STUDENTS' PERCEPTIONS OF DIGITAL DECODING TO IMPROVE READING COMPREHENSION IN DIGITAL TEXTS

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Abstract: The structure of digital text is different from printed text, since special techniques or strategies are required to understand digital text. Many challenges are encountered in digital texts, such as multimedia interference or loss of focus. This study aims to determine the use of digital decoding techniques in improving students' comprehension of digital texts. This digital decoding technique is implemented through associations between word sounds, meanings, and reading contexts, and is reinforced by the creation of 5W1H-based infographics to help students organize information from the texts they read. This study uses a qualitative approach with a phenomenological design, involving eighth-grade students at SMPN 3 Cisaga as participants. The data was collected through structured observations supplemented by field notes, which were then analyzed using descriptive analysis plus calls to action that include solutions or suggestions. The results of the study showed an increase in students' reading comprehension after the application of this technique. Students became more active and independent in reading, and their dependence on translation tools was reduced. The use of 5W1H-based infographics helped students organize important information, thereby improving comprehension and retention of reading content. This study contributes to enrich effective teaching strategies in digital literacy strategies. Further research is recommended to be conducted over a wider scope and longer period of time.

Keywords: *Digital decoding, reading comprehension, digital text*

INTRODUCTION

Reading skills are still a big challenge in education, especially in an era of digital learning. Many students have difficulties to comprehend what they read, especially in digital formats. Indonesia scored 436 in reading literacy according to the PISA 2022; it has decreased by 8.02% from 2018 to 2022 (PISA, 2023). Furthermore, a global literacy survey conducted by Central Connecticut State University ranked Indonesia 60th out of 61 countries, just above Botswana (Nadifa et al., 2024). These findings reflect the ongoing Indonesian students' difficulty in understanding reading materials, which in turn affects their academic performance. Anjarsari & Febriani (2022) claim that reading is one of the four essential language skills in English and is considered crucial for academic and communicative success because it is a window of knowledge for developing critical thinking skill (Rohayati, 2017; Rohayati & Friatin, 2021). Reading texts in a foreign language, especially in digital form, is a complex process requiring both cognitive and

linguistic skills. However, many students have limited vocabulary and lack effective reading strategies. This is further more complicated by reading in a foreign language that is not their native tongue. To address this challenge, teachers are encouraged to incorporate technology into their instruction to make learning more effective and engaging (Pitriani et al., 2024). An effective technique that can be used is to find effective techniques or strategies that can help students understand a text, especially digital text.

In the 21st century, reading has transformed beyond traditional print media to include digital platforms such as e-books, websites, and online learning resources. A previous study shows that students who are skilled at navigating digital tools and thinking critically better equipped to understand complex issue (Tursunov, 2024).The results of this study indicate that digital literacy has a significant positive impact on students' reading comprehension, as students are able to filter information and analyse text effectively. However, digital texts pose unique challenges: readers may struggle with hyperlink navigation, multimedia interpretation, and maintaining attention amidst online distractions. Therefore, reading comprehension in digital contexts involves decoding, recognizing, and analysing words within these new structures (Wawire et al., 2021). This can reduce the cognitive load created by multimedia elements, and students can analyze the information contained in digital texts.

Considering the importance of technology adaptation, this has extended to the world of education, which is undergoing changes along with the integration of technology into learning. This shift requires significant changes, particularly in reading instruction, such as how students are taught to read, interpret, and analyse texts in digital media. Traditional reading techniques that focus on comprehending printed texts in linear format are ineffective in addressing the challenges posed by digital reading. Research findings indicate that integrating multimodal elements such as animated illustrations in poetry, hyperlinks in interactive narratives, and dramatic audio effects significantly enhances students' critical deconstruction of textual meaning and fosters learning motivation (Fradana et al., 2025). These findings demonstrate that integrating multimedia elements requires specific and effective strategies or techniques. Therefore, students need skills beyond basic reading comprehension to develop digital literacy competencies that enable them to process, navigate, and think critically.

