CHAPTER II
REVIEW OF RELATED LITERATURE

2.1. Reading Comprehension

2.1.1 Definition of Reading Comprehension

Reading comprehension is basically defined as the process of constructing meaning through dynamic interaction between the reader and the written text (Lotfi Sin & Siahpoosh, 2020; Setiawati et al., 2022). This process involves simultaneously extracting and constructing meaning through active engagement with the written language (Arifin & Yunira, 2020). More specifically, reading comprehension reflects a person's ability to fully understand and summarize the content of a text, indicating the extent to which students can comprehend what they are reading (Ahmed et al., 2022). According to Snow (2002), reading comprehension is seen as the result of the interaction of three main elements, namely the reader who brings initial knowledge, motivation, and strategy; texts that have different levels of complexity; and well as reading activities that determine the purpose and context of understanding. This perspective emphasizes that the success of reading comprehension depends not only on the reader's cognitive abilities but also on prior knowledge, the strategies employed, and the context in which the reading activities are carried out. Correspondingly, reading comprehension is seen as a multi-component process and is very complex because it involves a wide range of interactions between the reader and the factors they bring into the text, including initial knowledge, the use of strategies, as well as the characteristics of the text itself (Arifin & Yunira, 2020; Lotfi Sin & Siahpoosh, 2020).

In line with this view, the Interactive Model of Reading developed by Rumelhart (1985) emphasizes that reading comprehension occurs through a dynamic and two-way process, where bottom-up and top-down strategies work simultaneously. In this model, the reader not only performs the process of word recognition and understanding sentence structure (bottom-up), but also activates initial knowledge, expectations, and context to build meaning thoroughly (top-down). This view aligns with the findings of Sin et al. (2020) which explain that reading comprehension does not only stop at word recognition, but also requires readers to interpret vocabulary and sentences, utilize prior knowledge, and apply cognitive and metacognitive strategies to understand the author's message. This process involves varying levels of cognitive operation, where the reader must go beyond word-for-word comprehension to grasp the ideas in the paragraphs and recognize the relationships between ideas in the text (Setiawati et al., 2022). In addition, reading comprehension encompasses a range of skills, including low-level skills such as vocabulary recognition and basic grammar comprehension, as well as high-level skills like making inferences, monitoring the comprehension process, and constructing mental representations of the text's meaning (Nasim et al., 2024). Ultimately, reading comprehension serves as a cognitive process that enables readers to engage with various types of texts of different levels of complexity, utilizing proper fluency and comprehension (Imbaquingo et al., 2023). The ultimate goal extends beyond simply recognizing words, aiming to achieve a deep understanding of meaning, evaluate the content of the text, and effectively manage the information presented in written form (Imbaquingo et al., 2023).

2.1.2 Importance of Reading Comprehension

Reading comprehension plays a crucial role in the education system and self-development, as it is one of the primary indicators of learning success and academic achievement (Munsod-Fernandez, 2021). The ability to understand written texts is an essential skill, as failure to read and comprehend will have a direct impact on learning outcomes, making reading comprehension a tangible manifestation of one's learning capacity (Munsod-Fernandez, 2021). In an academic context, reading comprehension significantly contributes to students' academic success and their broader life outcomes (Gunbas, 2020). The importance of this skill goes even beyond basic education, as reading comprehension also plays a crucial role in academic reading, which is closely related to the completion of cognitive and procedural activities, such as taking exams, writing papers, or making presentations (Adisaturrahimi et al., 2024). For university-level students studying English as a foreign language, the ability to comprehend academic texts is essential in supporting their academic success (Adisaturrahimi et al., 2024).

According to the Schema Theory proposed by Anderson & Pearson (1984), the process of reading comprehension is significantly influenced by schemas, which represent the structure of knowledge stored in the reader's memory. This theory posits that the reader relates new information from the text to their pre-existing knowledge, thereby constructing a comprehensive meaning. In other words, reading comprehension involves not only word recognition and sentence structure, but also the active process of connecting new information with previous experience and knowledge. This is in line with the findings of Habók et al. (2024), Oo et al. (2021), and Banditvilai (2020), which emphasize that a good reading strategy is indispensable to support the comprehension process because it helps students organize information, make predictions, and understand the relationships between ideas in the text.

Furthermore, reading comprehension is a lifelong learning skill that provides opportunities for academic success, self-development, and future job prospects (Habok et al., 2024). This skill also serves as a key tool in human life, as it enables the reader to build meaning, communicate effectively, and interact with their environment (Ntoulia, 2023). Therefore, reading comprehension is a crucial and fundamental skill for students in daily life, making it one of the primary requirements in the learning process as well as a goal that all education systems must achieve (Ntoulia, 2023). In the context of language learning, reading comprehension holds special significance because it is considered one of the most crucial skills in learning and mastering a second or foreign language (Ahmed et al., 2022). Thus, the teaching of reading comprehension not only aims to improve students' ability to comprehend texts, but also to develop active readers who can meaningfully interact with different types of texts throughout their lives (Ntoulia, 2023).

