



# Exploring students' barriers in reading digital books: A case study of English education students at IAIN Palopo

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Technological advancements have transformed education, including the use of digital books as learning media. Despite their potential, many students still encounter obstacles in accessing and utilizing digital books effectively. This study investigates the barriers faced by students of the English Language Education Study Program at IAIN Palopo in reading digital books. Using a qualitative case study approach, data were collected through unstructured interviews with 12 students from the Faculty of Education and Teacher Training. The data were analyzed through three stages: data reduction, data display, and conclusion drawing. The results reveal seven primary barriers: (1) limited device storage and low battery life hinder access to digital books (Device Access); (2) unstable internet connections in students' local areas affect accessibility (Internet Connectivity); (3) prolonged screen time leads to eye strain (Eyestrain); (4) students experience dizziness and fatigue after extended reading sessions (Reading Fatigue); (5) distractions from social media notifications reduce focus (Concentration and Retention); (6) unattractive digital book formats discourage engagement (Format Issues); and (7) some students cannot access certain materials due to financial constraints (Socioeconomic Barriers). These findings highlight the need for more accessible and student-friendly digital reading solutions.

**Keywords:** digital books, qualitative research, reading barriers, student challenges

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## INTRODUCTION

The rapid evolution of Information and Communication Technology (ICT) has fundamentally transformed educational paradigms worldwide, with digital books emerging as one of the most significant innovations reshaping how students access and engage with knowledge. Despite offering numerous advantages – such as portability, accessibility, cost-effectiveness, and interactive features that can enhance the learning experience (Diarta et al., 2021; Ninghardjanti et al., 2020) – digital book also present certain challenges. In higher education institutions like the English Study Program at IAIN Palopo, while digital books present an opportunity to improve learning accessibility, they also pose challenges in ensuring their pedagogical effectiveness. Growing empirical evidence suggests that, despite their advantages, digital books may not always facilitate the same depth of comprehension and retention as traditional print materials, indicating the need for further exploration into the obstacles faced by students in utilizing these resources effectively.

This paradox forms the crux of the current investigation, which seeks to identify and analyze the specific barriers students encounter when using digital books. While existing literature has addressed aspects of digital literacy in developing educational contexts, there remains a gap in understanding the practical challenges students face in everyday academic settings. The urgency of this study is underscored by Indonesia's persistently low performance in international literacy assessments, particularly the 2022 PISA results, which ranked the country 11th from bottom among 81 nations in reading literacy. This points to systemic challenges in education that demand immediate scholarly attention and practical solutions.

The cognitive and academic benefits of reading are well-established in numerous studies, consistently demonstrating a positive correlation with vocabulary development, language proficiency, and critical thinking skills. Neuroscientific investigations have further illuminated how reading stimulates neural connectivity in brain regions associated with language processing and comprehension, suggesting that the act of reading fundamentally shapes cognitive architecture. However, the contemporary educational landscapes are witnessing a concerning decline in reading motivation and engagement, particularly among younger demographics who increasingly favor digital distractions over sustained textual engagement. This trend is especially pronounced in Indonesia, where educational disparities, infrastructural limitations, and cultural learning preferences create additional barriers to reading comprehension.

The transition to digital books, while theoretically promising in its potential to overcome some of these barriers through enhanced accessibility and interactive features, introduces new complexities that warrant careful examination. Emerging research indicates that students frequently experience lower comprehension levels when reading digitally compared to print, a phenomenon attributed to factors such as increased cognitive load, screen fatigue, and the absence of tactile engagement that characterizes traditional reading experiences.

Notable gaps persist in current scholarship regarding digital reading comprehension, especially in developing countries like Indonesia, where the integration of technology in education presents unique challenges. While extensive research in Western contexts has explored the cognitive aspects of digital reading, there is insufficient understanding of how affective factors, such as motivation, digital self-efficacy, and reading anxiety, influence engagement with e-books in Southeast Asia. Moreover, pedagogical interventions to mitigate these barriers, such as digital literacy training, adaptive e-book designs, or updated teaching methodologies are largely untested in Indonesian higher education. This study aims to address these gaps by employing a multidimensional analysis of digital reading barriers, focusing not only on cognitive and technical difficulties but also on motivational and environmental factors. Grounded in Mayer's cognitive theory of multimedia learning and self-determination theory, the investigation explores how intrinsic and extrinsic motivation influence digital reading behaviors and comprehension.

