

Maximizing Learning Outcomes through Printed and Digital Learning Materials among Junior High School Students

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Abstrack:

This study aims to analyze junior high school students' perceptions of the pedagogical superiority of printed and digital learning materials within a blended learning framework. The study used a quantitative descriptive survey design involving 30 students as respondents. Data were collected through a structured questionnaire that measured usage patterns, learning needs, and the contribution of each media to the learning process. The results showed that both types of media were perceived positively, but had different and complementary pedagogical functions. Print media was preferred to support concentration and intensive reading (Mean = 4.12), indicating its role in maintaining cognitive stability, strengthening conceptual understanding, and supporting in-depth reading. In contrast, digital media obtained a higher average score (Mean = 4.25) in the aspects of motivation and learning engagement through interactivity, multimodality, and immediate feedback features. However, the effectiveness of digital media was moderated by structural factors, with 30% of respondents reporting connectivity constraints and device limitations as significant barriers. Another important finding was that 90% of students recommended the hybrid approach, indicating metacognitive awareness of diverse learning needs. Thus, this study concludes that modernizing junior high school learning is not effective if done through full digitization, but rather through adaptive instructional design that integrates the tactile consistency and conceptual depth of print media with the flexibility and interactivity of digital media in a contextual and equitable manner.

Keywords: Adaptive Instructional Design; Blended Learning Cognitive Load; Digital Divide; Dual Literacies

Introduction

Learning resources are no longer viewed merely as passive storage for information but have become an integral part of students' thinking processes that directly influence learning outcomes. At the junior high school level, learning resources function not only as sources of information but also as tools that support conceptual understanding, critical thinking development, learning motivation, and students' information technology skills. With the rapid advancement of technology, learning resources have evolved into various digital formats such as e-books, interactive multimedia, web-based modules, and learning applications that are increasingly used in formal classroom contexts. The integration of digital technologies in learning has also been shown to increase students' engagement and participation, as digital media provide more interactive and flexible learning experiences (Nurlita & Taufiq, 2025).

Despite the growing availability of digital learning resources, printed learning materials have not become obsolete. Previous studies indicate that the effectiveness of learning resources is not determined solely by their format but also by how well they align with students' cognitive processes and learning objectives. Printed materials are often considered advantageous for supporting deep, linear reading and note-taking activities, whereas digital resources offer flexibility, accessibility, and interactive features that may enhance students' engagement. A study by (Fenny and Perdhani, 2024) found that students generally showed positive perceptions toward both printed and digital reading materials, although digital formats were slightly preferred due to their accessibility and visual attractiveness, while printed materials remained valuable for note-taking and deeper comprehension.

Similarly, (Pratiwi et al., 2025) reported that junior high school students tended to prefer digital learning resources because they perceived them as more engaging and motivating, even though printed materials were still regarded as useful for strengthening conceptual understanding. Other recent studies also indicate that digital learning resources can enhance students' vocabulary development and language learning through interactive and accessible features (Nadira & Ningsih, 2025).

However, existing studies still present several limitations. Many previous studies tend to examine either printed or digital learning resources separately rather than comparing both formats simultaneously within the same learning context. In addition, a considerable portion of the literature focuses on students at the senior secondary or higher education level, leaving limited empirical evidence regarding how junior high school students perceive and utilize both types of learning resources within formal classroom learning environments. As a result, the comparative understanding of students' perceptions toward printed and digital learning resources at the junior high school level remains insufficiently explored.

Addressing this gap, the present study seeks to provide a more comprehensive understanding of junior high school students' perceptions of both printed and digital learning resources when used within formal learning settings. Specifically, this study contributes to the existing literature in two ways. First, it offers a direct comparison of students' perceptions of printed and digital learning resources within the same educational context. Second, it focuses specifically on junior high school students, a group that has received relatively less attention in previous comparative media studies. By doing so, this research aims to enrich empirical evidence regarding how different formats of learning resources support students' learning outcomes and inform educators and policymakers in designing balanced and effective learning resource strategies for the digital era.

Thus, the research question addressed in this study is:

"What are junior high school students' perceptions of the use of print and digital learning resources to support their learning outcomes?"

