing the depth of meaning-making in literary comprehension. Paivio's Dual Coding Theory (1986) supports the theory that print reading improves comprehension by activating verbal and visual cognitive pathways. This could explain why printed materials performed better in this investigation.

Meanwhile, the study by Kazazoglu (2020) stated that insufficient reading negatively affects academic success, emphasizing the essential role of literacy. While prior research (Delgado et al., 2018; Johnston & Salaz, 2019) has examined comprehension differences between digital and print reading, few studies have employed a controlled experimental design specifically within literature courses. This study aims to fill this gap by analyzing pre-test and post-test performance using a structured intervention. The findings highlight two substantial advantages for students studying printed texts in comprehension tests compared to digital platforms. In connection with the previous claim, Johnston & Salaz (2019), students prefer to print due to accessibility, tactile features, focus, and note-taking. Based on the findings of their study, libraries should consider print textbooks and services as well as printing services in supporting student learning.

Despite considerable research, it is still unclear how different formats affect students' academic achievement in literary courses. Most studies examine general reading comprehension but do not directly compare print and digital resources in literary analysis, critical thinking, and participation. Furthermore, whereas print reading is frequently linked to greater comprehension (Halamish & Elbaz, 2020), it is unknown whether digital reading may produce similar benefits under controlled learning situations. External factors like students' digital proficiency, reading habits, and cognitive load also need more investigation. Moreover, limited experimental evidence compares print and digital reading materials in literature courses, particularly using a controlled pre-test and post-test design. Using pre-test and post-test assessments, it measures changes in academic performance across both formats. Unlike previous research that relies solely on self-reported preferences (Johnston & Salaz, 2019), this study integrates objective performance metrics to determine whether the medium significantly influences learning outcomes.

According to Sage et al. (2020), a study on college students' reading experiences found that print materials were more effective than e-readers, with laptops ranking second. Students exhibited more robust perceptions and learning experiences with printed materials, regardless of the reading genre (Anggraini, 2023). On the other hand, digital reading provides ease of access and convenience. Online, students have expanded and continuous access to varied literary works that may benefit them. Studies show that digital reading can lead to shallow engagement as well. As Delgado et al. (2018)

mentioned, easy access that defines digital reading is often associated with lower comprehension than its printed equivalent. This is consistent with Kazazoğlu's claim that printed texts promote better reading practices by eliciting longer sustained attention and deeper processes in cognition. The literature has also reported eye strain and physical discomfort due to prolonged digital reading. A report by Antona et al. (2018) reveals that students who read from screens more often report experiencing eye fatigue and discomfort, negatively impacting the overall reading experience and understanding. It is very alarming if such circumstances arise in literature classes, given that thorough reading and prolonged attention to complex texts and texts requiring critical analysis are essential.

This study uniquely applies an experimental design within a literature course context, analyzing comprehension and engagement. This study, which focuses on literature courses, provides unique insights into how the reading format influences the perception of complicated texts that need sustained attention and critical thinking. It also emphasizes the practical consequences for educators, offering suggestions for balancing digital and print materials to improve student learning. The findings add to continuing conversations about digital literacy and educational techniques, underlining the importance of adaptive learning strategies that account for different reading preferences and cognitive processing patterns. Thus, this study not only settles the division over digital versus print reading but also guides future educational practices, ensuring that learning resources are appropriate for students' comprehension demands and academic achievement.

LITERATURE REVIEW

The shift from tangible books and printed texts to digital formats has aroused concerns about its effects on students' comprehension, information retention, and capacity for literary analysis. Research has progressively focused on comparing how students assimilate and recall information after engaging with printed materials versus digital texts, shedding light on the cognitive differences and potential challenges associated with this shift. This review aims to investigate the vital distinctions in reading comprehension and engagement between digital and printed texts among students. With the growing transition toward digital reading, understanding how different formats influence cognitive processing, information retention, and depth of analysis is essential.