Indonesia's ongoing struggles with literacy attainment, as evidenced by its PISA rankings, highlight the critical importance of this research for both academic scholarship and practical pedagogy (Mustadi & Amri, 2020). Indonesia's education system faces numerous challenges in adapting to 21st-century learning demands, including outdated teaching methods, limited access to quality reading materials, and insufficient focus on developing critical literacy skills. As digital books become more common in Indonesian higher education, understanding how to implement them effectively is essential. This study seeks to identify barriers to digital reading while also proposing practical, culturally relevant solutions to improve digital literacy and reading efficacy. From an ethical standpoint, the research aligns with both contemporary educational goals and Islamic teachings on the value of knowledge acquisition, as emphasized in Surah Al-Alaq, which underscores reading as a core human endeavor.

By bridging theoretical insights with practical applications, this research aims to provide valuable insights for educators, policymakers, and digital content developers working to enhance literacy outcomes in Indonesia's evolving educational landscape. These findings are expected to have broader implications for digital pedagogy in other developing countries, where the balance between technological integration and pedagogical effectiveness must be carefully managed to improve learning outcomes.

This study also aims to examine the significant gaps in digital reading comprehension research. These gaps include: (1) insufficient examination of affective and motivational factors in digital reading persistence, (2) limited research on culturally adapted digital reading pedagogies, (3) the absence of longitudinal studies tracking digital reading skill development, (4) a scarcity of research on effective teacher training for digital literacy instruction, and (5) a lack of investigation into optimal multimedia integration in academic e-books. The present study aims to address these gaps by employing a mixed-methods approach that combines cognitive testing with motivational assessment and qualitative analysis of reading behaviors in an Indonesian higher education context.

## METHODS

### Research Design

This study employed a qualitative research approach using a case study design to investigate the barriers experienced by students in reading digital books. A qualitative case study design was chosen because it allows for an in-depth exploration of the participants' experiences within their real-life context. As Creswell (2014) explains, qualitative research is an approach to understanding social and cultural phenomena, focusing on the meaning given by individuals or groups to a specific problem.

This research used an inductive approach, where conclusions were drawn based on data collected directly from the field. The study was conducted at Institut Agama Islam Negeri (IAIN) Palopo and involved 12 participants from the 2020 cohort of the English Language Education Study Program. These participants were purposively selected to

ensure a relevant and information-rich sample. Specifically, participants were chosen based on their consistent use of digital books from the first to the third semester, which provided them with sufficient exposure to digital reading and ensured that their experiences were relevant to the research focus.

Purposive sampling was used to select participants who could provide rich, detailed information about the barriers they faced in using digital books. This approach allowed for the inclusion of students who were actively engaged in the digital learning environment and were thus better positioned to discuss the challenges and obstacles encountered. The selection of participants was based on their academic background, experience with digital books, and their ability to reflect on the digital reading process.

### Research Instruments

The instruments employed in this research were unstructured interviews and documentation. Interviews were selected as the primary data collection method to enable the researcher to explore participants' experiences and perceptions in depth. Through direct, face-to-face conversations, the researcher was able to probe deeper into participants' responses, clarifying and expanding on their answers where necessary. The interviews comprised 14 open-ended questions, designed to allow participants to express themselves freely and elaborate on the barriers they faced when reading digital books. To complement the interviews, documentation was used as a secondary data source to provide supporting evidence. This included audio recordings of the interview sessions and the collection of relevant artifacts, which served to reinforce and validate the information obtained during the interviews. The combined use of interviews and documentation enhanced the richness, depth, and credibility of the data collected.

### Data Collection Techniques

Data collection was conducted through two main techniques: interviews and documentation. The interview process was carried out in several stages. First, the researcher arranged appointments with each participant to schedule the interviews. The researcher then conducted the interviews by posing 14 open-ended questions, which had been previously validated by subject matter experts to ensure relevance and clarity. Interviews were conducted in an informal and relaxed manner to create a comfortable environment for the participants, encouraging them to respond openly and honestly. Each interview session was audio-recorded, with the participants' informed consent, to ensure the accuracy of the data and to facilitate later transcription and analysis. In addition to interviews, documentation was employed as a supporting data collection technique. The researcher recorded the interview sessions and collected any relevant documents, such as students' reading materials or personal notes related to their digital reading experiences. These documents were used to triangulate the data, thereby enhancing the reliability and credibility of the research findings.