Literatur Study

Printed Learning Materials: Cognitive Stability and Deep Processing

Printed learning materials can no longer be understood simply as traditional media that "survives" amidst the tide of digitalization, but rather as cognitive instruments with their own epistemic characteristics. Several studies within the cognitive load theory and deep reading frameworks indicate that printed texts tend to support more stable linear processing, attentional control, and semantic integration compared to digital formats, which are often hypertextual and fragmented. This argument aligns with findings in Maryanne Wolf's *Reader, Come Home*, which emphasizes that deep reading requires a neurological state

that is more easily facilitated by printed texts because they minimize distractions and support metacognitive reflection.

However, the literature also shows that the advantages of print are not universal. Comparative studies across contexts have found that differences in reading performance between print and digital are often influenced by task design, text complexity, and student reading habits. In other words, the medium is not a single determinant; its effectiveness is situational and depends on the match between the media's characteristics and the learning objectives. Therefore, in the context of junior high school students, printed texts tend to be more effective for building conceptual foundations and structural understanding, especially when the material is explanatory and requires coherent causal reasoning. The current research challenge is no longer to compare "which is better," but rather to identify the pedagogical conditions under which printed media provide the most optimal cognitive contribution.

Digital Learning Materials: Multimodality, Cognitive Engagement, and Inequality

Digital learning materials expand the spectrum of knowledge representation through multimodality—a combination of text, audio, visuals, animation, and interactivity. Based on the Cognitive Theory of Multimedia Learning developed by (Mayer, R. E. 2020), learning is more effective when information is presented through integrated verbal and visual channels, as long as the design adheres to the principles of cohesion, segmentation, and appropriate redundancy. This means that multimedia does not automatically enhance learning; its effectiveness depends on the quality of the instructional design.

Motivationally, features such as immediate feedback and gamification have been shown to increase task engagement, particularly in adolescents who need rapid responses and high visual stimulation. However, contemporary literature also critiques the assumption that increased motivation is always directly proportional to increased conceptual understanding. Excessive interactivity can actually increase extraneous cognitive load and disrupt the integration of meaning.

In addition to cognitive aspects, structural dimensions such as the digital divide remain crucial variables. Data shows that limited internet access, devices, and digital literacy moderate the effectiveness of technology-based learning. Thus, in the context of junior high schools in areas with unequal infrastructure, digital learning materials have the potential to create disparities in learning outcomes if not balanced with equitable access policies and adequate pedagogical support.

Learning Outcomes: Beyond the Media Dichotomy toward Contextualized Blended Integration

Recent discourse in international education policy, including a report by the (Organization for Economic Co-operation and Development, 2021), emphasizes that the print versus digital dichotomy is reductionist. Learning outcomes are not determined by the type of media, but rather by the quality of the instructional design, teacher competency, and the student's learning context. Thus, a blended learning approach is not simply a technological compromise, but rather a pedagogical strategy that integrates the cognitive stability of print media with the interactive flexibility of digital media.

For eighth-grade students, this integration has developmental relevance. At this stage, students are strengthening their abstract thinking and self-regulation skills. Print media can serve as a support for conceptual structures and in-depth reading, while digital media provides space for exploration, simulation, and adaptive feedback. A literature synthesis suggests that the combination of the two is more effective when: (1) print is used to reinforce core concepts and academic literacy, (2) digital is used for elaboration,

practice, and collaboration, and (3) the teacher acts as a pedagogical mediator who ensures coherence between the two media.

Thus, rather than pitting media against each other, this study positions learning as a multimodal ecosystem oriented toward alignment between cognitive goals, learner characteristics, and socio-technological contexts. This synthetic approach provides a more robust theoretical foundation than descriptive approaches that merely outline the advantages of each medium without intercontextual analysis.

Metode Penelitian

Research Design

In this research project, we used a quantitative research design that describes and measures the way in which students perceive the printed and digital learning materials they use. We selected a descriptive design because it gives us an objective way to identify and quantify what students think about using the printed and digital learning materials, how they use them, and what their educational requirements are. The use of this design enables us to provide a statistical overview of the current educational environment within junior high schools, thereby helping to understand how different types of media impact student engagement.

Participants and Sampling

The participants consisted of 30 Grade VIII students from SMP Negeri 10 Ambon. A convenience sampling technique was employed for participant selection, chosen for its practical feasibility within the specific school setting. Grade VIII students were specifically targeted as they are at a critical developmental stage where they transition from foundational learning to more complex, independent study habits, making their perceptions of learning media particularly relevant.