This study is anchored on the Transactional Theory by Rosenblatt, L. M. (2018). The theory emphasizes the changing dynamics interplay between the reader and the text, highlighting the reader's function in creating meaning based on their personal experiences, attitudes, and cultural background. Within the framework, the study examines how the alter from physical books to digital texts may influence the transactional processes involved in literary analysis and critical reading skills.

Moreover, this study is also anchored by the Dual Coding Theory by Paivio, A. (2014). The theory assumes that there are two cognitive subsystems, one specialized for the representation and processing of nonverbal objects/events (i.e., imagery), and the other specialized for dealing with language. Dual Coding theory identified three types of processing: (1) representational, the direct activation of verbal or non-verbal representations, (2) referential, the activation of the verbal system by the nonverbal system or vice-versa, and (3) associative processing, the activation of representations within the same verbal or nonverbal system. A given task may require any or all three kinds of processing.

Transactional theory, as conceived by Rosenblatt, L. M. (2018), posited that reading is a dialogue between the reader and the text. The reader contributes their own experiences and knowledge to the text, and they make sense of the text as they engage with it (Rahman, Hossain, et al., 2025). This implies that there cannot be one, the right meaning of a text because each reader is going to contribute their own personal meaning to it. Dual coding theory, created by Paivio in 2014, countered that there are distinct systems of information processing in the brain: the verbal system for processing words, and the non-verbal system for processing pictures and other sensory input. Both systems are activated when we read. The verbal system interprets the words on the page, and the non-verbal system constructs images in our minds of what we are reading about. This two-stage coding process assists us in comprehending and recalling what we read.

The two theories offer contrasting but complementary views of the process of reading. Transactional theory highlights the contribution of the reader to making sense of the text, whereas dual coding theory highlights the contribution of the brain to processing information. Together, the theories offer an enhanced view of how we read and understand text. Writing theories in the context of writing would imply that writers need to take both the reader and the text into account when writing. Writers need to reflect on what the readers already know and how they can assist their readers in creating meaning within the text. Writers need also to employ language and imagery in such a manner as to engage both the verbal and non-verbal systems within the brain of the reader.

A number of studies point to the differential impact of reading printed and digital material on comprehension and engagement. A study of college students' reading experiences by Sage et al. (2020) concluded that printed materials were more effective than e readers, ranking second to laptops. Students therefore had stronger perceptions and learning experiences with printed materials, whether reading a certain genre or not (Anggraini, 2023). Conversely, digital reading offers ease of access and convenience. Students have extended and ongoing access to diverse literary materials on the web that can be useful for them. Indeed, research indicates that digital reading can have shallow engagement too. Easy access that characterizes digital reading, as Delgado et al. (2018) stated, is often coupled with less understanding than its printed counterpart. This aligns with Kazazoğlu's assertion that printed texts support improved reading habits by triggering increased sustained attention and more in-depth processes in cognition. Hence, eye strain and physical discomfort caused by extended digital reading have been documented in the literature as well. A study by Antona et al. (2018) reveals that students who read more frequently from screens indicate that they feel eye fatigue and discomfort, which adversely affects the overall experience of reading and comprehension. It is highly worrying if such situations occur in literature class, considering that intensive reading and sustained focus on complex texts and texts requiring critical analysis are required.

The development of digital technology has redefined learning environments, especially in literature classes. The issues related to the impact of digital reading on students' performance, particularly comprehension and critical thinking abilities abilities that are core within literary studies are noted by Lilis & Sudarsih (2024). Despite the issues, studies conducted by Saputra et al. (2024) show that digital learning materials can boost the skills of literary literacy. Their work revealed that students who employed digital materials demonstrated greater academic gain than students who used traditional print materials. Nonetheless, surface-level engagement typical of digital reading might affect literary understanding. Paivio & Clark (2006) describe how printed reading activates

thought pathways supporting comprehension, an explanation why research persistently benefits from print forms in the case of deep understanding. Kazazoglu (2020) also highlights that poor reading interaction has a detrimental impact on learning performance, cementing the significance of literacy-informed learning approaches.