### Data Analysis Techniques

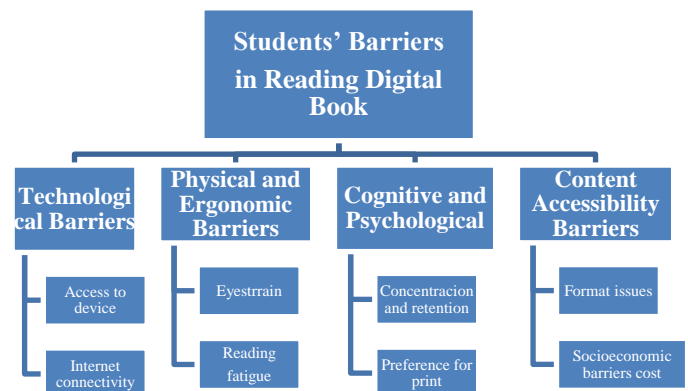
The data analysis process followed several systematic steps to ensure a rigorous and credible interpretation of the findings. First, the recorded interview data were transcribed

verbatim, preserving the original words of the participants to maintain the authenticity of their responses. Once the transcription process was completed, the data were subjected to coding, which involved identifying key themes, categories, and recurring patterns within the participants' narratives.

The analysis was guided by the framework proposed by [Miles, Huberman, and Saldana \(2014\)](#), which includes three concurrent flows of activity: data reduction, data display, and conclusion drawing or verification. Data reduction involved selecting, simplifying, and transforming the raw data into a more manageable form. Data display entailed organizing and presenting the reduced data in visual formats such as matrices or thematic charts to facilitate interpretation. Finally, conclusions were drawn based on the patterns identified, and these conclusions were continually verified by cross-checking them with the raw data and supporting documentation. To enhance the validity of the findings, triangulation was employed by comparing the data obtained from interviews and documentation. This multi-source approach helped ensure that the results were both reliable and comprehensive.

## RESULTS AND DISCUSSION

This study employed qualitative research methods to investigate the multifaceted barriers encountered by undergraduate students in the English Language Education Study Program at IAIN Palopo when engaging with digital books as part of their academic studies. Through in-depth semi-structured interviews conducted with 12 participants from the 2020 cohort between September 4 and September 20, 2024, supplemented by audio documentation for data verification, seven primary barriers to effective digital reading were identified from an initial framework of eleven potential obstacles. In [figure 1](#), these barriers encompass technological limitations, physiological effects, cognitive challenges, and socioeconomic factors that collectively impact the students' digital reading experiences. The findings highlight a complex interplay between device characteristics, environmental conditions, individual reading behaviors, and institutional support systems – factors that collectively influence the effectiveness of digital book utilization in higher education contexts.



**FIGURE 1 |** Conceptual Framework After the Research Conducted

*Technological barriers* emerged as foundational challenges that significantly constrained students' access to and use of digital books. Most participants (83%) relied

primarily on smartphones for accessing digital reading materials due to their portability and constant availability, with only a minority having regular access to laptops (25%) or tablets (8%). However, this smartphone dependence introduced several limitations, including restricted screen size for comfortable reading, limited battery life that disrupted extended study sessions, and insufficient storage capacity for downloading multiple digital books. One participant's statement, *"If the phone's memory is full, we can't access digital books...so it's limited"* (Excerpt 3), exemplifies this widespread issue. Furthermore, 25% of respondents reported encountering digital rights management (DRM) restrictions that prevented them from downloading certain books for offline use, forcing continuous internet dependence. These technological constraints highlight a critical gap between the theoretical availability of digital resources and their practical accessibility for students in real-world learning scenarios.

*Internet connectivity issues* represented perhaps the most pervasive infrastructural barrier, affecting 67% of study participants. The quality and reliability of internet access varied dramatically based on geographic location and socioeconomic status, with students from rural areas or lower-income backgrounds experiencing particularly severe limitations. Multiple respondents emphasized how unstable networks disrupted their reading sessions, with one noting, *"To access it, of course, we have to have internet access...but not all places have good internet access...so that's the main barrier"* (Excerpt 7). This challenge was further exacerbated by the financial burden associated with mobile data usage, which 42% of participants identified as a major concern. Due to inconsistent access, students were often compelled to adopt inefficient coping strategies, such as taking screenshots of key pages or quickly copying text during brief periods of connectivity. These findings underscore the extent to which inadequate digital infrastructure can undermine the theoretical advantages of digital books, transforming them from convenient learning tools into sources of academic stress and reduced educational effectiveness.