The application of digital decoding techniques facilitate in improving the reading comprehension among children. multimodal text patterns guided students to identify keywords and summarize information in the text using structured tools such as the 5W1H, actively engaging in the learning process rather than passively receiving it. This approach transforms students into active readers who are able to process information contained in digital text and organize ideas visually. This approach can also improving motivation, confidence, and a sense of ownership in the learning process. As one of strategy, a digital decoding supports learners in associating written words with sounds and meanings using multimedia tools (Fogarty et al., 2021). Thus, it can be considered that digital decoding is a technique that connects letters in text with the sounds of the letters, which aims to make it easier to find the meaning of the word. It is consistent with Paivio's Dual Coding Theory (1986, as cited in Mir, et al., 2023), who explain how the implementation of digital decoding techniques can improve students' literacy comprehension. This theory attempts to combine two communication systems which allows students to connect digital text with verbal and visual elements, thereby facilitating reading comprehension. Accordingly, the verbal system refers to the processing of words and language in the text, while the visual system refers to images, charts, or videos. In the context of digital decoding, students read digital text while associating it with visual elements, such as creating a 5W1H infographic, or with verbal elements, such as spoken words or narration. This this dual input not only improves students' reading comprehension but also sharpens vocabulary retention and inference skill for students who struggle with reading comprehension.

Digital decoding techniques are also highly relevant to educational developments that emphasize digital transformation. Many programs, both local and international, emphasize

technology. For example, local governments have issued policies regarding the National Digital Literacy Movement (GNLD) Program, which aims to facilitate the development of digital skills (Banyu Hikmah et al., 2024). Internationally, the Australian government's policy on digital technology instruction is implemented in New South Wales (NSW), Australia, where learning in Australia has embraced technology at all levels (Cosby et al., 2023). From these two policies, it can be concluded that, both locally and internationally, digital literacy has become a major focus in education. With this digital technique, teachers can develop targeted, cost-effective, and effective strategies. However, this educational advancement also is hindered by the less internet supply. One example is in Indonesia, where many schools, especially in rural areas, still lack access to technology or the internet.

Previous studies have demonstrated the potential of digital decoding techniques in enhancing reading skills. Donnelly et al. (2020) who showed the benefit from the use of decoding techniques in a digital context and demonstrated greater improvement compared to students who did not use digital decoding techniques. Day et al. (2024) found that affordances offered by technology, which are not available in paper-based books, can effectively support the development of students' reading-related skills, including the use of strategies. Decoding and reading fluency have also been found to predict 8.1% to 43.3% of variance in reading comprehension (Kang et al., 2019). However, in digital texts such as hypertext, students can experience cognitive overload due to the large number of competing information elements. This aligns with Sweller's Cognitive Load Theory (CLT) (1988, as cited in Lopez, 2024), which argues that human mental capacity is limited, and this limitation plays a major role in how learners absorb and retain new information. While cognitive overload can hinder comprehension in hypertext environments, well-designed digital texts and navigation tools can mitigate these effects (Taky et al., 2024). Additional research has argues that students with lower vocabulary levels benefit more from structured digital decoding than from traditional text formats (Foorman et al., 2018; Blom et al., 2018). Similarly, hyperlinks in digital texts can enhance reading efficiency and comprehension by directing students to key information quickly (Fitzsimmons et al., 2020). Also, Fenny et al. (2025) reports that the use of digital texts has an effective impact on improving reading comprehension. From the five previous studies, it can be concluded that if digital decoding techniques are integrated with good digital text and supporting navigation, it can have a positive and effective impact on improving students' reading comprehension. Considering the declining trend in reading comprehension and the unique demands of digital texts, this study aims to investigate the effectiveness of digital decoding techniques in improving students' reading comprehension.

METHOD

This approach is adapted from Yin & Robert (2016), who emphasized qualitative interpretation that links field data with potential instructional interventions. In particular, this study utilized phenomenology rooted in Husserl's phenomenological approach. It is a way of scientific method in understanding of reality and examining human experiences (Bonyadi, 2023). The participants in this study were seventh-grade students at SMP Negeri 3 Cisaga, a junior high school located in Ciamis Regency, Indonesia. This grade level was selected because students at this stage are beginning to engage with more complex reading materials, including digital texts. Two primary data collection methods were used: structured observation and semi-structured interviews.