In contrast, digital reading develops to nurture greater surface-level interaction upon influencing the discernment of meaning-making in literary comprehension. Paivio, A., & Clark, J. M. (2006) supports the theory that print reading improves comprehension by activating verbal and visual cognitive pathways. Moreover, this could even explain why printed materials performed better in this study. Meanwhile, the study by Kazazoglu (2020) stated that insufficient reading negatively affects academic success which emphasized the essential role of literacy. While prior research (Delgado et al., 2018; Johnston & Salaz, 2019) has examined comprehension differences between digital and print reading and few studies have employed a controlled experimental design specifically within literature courses. This study aims to fill this gap by analyzing pre-test and post-test performance using a structured intervention (Hossen & Pauzi, 2025a). The findings shows two substantial advantages for students studying printed texts in comprehension tests compared to digital platforms (Alam et al., 2025)**.** In connection with the previous claim, Johnston & Salaz (2019), students prefer to print due to accessibility, tactile features, focus, and note-taking. Therefore, based on the findings of their study, libraries should consider print textbooks and services as well as printing services in supporting student learning.

The gap in literature is the lack of exploration of how different formats affect students' academic achievement in literary courses. Most studies investigate collective reading comprehension but do not make direct comparisons between print and digital materials in literary analysis, critical thinking, and participation. Whereas print reading is habitually linked to greater comprehension (Halamish & Elbaz, 2020), it is unspecified whether digital reading may produce similar benefits under controlled learning situations. Thus, external factors, such as students' digital proficiency, reading habits, and cognitive load, also need more investigation to clearly demonstrate its effectiveness (Hossen & Pauzi, 2025b). Furthermore, a lack of empirical evidence comparing print and digital reading materials within literature courses remains hanging, particularly through the utilization of a controlled pre-test and post-test design. By employing pre-test and post-test evaluations, it assesses variations in academic performance across both mediums. In contrast to the preceding research that is predicated solely on self-reported preferences (Johnston& Salaz, 2019), this investigation incorporates objective performance standards to ascertain whether the medium exerts a significant impact on educational outcomes.

Although digital reading offers considerable convenience and accessibility, current research suggests it does not necessarily enhance deep comprehension or literary engagement. In contrast, print materials continue to demonstrate their effectiveness in fostering focus, comprehension, and critical thinking, particularly in literature courses (Hossen, 2023). with these findings, experimental investigations utilizing pre-test and post-test evaluations are necessary to further assess the long-term implications of reading format on literary learning. Additionally, understanding students' reading habits, digital literacy, and screen-related discomfort will contribute to refining teaching strategies and optimizing learning outcomes in literacy education.

METHODOLOGY

Research Design

This study employed a quasi-experimental design utilizing pretest and posttest in assessing the impact of printed against digital reading formats on student performance in literature courses. The main objective was to determine which of the two formats promotes greater comprehension, retention, and overall academic success. The participants who were the third-year BA Literature students of the College of Arts and Sciences of Cebu Technological University, Argao Campus—were systematically assigned to two distinct groups: one was exclusively exposed to printed materials, while the other interacted only with digital texts. The design appropriately measured the differences in reading comprehension and engagement between the two formats.

Environment and Population

The study was conducted at Cebu Technological University, Argao Campus (CTU-AC), located in Ed Kintanar, Lamacan, Argao, Cebu. It is a dynamic academic institution with an estimated student population of 5,000 and 200 faculty members, spread across 8 colleges and 16 program offerings. Specifically, the environment of the study is the College of Arts and Sciences (CAS) which houses the Bachelor of Arts in Literature (BALit) program. Due to logistical constraints and the limited number of qualified enrollees in the program, the population size remained relatively small. The 14 third-year BALit students served as the research participants who were distributed into two groups, with one group exposed exclusively to printed texts and the other engaged solely with digital reading materials. For a fair and unbiased participant distribution, students were randomly assigned to their respective groups using a computer-generated randomization mechanism, minimizing potential selection biases and ensuring the integrity of the experimental process. Future studies incorporating larger populations could enhance generalizability and statistical reliability, providing a broader perspective on the impact of reading format on comprehension and engagement.