*Physiological impacts of digital reading* manifested prominently in the form of visual discomfort and reading fatigue, affecting 75% and 58% of participants respectively. Extended screen exposure led to a range of ocular symptoms collectively referred to as digital eye strain, including dryness, irritation, blurred vision, and headaches. As one student described, *"If I read for a long time, the writing is a bit blurry, making my eyes hurt"* (Excerpt 15). The physiological strain was exacerbated by several factors: the small screen size of smartphones (used by 92% of participants), high levels of blue light emission, and suboptimal reading environments where students often contended with glare and poor lighting. Additionally, 42% of respondents reported experiencing cognitive fatigue characterized by dizziness, difficulty concentrating, and reduced comprehension after prolonged digital reading sessions. One participant's vivid description of seeing "fireflies" after extended reading (Excerpt 16) illustrates the severe physiological effects that can accompany digital text consumption. These findings align with existing ophthalmological research on computer vision syndrome while highlighting the vulnerabilities of student

populations who engage in intensive academic reading through digital mediums.

*Cognitive and metacognitive challenges* emerged as significant barriers to effective digital reading comprehension and retention. Approximately 62% of participants reported greater difficulty maintaining focus when reading digitally compared to print, with digital distractions being the primary culprit. The constant intrusion of notifications from social media and messaging apps fragmented attention, as captured in statements like *"Incoming notifications disrupt reading activity"* (Excerpt 21). Moreover, 58% of students described experiencing shallower engagement with digital texts, characterized by more frequent skimming, reduced annotation, and poorer long-term retention of material. This phenomenon corresponds with existing cognitive research on the "screen inferiority effect," where readers demonstrate poorer recall and comprehension when reading digitally versus in print. The spatial characteristics of digital reading - including the lack of tactile feedback, inconsistent pagination, and difficulty in forming spatial memories of text location - were cited by 33% of participants as factors impairing their ability to navigate and synthesize complex academic material effectively.

*A strong preference for printed books* emerged among 67% of participants, despite their general proficiency with digital technologies. This preference was motivated by several factors: better tactile engagement (*"printed books are more engaging and aesthetically pleasing"* - Excerpt 23), reduced eye strain, fewer distractions, and superior annotation capabilities. Interestingly, this preference was most pronounced for intensive reading tasks requiring deep comprehension, while digital formats were often preferred for quick reference or searching specific content. The persistence of print preference among digital natives' challenges assumptions about the inevitable dominance of e-books in academic settings and suggests that current digital reading technologies may not fully meet the needs of scholarly reading practices. This finding has important implications for educational institutions transitioning to digital resources, as it indicates that print materials may still play a vital role in supporting certain types of academic reading.

*Socioeconomic barriers* created significant inequities in digital book access and utilization. Approximately 33% of participants reported financial constraints that limited their ability to purchase necessary devices, access paid digital book platforms, or maintain consistent internet connectivity. Statements like *"usually there are also paid ones"* (Excerpt 27) and *"problems in terms of payment"* (Excerpt 28) reveal how commercialization of digital educational resources can exclude economically disadvantaged students. These barriers were compounded by the lack of institutional support systems - only 17% of participants reported having access to university-provided devices or subsidized digital book programs. The socioeconomic dimension of digital reading barriers highlights how technological transitions in education can inadvertently exacerbate existing inequalities unless accompanied by comprehensive support mechanisms.

The findings of this study paint a nuanced picture of digital book adoption in higher education, revealing multiple interdependent barriers that extend beyond simple



technological access. While digital books offer theoretical advantages in terms of availability and searchability, their practical implementation faces significant challenges related to device limitations, infrastructural deficiencies, physiological effects, cognitive impacts, and socioeconomic barriers. These challenges are particularly acute in developing educational contexts like Indonesia, where uneven technological development and resource constraints amplify existing digital divides.

Several important implications emerge from these findings. First, educational institutions must adopt a more holistic approach to digital resource implementation that addresses not just content availability but also the technological, physiological, and cognitive aspects of digital reading. This could include providing eye-friendly reading devices, offering training in effective digital reading strategies, and creating distraction-reduced reading environments. Second, the persistence of print preference suggests that complete transitions to digital formats may be premature, and hybrid print-digital solutions may better serve student needs. Third, the socioeconomic dimensions of digital reading barriers underscore the need for institutional support programs that ensure equitable access to necessary technologies and resources.