The researchers observed the implementation of digital decoding techniques during reading activities. The focus of the observation included students' engagement with reading tasks, their application of decoding strategies, and their level of attention and comprehension when interacting with digital texts. These observations were guided by an observation checklist developed to capture relevant behaviours and interactions. To complement the observational data, semi-structured interviews with open-ended questions were conducted. These interviews aimed to

explore students' prior knowledge, perceptions, and self-assessed difficulties related to reading comprehension in digital contexts.

The data were analyzed using descriptive qualitative analysis. In observational and interview data were thematically organized to identify patterns related to students' use of digital decoding strategies and their reading comprehension outcomes. The findings were interpreted to generate pedagogical insights, including how digital reading materials can be more effectively delivered, how student challenges in comprehension can be addressed, and how decoding techniques can be optimized in classroom settings. The analysis also included reflective commentary by the researchers to provide practical suggestions for improving the teaching of digital reading skills.

RESULTS AND DISCUSSION

The researcher first conducted a semi-structured interview with open and closed questions to the 10 participants to find out how the participants' initial reading comprehension abilities were. Subsequently, the researchers conducted observations on participants with the aim of finding out how the use of digital decoding techniques improves students' reading comprehension of digital texts. The results of the interview and observation are discussed in the following organization:

The result of semi structured interview

As previously mentioned, the interview with the aim of exploring their initial understanding of reading comprehension, the strategies they usually use when facing difficult texts, and their general attitudes towards reading. The students' initial understanding of reading comprehension is illustrated in the Excerpt 1.

Excerpt 1:
P1 : *In my opinion, reading comprehension is understanding the contents of the text, like being able to answer the questions.*
P4 : *Reading comprehension is knowing the contents and meaning of the reading.*

From Excerpt 1, it can be concluded that the participants understand what reading comprehension is, especially in understanding the content and meaning of a text as a whole. This indicates that the participants recognize the importance of the process of understanding meaning as a whole. This statement also indicates that the participants have not yet fully mastered complex reading techniques, but they have already recognized that reading is not only about recognizing words but also about understanding the meaning and content of the text they read. This awareness forms the basis for improving reading comprehension. Meanwhile, the students' strategies when facing difficult texts is elaborated in Excerpt 2.

Excerpt 2:
P1 : *Sometimes I get lazy if the reading is long and the topic is not interesting. It makes me lose focus.*
P8 : *The challenge is usually new vocabulary, but I enjoy trying new things.*

From Excerpt 2, participants experienced specific difficulties that varied among participant, such as loss of focus, limited vocabulary, and more. This made the difficult to understand a reading text. This indicates that although participants had a basic understanding of reading comprehension, they often struggled to apply this understanding effectively to complex texts.

Excerpt 3:
P2 : *My difficulty is usually with new words or if the text is too long*
P6 : *I don't remember it well*

However, in practice, participants experienced difficulties in comprehending reading texts as a whole, such as limited vocabulary, poor recall of the text, and so on (Excerpt 3). These difficulties indicate that although students have a basic understanding of reading comprehension,

they struggle to apply effective strategies that can fully comprehend the text. This is an important baseline finding for researchers in understanding participants' needs and provides a basis for implementing digital decoding techniques.

Excerpt 4:

P1 : *I think digital is easier because it can be accessed anywhere. But the downside is that it tires your eyes.*

P2 : *Quickly get information, lots of notifications*

The last, based on Excerpt 4, it can be concluded that participants are aware of the advantages and disadvantages of reading digital texts. One advantage of reading digital texts is flexibility, quick access to information, and so on. However, digital texts also have disadvantages, such as eyestrain, multimedia distractions, and other issues. These disadvantages can be minimized by implementing effective teaching strategies that guide students in navigating digital content in a more focused manner.