Data Collection Methods

To ensure the gathering of empirical data for credible results and well-founded analysis and recommendations, rigorous data collection method was employed in the study. This process followed a systematic approach, divided into three key phases: pre-collection, data collection, and post-collection. Participants were carefully chosen from a designated group of students based on specific population criteria. Ethical considerations were also a top priority before data collection; hence, necessary process was addressed, including securing formal authorization from academic authorities concerned. Upon receiving official approval, the data-gathering phase commenced, beginning with a pre-test designed to assess students' baseline reading comprehension across both printed and digital materials. Participants underwent initial assessment before being subjected to the three instructional treatments, each strategically designed to enhance reading comprehension. After treatments were completed, the post-test was administered, evaluating students' progress relative to their initial pre-test scores. Considering that participants were assigned exclusively to one format—either print or digital—any observed differences in performance in comprehension could be directly qualified to the reading medium used. All the collected data were tallied and treated statistically.

Data Analysis Method

Analysis of data was done employing the Paired t-test, which was used to determine whether a statistically significant difference exists in students' reading comprehension performance across printed and digital materials. The Paired t-test was basically used to assess entry-level differences in comprehension between students of the two groups - print versus digital reading formats. After the intervention program, the Paired t-test was again applied to analyze post-test results, assessing the influence of the assigned reading format on students' comprehension improvement. Prior to performing the Paired t-test, normality was assessed using the Shapiro-Wilk test ($p > 0.05$), ensuring that the data met the assumptions required for parametric analysis. The test was further utilized to examine the significant difference between pre-test and post-test scores, determining the effectiveness of the reading format in enhancing comprehension. The Paired t-test effectively accounts for individual variability, ensuring that any observed improvements or differences in comprehension can be attributed exclusively to the type of material used was made possible by comparing the mean performance scores of the same participants under varying reading conditions.

RESULT AND DISCUSSION

Students' Pre-test Performance

The table below shows the pre-test scores of BAL 3 students from both groups: printed and digital reading materials. The pre-test measures student growth through comprehensive assessment (Kelly, 2019). It successfully assesses a student's comprehension both before and after intervention. This data was analyzed using descriptive statistics to summarize and organize it (Mvududu et al., 2023). In this context, the mean value is the most important factor in determining student academic performance.

Table 1: Pre-Test: Level of performance of respondents as to printed and digital materials

Reading Materials	***Mean***	***SD***	***Level***
Printed	***17.25***	***3.06***	***High***
Digital	***15.71***	***3.45***	***High***

Note: 22.51-30.00 – Very High; 15.01-22.50 – High; 7.51-15.00 – Low; 0.00-7.50 – Very Low

Table 1 aims to show the respondents' level of performance in terms of printed and digital materials. The pre-test data provides valuable insights into respondents' early performance on printed and digital materials. The pre-test data reveals the entry-level performance of respondents concerning printed and digital materials. Concerning the printed materials, the mean score is 17.25, with a standard deviation (SD) 3.06. This high mean score indicates that respondents typically show strong retention and comprehension when engaging with printed texts. It suggestthat s students can retain better access to printed materials (Pikhart et al., 2023). The relatively low SD signifies that the scores are closely clustered around the mean, suggesting a consistent performance across the respondents.

On the other hand, the mean score for digital materials is slightly lower at 15.71, with an SD of 3.45. Despite the high level of performance, the lower mean score compared to printed materials

suggests that respondents may find digital textt more challenging. The higher SD indicates greater variability in the respondents' performance, reflecting a wider range of abilities and experiences with digital materials (Mohammadyari et a,l. 2015).

Therefore, in their pre-test assessment, the BAL 3 respondents obtained a “High” overall mean with both reading materials, but there is a slight preference for printed texts and higher proficiency. This could be due to greater familiarity and experience with printed formats. Given that these students had not yet received lessons or been introduced to the topics, their pre-test results were found to fall within the High-level category. Given their lack of prior understanding of the topic, this outcome is reasonable and expected (Booth et al., 2007). Furthermore, this implies that during a pre-test, students are not likely to know all the answers but rather to use prior knowledge to produce reasonable answers (Kuehn, 2022). These findings highlight the importance of supporting digital literacy to enhance performance with digital materials.