This research conducted on student barriers in reading digital books at the English Language Education Study Program aimed at identifying student barriers, and then researcher carried out an analysis of their findings. In this research, researcher collected data through student interviews, and observations during first semester until third semester.

The research results show that there were various barriers experienced by students, ranging from technological, physical, to psychological barriers. Even though digital books offer easy access, this research confirms that there were special challenges that influence the effectiveness of using digital books in learning. This section focused on how these barriers relate to existing theory and research, as well as explore potential solutions that can be implemented to improve the student's learning experience.

### Access to Device

Students experience problems accessing devices to read digital books. These barriers include limited device memory capacity, batteries that drain quickly when outside the home, and some digital books that can only be accessed online without the option to download. This research supports the findings of [Bafadhal \(2021\)](#), which show that technical barriers such as access to digital devices and platforms are the main obstacles in technology-based learning, the importance of the availability of adequate devices to improve digital-based learning experiences.

### Internet Connectivity

Internet connection stability was one of the main barriers for students. Several students reported difficulty accessing digital books due to slow internet networks and uneven internet access where they live. So, they have to looked for a place with a stable internet connection so they can download the digital book and then read it when it's downloaded.

These findings are consistent with research by [Zilka et al., \(2021\)](#), who stated that poor internet connectivity can hinder digital accessibility and learning. This is further supported by [Raihana \(2022\)](#), who highlights that unstable internet access is an obstacle in understanding digital material. Digital-based education in Indonesia was not yet supported by adequate facilities and infrastructure. One of them was that using digital books as a learning medium still has obstacles in terms of access to devices. Most students use cell phones to access it, but the smartphones they use still do not support digital-based learning. Some students complained that the storage was full, making it difficult to download the digital book. In a Related Study Review, research by [Utami Aulia Bafadhal \(2021\)](#) which discusses students' obstacles in understanding texts using Google Classroom shows that one of the main problems was access to technology and technical obstacles that arise during the use of digital platforms. This was in line with the findings in this research which also found that unstable access to devices and internet connections were the main barriers for IAIN Palopo students in reading digital books. The findings of this research corroborate the results of Utami's research, by showing that technological barriers remain a significant issue in the educational environment, especially among students who do not yet have adequate access or technical skills. This highlights the need for better technological support, as also discussed in previous studies.

### Eyestrain

Reading for long periods on digital devices causes eyestrain. Some students said their eyes hurt after reading digital books, and the writing became blurry. This shows that reading on a digital screen causes eyestrain more quickly than reading a printed book. They emphasize strategies to reduce negative impacts, such as taking rest first and using anti-radiation glasses. This is similar to research that found that prolonged use of digital screens can cause digital eye strain, which includes symptoms such as eye pain, blurred vision, and headaches ([Maulida et al., 2021](#)).

### Reading Fatigue

Apart from eyestrain, students also experience general fatigue when reading digital books. This was often caused by radiation from digital device screens. Or it could also be due to irregular study time management. This research supports research by [Mustikasari \(2021\)](#) in the Related Study Review shows that psychological barriers such as lack of attention, low motivation, and anxiety are the main obstacles to reading comprehension. In this research, findings related to eyestrain and reading fatigue when using digital devices also show that physical and psychological factors are very influential in technology-based learning. This two research indicate that physical and mental aspects are important factors that need to be considered in the context of digital learning. If Maysarah focuses on psychological aspects such as motivation, this research adds an important physical dimension, namely the reading fatigue that student's face when reading digital books. Thus, this discussion broadens the scope of Maysarah's research by emphasizing the physical effects of technology use in learning. The present study revealed that students frequently encounter challenges in maintaining focus and concentration while engaging with digital books, which

subsequently impedes their overall reading comprehension and retention (Xie, 2021). The proposed solutions include the use of ergonomic devices and limiting reading duration.