The result of observation

After conducting interviews to determine students' initial reading comprehension abilities, researchers conducted observations on participants with the aim of finding out how the use of digital decoding techniques improves students' reading comprehension of digital texts. Observation activities are divided into three main aspects, each of which is designed with indicators and assessment criteria that have been determined according to the focus of observation: 1) General Classroom Engagement and Participation/ Grouped Observations; 2) General Behaviour of Each Student's Group; and 3) Classroom Trends (General Summary). The result of observation is elaborated in the Table 1, Table 2, and Table 3.

Table 1 General Classroom Engagement and Participation/ Grouped Observations

General Group/Activity	Engagement with Decoding Task	Participation in Activities	Attention to Reading Task	Use of Decoding Technique
Group 1	2	2	2	3
Group 2	3	4	3	3
Group 3	3	2	3	3
Group 4	3	4	2	2

Notes: Rate each student's behaviour on the following scale during the observation:

1 = Low engagement
2 = Some engagement
3 = Moderate engagement
4 = High engagement

Based on the Table 1 above, it shows the level of involvement and application of digital decoding techniques in learning digital texts. Among the four groups of students, Group 2 showed consistent performance and high scores, at which they showed active involvement and fairly good use of digital decoding techniques. Group 3 also showed moderate involvement and attention, although their participation was still less than optimal. Meanwhile, group 1 showed moderate scores, indicating their involvement was limited even though they started using digital decoding techniques. While Group 4 showed high participation but their use of digital decoding techniques was low. So, it can be concluded that the success of this digital decoding technique is not seen from the level of student participation, but the extent to which students can apply the technique consistently and effectively.

The Table 2 depicts General behaviour of each student's group during the digital decoding technique activity, the following trends were observed: a. how involved is the student group in the decoding task; b. the difficulties faced by the student group; and c. general tendencies of students in applying the digital decoding technique

Table 2 General behaviour of each student's group

Group/Activity	General Observations
Group 01	This group's members are a bit passive and slow; they rely too much on Google Translate.
Group 02	In this second group, they are active in asking questions and fast in doing assignments, they are also good at using decoding techniques, the downside is that they rely too much on one student.
Group 03	In group three, they are active in asking questions and focus on text analysis, they are also good at using digital decoding techniques, where they remember words with the sounds of the words. the difficulty is that they ask too many questions.
Group 04	In the last group, they are a bit passive in interacting, they also focus too much on image design, not on text analysis or using digital decoding techniques, but they can complete assignments, not as long as group 1

The Table 2 above shows observations of the general behavior of each group of students during the learning process using digital decoding techniques. In the first group, participants appeared passive, slow, and overly reliant on Google Translate, demonstrating a lack of independence in understanding the text. Meanwhile, Group 2 was active and quickly completed tasks and was quite good at using digital decoding techniques, although they tended to rely on one dominant member. The third group focused on text analysis, actively asked questions, and had a good understanding of digital decoding techniques, but needed guidance. Meanwhile, the fourth group was less active, focusing too much on visual design rather than text analysis, resulting in less than optimal implementation of digital decoding techniques. These findings indicate that the success of digital decoding techniques is influenced by group dynamics, focus of attention, and role distribution in the learning process.

The last pat deals with Classroom Trends (General Summary) of observation results during the use of digital decoding techniques as described in following Table 3.

Table 3 Classroom Trends

Overall student engagement with decoding techniques	Some students can already use digital decoding techniques on digital texts, where they can interpret a word by recalling the sound of a word in the digital text with the sound of a word they know.
Common difficulties faced by students	The difficulty they face is that there is vocabulary that they just know, so they need other tools, such as Google Translate, to find out the meaning of the word.
Level of comprehension using the decoding techniques	By using digital decoding techniques, their understanding of a digital text develops well, and they can translate a text without leaving out any words. this helps them to increase their new vocabulary.