Students’ Post-test Performance

The table presented thereafter was the post-test scores of BAL 3 from both groups: printed and digital reading materials. This assessment has also been calculated using mean and standard deviation. As in the previous table, the mean value was the primary criterion for assessing students' academic performance. The mean score was categorized using descriptive statistics using the earlier technique.

Table 2: Post-Test: Level of performance of respondents as to printed and digital materials after the intervention

Reading Materials	***Mean***	***SD***	***Level***
Printed	***21***	***4.44***	***High***
Digital	***18.14***	***4.52***	***High***

Note: 22.51-30.00 – Very High; 15.01-22.50 – High; 7.51-15.00 – Low; 0.00-7.50 – Very Low

Table 2 aims to show respondents' results and level of performance with printed and digital materials after the intervention program. After the intervention program, the post-test results show significant improvements in the respondents' performance with printed and digital materials. For printed materials, the mean score increased to 21 with a standard deviation (SD) of 4.44. This indicates a higher level of comprehension and retention among respondents for printed texts (Pikhart et al., 2023). Nonetheless, the significant increase in pre-test scores suggests that the intervention positively impacted student performance with printed materials. The higher SD compared to the pretest indicates that individual outcomes shifted significantly while overall performance improved. This variety might be due to respondents' prior knowledge, engagement, and learning techniques (Hailikari et al., 2008). According to (Koppikar et al., 2022), post-tests indicate if students have obtained the essential information to effectively complete the course and their progress level. In this sThishstudy'sprovement in mean scores from the pre-test to post-test demonstrates that students' comprehension and skill with both prinnd digital reading materials has increased.

Therefore, for digital materials, the mean score increased to 18.14 with an SD of 4.52. This reflects an overall enhancement in the respondents' ability to understand and retain information from digital texts. The improvement in the mean score indicates that the intervention program effectively boosts digital reading skills. However, the higher SD suggests considerable variability in performance, pointing to differences in individual experiences and proficiency with digital formats. The data indicates that digital materials can help students comprehend and retain more information. However, the degree of effectiveness may vary depending on individual factors such as previous engagement with digital texts, personal learning styles, and digital comfort (Aldhafeeri et al., 2022). The high mean score in the "High" level group indicates the ability of digital reading materials to improve academic achievement. The greater variation in scores indicates that students who struggle with digital materials require individualized assistance.

The post-test results reveal that the intervention program effectively enhanced respondents' performance with printed and digital materials. The increase in mean scores for both materials shows that respondents gained better comprehension and retention abilities (Kuehn, 2022). However, the increased variability in scores, especially for digital materials, highlights the need for continued support to address individual differences in digital literacy. These results emphasize the importance of ongoing, personalized interventions to improve reading skills across different media.

Significant Differences

The table presented thereafter presents the significant difference between both formats' pre-test and post-test results. This study applied a statistical instrument known as the T-test, which has been tested at a confidence level of .05. The baseline to determine if there is a significant difference between the two variables is a p-value of .05. A p-value greater than .05 indicates that the null hypothesis has been accepted and that there is no significant difference. In contrast, a p-value less than .05 indicates that the null hypothesis has been rejected and therefore there is a significant difference.

Table 3: Significant Differences Between Pre-Test and Post-Test Results: Printed and Digital Materials

Reading Materials	***Mean Difference (Pre-Post)***	***P-value***	***Decision***
Digital	***-2.43***	***.207***	***Accept Ho***
Printed	***=3.75***	***.022***	***Reject Ho***

Table 3 aims to show the significant differences between the level of performance of the respondents before and after the intervention, with regards to printed and digital materials during the pre-test and post-test. To determine if there is a significant difference between the pre-test and post-test results, the mean differences and p-values were analyzed for both printed and digital materials. The mean difference between the pre-test and post-test scores for printed materials is -3.75, with a p-value of .022. Since the p-value is less than the significance level of .05, we reject the null hypothesis (Ho1). This indicates a statistically significant improvement in the respondents'

performance with printed materials after the intervention program. Although printed materials showed a statistically significant improvement ($p = 0.022$), the small sample size necessitates cautious interpretation. Future studies should verify these results with larger cohorts.