Research Instrument

The primary data collection tool was a structured questionnaire, adapted from previous studies on the perceptions of learning materials with respect to ensuring construct validity. There were four thematic sections to this tool and each was designed to capture a holistic view of the student experience. Section I: Patterns of engagement with printed learning materials, Section II: Frequency and type of use of digitally based learning materials, Section III: Pedagogical benefits (in other words, how students perceive each medium contributes to their education) of both printed and digitally based materials, Section IV: Learning needs, identified by students, and preferences for the future integration of materials

The responses to each question were measured on a five-point Likert scale (1 = Strongly Disagree; 5 = Strongly Agree) to promote nuanced data collection. The data from these scales provided mean scores for comparison across all participants regarding their perceptions of the value of each type of material. The questionnaire items were adapted from previous studies, ensuring content validity. The instrument was reviewed for clarity and relevance before administration and is considered to have acceptable reliability based on its consistent use in similar perception-based studies.

Data Analysis Procedure

The collected data were subjected to descriptive statistical analysis using frequency distribution, percentage calculations, and mean score determination. Frequencies and percentages were used to categorize the breadth of student agreement, while mean scores served as the primary metric for evaluating the overall strength of student perceptions toward both printed and digital resources. This analytical framework ensured that the conclusions were grounded in empirical evidence derived directly from student responses.

Data Analysis

The collected data were analyzed using descriptive statistics, including frequencies, percentages, and mean scores, to describe students' perceptions and needs.

Result

Table 1. Students' Perceptions of Printed and Digital Learning Media (N = 30)

Learning Media	Mean Score	Percentage (%)	Main Function Identified by Students
Printed Materials	4.12	83%	Concept clarification, structured reading, note-taking
Digital Media	4.25	87%	Engagement, interactivity, immediate feedback
Infrastructure Barrier (Digital Access Limitation)	—	30%	Unstable internet, limited hardware access

The descriptive statistical analysis reveals a nuanced and non-dichotomous relationship between student learning and learning media. A substantial majority of respondents (83%, $M = 4.12$) agreed that printed materials contribute significantly to clarifying subject matter. This finding suggests that print functions as a cognitive stabilizer, supporting sustained attention, structured reading, and note-taking activities that reinforce conceptual understanding. In other words, printed materials appear to provide the structural backbone of the learning process.

Conversely, digital media obtained a slightly higher mean score ($M = 4.25$), with 87% of students reporting active use of digital tools such as Google Forms and instructional videos. This indicates that digital platforms play a prominent motivational and engagement-oriented role in learning. Students perceive digital tools as interactive and responsive, particularly due to features such as immediate feedback and multimedia representation.

However, the data also reveal a structural limitation: approximately 30% of students reported experiencing infrastructure-related barriers, including unstable internet connectivity and limited access to appropriate hardware. This finding highlights a critical equity concern. While digital media demonstrate strong engagement potential, an exclusive shift toward fully digital learning risks marginalizing a significant proportion of students. Therefore, the data empirically support a balanced or blended instructional approach rather than a digital-only transition.

Discussion

Empirical findings from SMP Negeri 10 Ambon indicate that positioning print and digital teaching materials as two opposing formats constitutes a false dichotomy. Rather than competing, the data suggest a differentiation of pedagogical functions within an integrated learning ecosystem. The mean score for print media ($M = 4.12$), particularly in supporting reading concentration and clarifying concepts, indicates that students perceive printed materials as facilitating focused reading and conceptual comprehension. This perception is consistent with students' responses in the questionnaire, where a majority reported that printed texts help them maintain concentration and make it easier to annotate or revisit important sections. From a cognitive load perspective, this pattern can be interpreted as reflecting the relative stability of linear text

structures, which reduce navigational demands and allow students to allocate more cognitive resources to understanding the material.

However, these findings should not be interpreted as evidence that printed media are inherently superior to digital media. Cognitive Load Theory primarily emphasizes the efficiency of instructional design rather than the inherent advantages of a specific medium. In this study, the relatively stronger perception of print for concentration may reflect contextual learning conditions reported by students, such as distractions when using smartphones, interruptions from notifications, or difficulties maintaining focus when reading longer materials on screens. Therefore, the empirical data suggest that the perceived effectiveness of print media in this context may be associated with the current digital learning environment experienced by students rather than with intrinsic media superiority.