Based on the Table 3, it shows general observations during the use of digital decoding techniques in class. Overall, students have a fairly good level of engagement in the use of digital

decoding techniques to improve reading comprehension This can be seen from students being able to use decoding techniques well in reading digital texts, for example by associating words in the text with recognized word sounds to make it easier for them to understand the meaning in the text. In addition, participants' understanding of the content increases where they can translate the text in its entirety without omitting or skipping words. At the same time, this technique helps participants increase their vocabulary and supports literal understanding of digital reading.

From these three observation analyses result, the researchers concluded that this digital decoding technique can improve students' reading comprehension, especially for digital texts. The success of this technique is determined by the consistency and effectiveness of its application in understanding digital texts. Although groups with high participation do not always demonstrate optimal use of digital decoding techniques, more focused and directed groups can activate this technique more effectively. Through this technique, students' reading comprehension also improved. This is evident in the differences in students' initial abilities, where students relied on translation aids and struggled to understand the text as a whole. After implementing this digital decoding technique, students began to demonstrate independence in reading, were able to associate word sounds with their meanings, and understood the content of digital texts without having to search for the meaning.

Discussion

The findings of this study provide several practical implications for educators to improve students' reading comprehension. Teachers can be encouraged to integrate this technique into reading lessons by combining verbal and visual representations such as infographics. This can be implemented through simple tools such as PowerPoint presentations, interactive e-books, or student-created visual summaries combined with the 5W1H framework. Teachers can also provide more guidance to students who have difficulty decoding or limited vocabulary. This consistent with Paivio's Dual Coding Theory (1986, as cited by Kanza Junaid, 2023), which can help explain how the application of digital decoding techniques can improve students' literacy comprehension. This theory combines the two systems' modes of interaction but complementary cognitive systems, where the verbal and visual systems are used simultaneously, resulting in better comprehension of text information. Through this technique, students not only read the text but also connect it to the images within it.

This aligns with the findings of Donnelly et al. (2020) which found that readers with reading difficulties can benefit from decoding techniques to stimulate reading comprehension. This finding is also in line with the findings of Day et al. (2024) which state that affordances offered by technology, which are not available in paper-based books, can effectively support the development of students' reading-related skills, including the use of strategies. Furthermore, the findings of Fenny et al. (2024) showed that in general, students had positive views of both digital text and printed text, but they preferred digital reading materials. This statement is also supported by the findings of Fogarty et al. (2021) in that phonics instruction is effective in teaching reading. The researchers concluded that the present study is similar with previous studies aforementioned in that decoding approaches, including phonics, can promote reading comprehension by mapping the relationship between sound and word meaning.

CONCLUSION

This study demonstrates that digital decoding techniques can significantly enhance students' reading comprehension of digital texts. By linking written words to their sounds, meanings, and contextual meaning, this technique helps students better understand the overall content of digital materials. The findings indicate increased student engagement and independence, as evidenced by a reduced reliance on translation tools and improved ability to interpret vocabulary within context. This study transforms students from passive translators who rely on translation tools to active readers by implementing digital decoding techniques, which associate students with sounds and

visuals. This change is meaningful and aligns with 21st-century learning objectives. Teachers can encourage and guide students to further improve their reading comprehension by applying these digital decoding techniques in simple ways through digital tools such as e-books, learning websites, blogs, and other tools that can support learning and conceptually support vocabulary acquisition and reading comprehension. This aligns with the goal of supporting students' vocabulary mastery and reading comprehension of information contained in the text.

This study has positive implications both theoretically and practically. Theoretically, these findings support the Dual Coding Theory (Paivio) and Cognitive Load Theory (Sweller), both of which emphasize how multimedia-based decoding can facilitate effective information processing. Practically, it suggests that educators should integrate digital decoding techniques into the learning process. The study contributes to the development of reading instruction strategies that are responsive to the demands of the digital era. By integrating technology-based approaches, it offers practical insights into how educators can support learners in navigating digital texts more effectively. This study contributes to the literature by providing insights into how secondary schools implement and integrate digital decoding techniques into digital texts. This differs from previous research that focused on print decoding. Nevertheless, the study is limited in terms of its sample size and duration. Future research is recommended to examine the application of digital decoding techniques across broader educational contexts and over extended periods to validate and expand upon these findings.

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