### Concentration and Retention

Concentration problems are other barriers in reading digital books. Most students say they were distracted by social media notifications or other applications active on their devices. In the previous study, research by Alidin and Hartiningsih (2024) who examined barriers to reading comprehension using the Question-Answer Relationship (QAR) strategy found that barriers to grouping questions and finding main ideas often become challenges. In this research, it was found that distractions from social media notifications are also one of the main obstacles in digital reading comprehension. This interference has a negative impact on understanding the material contained in the digital book. The results of this research support the findings Rinaldy & Hartiningsih (2024), who stated that impaired concentration and lack of focus are the main obstacles in understanding text. This discussion may show that although the contexts and media used are different, both Rinaldy's research and this study highlight the need for strategies to overcome barriers related to comprehension and concentration. From the result interview, respondents suggest using methods such as turning off notifications during study sessions, which could be a strategy to reduce distractions, similar to using QAR as a strategy in improving reading comprehension. A second similar study pointed to the importance of specific intervention strategies to help students overcome their challenges.

### Format Issue

Some students experience discomfort with the digital book format, citing issues such as unappealing design and incompatibility with certain devices. In some instances, the students found the interactive features of the digital books, intended to enhance engagement, to be confusing or difficult to navigate, thus hindering rather than helping their comprehension (Kesson, 2020). This barrier supports the findings of Raihana (2022), which shows that appropriate formatting and structure of digital texts was very important to improve the reading experience. Adapting the format to make it more user friendly is necessary to reduce these barriers.

### Socioeconomic Barriers Cost

Cost was a barrier for some students, both in purchasing devices and digital books. Several students said they had difficulty accessing paid digital books, as well as economic limitations in purchasing adequate equipment. It was so important to provide affordable and inclusive educational resources so that digital-based teaching and learning activities can be realized well. Some students indicated that the cost of e-books and devices was a significant barrier to their access and use (Alsadoon, 2020). This research also supports the findings of Bafadhal (2021), who stated that cost constraints were a significant factor in technology-based learning. From interviews that have been conducted, respondents who have problems with the digital book payment process were looking for digital books that are not paid for or they even still buy them if the digital book was needed.

### Practical Solutions and Immediate Action for IAIN Palopo

The findings of this study present a nuanced understanding of digital book adoption in higher education, revealing multiple interdependent barriers that extend beyond simple technological access. While digital books offer theoretical advantages in terms of availability and searchability, their practical implementation faces significant challenges related to device limitations, infrastructural deficiencies, physiological effects, cognitive impacts, and socioeconomic barriers. These challenges are particularly acute in developing educational contexts like Indonesia, where uneven technological development and resource constraints amplify existing digital divides.

Several important implications emerge from these findings. First, educational institutions such as IAIN Palopo must adopt a comprehensive approach to digital resource implementation that addresses not just content availability, but also the technological, physiological, and cognitive aspects of digital reading. Practical solutions could include offering subsidized devices and internet access to students, ensuring that all students, regardless of their economic background, have access to the necessary tools for digital learning. Immediate steps could also involve providing eye-friendly reading devices, offering training in effective digital reading strategies, and creating distraction-reduced reading environments. These initiatives would address the technological, physical, and cognitive barriers identified in this study.

Second, the persistence of print preference suggests that complete transitions to digital formats may be premature. Hybrid print-digital solutions could better serve student needs. For example, IAIN Palopo could integrate both digital and print materials, allowing students to choose the format that best supports their learning objectives. This approach could bridge the gap between traditional and digital learning methods, supporting students' academic reading requirements.

Third, the socioeconomic dimensions of digital reading barriers underscore the need for institutional support programs to ensure equitable access to necessary technologies and resources. IAIN Palopo could explore offering subsidies or scholarships to students for the purchase of digital books or devices, as well as providing free or discounted access to educational resources. These measures would help alleviate the financial burden and ensure that all students can engage fully with digital learning materials.

This study offers valuable insights into the multifaceted barriers students encounter in accessing and effectively utilizing digital books. These challenges extend beyond mere technical difficulties, encompassing cognitive, psychological, and socioeconomic dimensions. By implementing practical interventions – such as providing subsidized devices and internet access, developing hybrid learning environments, and delivering targeted support to disadvantaged students – institutions like IAIN Palopo can mitigate these obstacles and foster a more inclusive and effective digital learning experience.

The findings underscore the importance of adopting a comprehensive approach to digital education that considers

the technological, physical, and cognitive needs of students. By grounding these recommendations in actionable solutions, IAIN Palopo and similar institutions can foster more equitable access to digital resources, improve student engagement with digital books.