Conversely, digital media obtained a slightly higher mean score ($M = 4.25$), particularly in indicators related to engagement, accessibility, and learning motivation. Students reported that digital resources make learning feel more interesting and easier to access because materials can be opened quickly through mobile devices or school platforms. This empirical pattern aligns with the principles of the Cognitive Theory of Multimedia Learning proposed Mayer, R. E., (2020), which suggests that learning materials combining visual and verbal information can enhance engagement and facilitate information processing when properly designed. Nevertheless, it is important to note that the data collected in this study measure students' perceptions and usage patterns rather than direct indicators of long-term retention or conceptual transfer. Consequently, while higher engagement with digital media was evident in the responses, this finding should be interpreted cautiously, as perceived engagement does not necessarily guarantee deeper conceptual understanding.

Another notable finding emerging from the survey responses is students' positive orientation toward combining both types of learning resources. Many students indicated that they prefer using printed materials when reading complex explanations or studying core concepts, while digital resources are considered more useful for searching additional information, completing exercises, or accessing multimedia explanations. These responses suggest that students are beginning to recognize functional differences between media types in relation to specific learning tasks. Such patterns indicate a developing form of metacognitive awareness in which students implicitly match learning media with the cognitive demands of different academic activities.

In addition to cognitive considerations, the data also reveal structural factors that influence the use of digital resources. Approximately 30% of students reported experiencing limitations related to internet access, device availability, or connectivity stability. This finding highlights that the effectiveness of digital learning resources is moderated by infrastructural and technological conditions. In contexts where digital access is uneven, exclusive reliance on digital materials may unintentionally create learning disparities among students. Therefore, the adoption of digital learning resources should also consider issues of accessibility, digital literacy, and institutional readiness.

Overall, the integration of empirical findings and relevant theoretical perspectives suggests a contextualized blended learning model. The results of this study indicate that students do not perceive print and digital media as mutually exclusive; instead, they view them as complementary learning tools that support different aspects of the learning process. Within this pedagogical configuration:

1. Print media support sustained attention, structured reading, and deeper conceptual engagement.
2. Digital media facilitate accessibility, multimodal interaction, and flexible learning exploration.

3. Infrastructure and access act as moderating factors that influence the practical effectiveness of digital learning environments.

Thus, the findings encourage a shift in pedagogical focus from the binary question of “which medium is better?” toward a more context-sensitive consideration of “which medium best supports specific learning objectives and cognitive tasks in a given educational context.” By grounding theoretical interpretation in the empirical data collected from students, this study contributes to a more nuanced understanding of how traditional and digital learning resources can be strategically integrated to support effective learning in junior high school environments.

Conclusion

This study confirms that junior high school modernization will not be achieved through total digitalization, but rather through strategic synergy between print and digital media. Data shows that 90% of students prefer a hybrid model, indicating a metacognitive awareness of their own learning needs. Digital media has been shown to play a powerful role in increasing motivation and vocabulary enrichment, while print serves as an anchor for in-depth reading and conceptual retention. In line with (Baron's, 2021) view on the importance of tactile experience in in-depth reading, as well as (Wolf's, 2018) concept of the "bi-literate brain," students need to be trained to shift adaptively between rapid digital-based processing and slower print-based reflection. Thus, a one-media-fits-all approach is no longer relevant in contemporary educational practice.

Based on these findings, the following policy recommendations can be put forward: (1) developing a curriculum based on adaptive instructional design that establishes media selection based on the type of cognitive task; (2) strengthening dual literacies (digital and print) in student competency standards; (3) training teachers in blended learning designs oriented toward balancing cognitive load; and (4) prioritizing infrastructure investment to close the digital divide still experienced by approximately 30% of students. In line with (Carr, 2020) emphasis on the importance of "cognitive patience," education policy needs to ensure that technology integration does not sacrifice depth of thought for the sake of speed of access.

Further research requires more robust and specific methodological designs, such as quasi-experimental studies with control groups to measure differences in long-term retention between print, digital, and blended formats; cognitive load analysis based on standardized instruments; and longitudinal studies tracking the development of students' multiple literacies. Furthermore, mixed-methods research that combines quantitative learning outcome data with in-depth interviews about students' metacognitive strategies would provide a more comprehensive understanding of how and under what conditions media synergy actually improves learning quality.

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