In contrast, for digital materials, the mean difference between the pre-test and post-test scores is -2.43, with a p-value of .207. Since the p-value is greater than the significance level of .05, we accept the null hypothesis (Ho2). This indicates that the improvement in respondents' performance with digital materials is not statistically significant. While there was an increase in the mean score from the pre-test to the post-test, the change was insufficient to be considered statistically significant. This suggests that the intervention program had a less pronounced impact on digital reading skills than printed materials (Hare et al., 2024).

These findings emphasize the intervention program's variable effectiveness across different reading materials. While the instruction improved printed text comprehension and retention, additional strategies may be required to obtain similar improvements in digital reading skills. This emphasizes the significance of developing specific interventions to meet the challenges associated with digital literacy. The improved comprehension of printed material can be attributed to cognitive mechanisms such as spatial memory and physical involvement. According to research, the materiality of print promotes memory encoding by helping readers create mental maps of the text's structure, which improves recall and understanding (Mangen et a,l., 2013). Findings align with Cognitive Load Theory, which posits that printed materials reduce cognitive distractions, leading to better retention and comprehension (Sweller, J. (1988). These cognitive advantages may explain the significant improvement observed in printed materials and reinforce the need for adaptive strategies to enhance digital literacy.

CONCLUSION

The effectiveness of printed materials in education has been the subject of extensive research, revealing both advantages and limitations. Studies indicate that printed educational materials (PEMs) can enhance academic performance, particularly in Physics and reading comprehension (Olaniyi & Hassan, 2019). Similarly, research shows that printed materials are preferred by students for their academic projects, fostering creativity and innovation (Gautam et al., 2020). Furthermore, EFL students demonstrated better comprehension when using printed sources over digital formats (Kareva, 2024). Students often better understand and retain when using printed materials (Kareva, 2024). Print media inspires students to engage in innovative academic projects (Gautam et al., 2020). The study's findings conclude that the students preferred and were more competent with printed materials. The outcome indicates that following the implementation of the intervention program, students' performance with printed texts improved a lot and proves that they are more at ease and achieve better results when using traditional print. Although materials representing digital media have received high success rates, this still requires additional support as it is yet to match the effectiveness of traditional books. That highlights the convenience and familiarity when it is used in the print version; it implies that students will be more interactive and understanding when working within a print-based setting.

The study also confirmed the importance of Rosenblatt's Transactional Theory, which underlines the reader's interaction with the text, and Paivio's Dual Coding Theory, which affirms the notion that knowledge is best attained through learning through two pathways: visual and verbal.

It still calls for investigating ways to enhance digital literacy and provide targeted support for digital reading. Such a study, therefore, suggests that future studies should examine whether annotation tools in digital materials can enhance comprehension and match printed materials.

RECOMMENDATION

The small sample size limits the study's findings and may not be generalizable to broader student populations. Further research with diverse participants is needed. First, there is a need to improve printed materials. This can be accomplished by using larger and clearer fonts to improve readability and ensuring that all printed papers are thoroughly proofread to avoid errors and give accurate information. These techniques can help pupils learn more efficiently and effectively. Second, enhancements to digital resources are essential. The emphasis should be on readability by choosing proper font sizes and text styles.

Furthermore, digital information should be more user-friendly, including clear and simple instructions. It is also recommended that digital content be developed in reduced file sizes for faster downloads and optimal bandwidth utilization. These enhancements will improve student access to and efficiency with digital resources. Thus, future research should investigate whether enhanced annotation tools in digital reading platforms can mitigate comprehension gaps.

Lastly, further research is strongly advised in certain areas. Investigating the long-term effects of digital and printed materials on student performance can reveal further information on their impact. Furthermore, researching the elements that influence students' choices for different types of reading materials might provide useful information for creating more effective teaching resources. These research activities will help to advance our understanding of the use and impact of reading materials in education. Implementing these recommendations will contribute to developing more effective and accessible reading materials, ultimately supporting better educational outcomes.

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