## CONCLUSION

This study provides significant insights into the complex barriers that hinder effective digital book utilization in higher education, particularly within under-resourced institutional contexts. The identification of seven distinct yet interrelated barriers – spanning technological, physiological, cognitive, and socioeconomic dimensions – challenges the assumption that digital formats inherently enhance learning accessibility. The research highlights how seemingly accessible technologies, such as smartphones, paradoxically create new forms of exclusion due to device limitations. Additionally, the high prevalence of digital reading fatigue (58%) and concentration difficulties (62%) calls into question the pedagogical adequacy of current digital reading interfaces for sustained academic engagement. Furthermore, the strong preference for print (67%) among students – especially digital natives – raises important concerns about the effectiveness of digital learning tools in fostering long-term comprehension and academic success.

The study carries significant theoretical implications by advancing three key arguments in educational technology discourse. First, it demonstrates that the materiality of reading technologies mediates cognitive outcomes, supporting embodied cognition theories in digital literacy. Second, the findings complicate the digital native paradigm by revealing persistent comprehension gaps in digital environments. Third, the research validates a post-digital perspective, suggesting that technological integration should be situated within existing educational ecologies rather than viewed as a standalone solution.

From a practical standpoint, these insights emphasize the need for institutions to recognize that equitable digital education requires more than just infrastructure—holistic support systems addressing device adequacy, digital wellness, and multimodal resource availability are equally essential. In particular, the physiological impacts documented underscore the need for ergonomic considerations in educational technology design and policy.

Several methodological limitations qualify the study's contributions. The context-specific nature of the research, conducted at a single Indonesian institution, limits the generalizability of findings to other educational settings. While the modest sample size (N=12) provided qualitative depth, it prevents broad statistical claims. The three-semester observation period may not fully capture longitudinal adaptation effects, and potential self-reporting biases in interview data could influence barrier prevalence estimates. Additionally, the study's exclusive focus on English majors may overlook discipline-specific variations in digital reading challenges. These limitations highlight the need for future larger-scale, mixed-methods research to establish definitive patterns across diverse educational contexts.

To address the identified barriers, a multi-tiered implementation framework is proposed. At the policy level, institutions like IAIN Palopo should consider developing comprehensive digital equity plans that include device lending programs, connectivity subsidies, and hybrid resource policies. Hybrid learning models, combining digital and print resources, could be particularly useful in contexts where digital infrastructure is limited. These models would allow students to benefit from the interactive features of digital tools while still having access to the tactile engagement provided by print books.

Curriculum designers should integrate digital literacy training, with a specific focus on concentration strategies and ergonomic practices. Faculty development should emphasize multimodal pedagogy that strategically combines both print and digital formats, based on learning objectives and resource availability. Additionally, academic support services focusing on digital wellness and time management techniques should be created for students. These services should work in tandem with rigorous monitoring systems to assess their effectiveness in reducing digital reading barriers.

While this study touches on the need for enhanced infrastructure and digital literacy support, future research could explore the effectiveness of specific interventions aimed at mitigating digital reading barriers. For example, digital detox strategies, which help students reduce screen time and minimize distractions, could be assessed for their impact on student focus and comprehension. Additionally, the use of ergonomic devices designed to reduce physical strain during prolonged reading sessions may offer significant improvements in students' overall learning outcomes. Experimental studies on these interventions, alongside longitudinal investigations, could provide valuable evidence for designing more effective digital learning environments.

The study identifies several avenues for further investigation. Longitudinal studies tracking the relationship between digital reading practices and academic performance across disciplines should be prioritized. Comparative research across diverse institutional contexts would help clarify how socioeconomic factors mediate digital learning experiences. Experimental studies testing interventions like blue-light reduction technologies or distraction-minimizing interfaces would contribute valuable insights into effective technological development. Research examining the intersection of digital barriers with other forms of educational disadvantage could inform more targeted support strategies. Mixed-methods designs are recommended for these studies to capture both quantitative patterns and qualitative experiences of digital reading.

In conclusion, this research advocates for a paradigm shift in digital education from technology driven adoption to learning-centered integration. The findings demonstrate that unlocking the potential of digital books requires addressing the complex interplay of technological, physiological, and cognitive factors that shape reading experiences. Institutions must recognize that achieving educational equity in the digital age necessitates more than just providing devices and connectivity. It requires a thoughtful approach to how these technologies interact with human learning processes. By adopting this evidence-based, nuanced approach, educators



and policymakers can develop digital learning ecosystems that genuinely enhance, rather than inadvertently hinder, learning outcomes.

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