2.1.3 Components of Reading Comprehension

Reading comprehension is facilitated by several essential components that are interconnected and work together to enable meaningful text comprehension. This process encompasses fundamental elements, including recognizing words, developing reading fluency, and enhancing the ability to comprehend the meaning

of the text (Rosyidi, 2018). At its core, reading comprehension involves the process of decoding vocabulary and sentences, utilizing prior knowledge relevant to the text, and applying cognitive and metacognitive strategies to understand the message conveyed by the author (Sin et al., 2020In line with this, according to the Simple View of Reading (SVR) presented by Gough and Tunmer (1986), the success of reading comprehension is determined by two primary factors: decoding and linguistic comprehension. Decoding refers to the ability to recognize and convert written symbols into meaningful sounds or words. In contrast, linguistic comprehension refers to the ability to understand the meaning of the language that has been described in the text. These two aspects complement each other, so that reading comprehension can be achieved optimally only if the reader can recognize words accurately and relate them to relevant language understanding and knowledge.

After understanding the basic components of reading, it is also essential to review reading comprehension skills, which are categorized into two main areas: low-level and high-level comprehension skills. The reading comprehension component can be categorized into two main areas: low-level comprehension skills and high-level comprehension skills (Seleem et al., 2023). Low-level comprehension skills include the ability to recognize words in their entirety, determine the meaning of words by accessing sight vocabulary, recognize basic grammatical features, and understand vocabulary and sentence structures. Meanwhile, high-level comprehension skills involve the ability to construct mental representations of text meaning, make inferences, monitor the comprehension process to avoid misinterpretations, understand the text's organization, and connect concepts and synthesize information.

In addition to these skills, the process of reading comprehension can also be viewed from three different levels of understanding: literal, inferential, and critical-evaluative. Reading comprehension operates on three levels of comprehension (Munsod-Fernandez, 2021), namely: (1) The literal level, which is understanding the information explicitly stated in the text; (2) Inferential level, which is combining information and concluding the author's intentions and messages; and (3) Critical-evaluative level, namely analyzing information, reading deeply, and developing a more complex understanding of the concepts and implications of the text.

However, the ability to comprehend reading is not only influenced by linguistic skills alone, but also by the reader's involvement in integrating information, concluding, and connecting it with previous knowledge. The process of reading comprehension requires the reader to recognize words and derive their meanings, then use syntactic knowledge to combine them into larger units, such as clauses and sentences, and integrate information from different parts of the text (Nasim et al., 2024) In addition, effective reading comprehension also requires readers to utilize background knowledge to draw on the information implied in the text as well as apply reading strategies such as relating experiences to the information in the text, summarizing information, drawing conclusions, and asking critical questions (Lotfi Sin & Siahpoosh, 2020).

In line with this, the Simple View of Reading (SVR) theory, proposed by Gough & Tunmer (1986), provides a relevant conceptual framework for understanding how decoding skills and language comprehension interact to shape overall reading ability. This view emphasizes that the reader must not only possess good decoding skills,

but also the ability to understand and interpret information, because without a combination of the two, reading comprehension cannot be achieved to its maximum potential (Gough & Tunmer, 1986).

2.1.4 Challenges in Reading Comprehension

Reading comprehension presents various challenges for students in various educational contexts. One of the most fundamental barriers is the limitation of vocabulary, which directly affects students' ability to understand written texts. Students cannot understand the content of reading if they do not know the meaning of most of the words they encounter, so vocabulary mastery is an important factor in supporting the success of reading comprehension (Septiana et al., 2022). This challenge is even more evident when students struggle to understand the text due to limited vocabulary (Gözüküçük & Günbaş, 2020).

Furthermore, the lack of motivation and involvement among students is a significant factor that contributes to their limited ability in reading comprehension. Many students face dilemmas when trying to understand the text; most can read the words in the text but fail to comprehend their meaning thoroughly (Munsod-Fernandez et al., 2021). Additionally, students often find English texts too challenging to comprehend, which in turn lowers their interest and motivation to read (Ganito et al., 2022).

On the other hand, traditional learning approaches also contribute to students' low reading comprehension. Interviews with Turkish teachers revealed that the traditional reading environment was less appealing to students, with reports indicating that they were uninterested in participating in reading activities because they perceived them as passive, particularly due to the repetitive and monotonous methods employed (Gunbas et al., 2020). This is reinforced by the findings of Ganito et al. (2022) which suggest that learning to read often feels boring, thus affecting student engagement.

Furthermore, the academic reading context presents additional complexity, especially for students learning a second language. Some students often struggle to understand academic texts and tend to lack confidence in their reading abilities (Prof. Seleem, 2023). Challenges in understanding academic reading pose a significant obstacle, considering that achieving high proficiency in reading a second language is a complex task that involves numerous cognitive processes interacting with one another (Adisaturrahimi et al., 2024).

2.2 Problem-Based Learning (PBL)

2.2.1 Definition of PBL

Problem-Based Learning (PBL) is a student-centered pedagogical approach that empowers students to build knowledge through research, integration of theory and practice, and the application of skills to solve real-world problems (Insuk Han, 2024). PBL utilizes authentic problems as a learning context, enabling students to actively think, communicate, process information, and draw conclusions (Sari, 2018). Barrows and Tamblyn (1980), pioneers of PBL, explained that this method uses problems as a starting point to acquire and integrate new knowledge. In contrast, Savery & Duffy (1995) emphasize the principles of constructivism, where knowledge is built through active engagement and meaningful interaction with real-world contexts. This view aligns with the Constructivism Learning Theory proposed by Piaget (1952) and Vygotsky (1978), which posits that learners actively construct

knowledge by connecting new information to their prior experiences and through social interaction. Therefore, PBL requires students to become independent learners who can identify, understand, and apply relevant concepts in collaborative problem-solving (Sonrum et al., 2023).

In addition, PBL emphasizes case resolution that reflects professional challenges, allowing students to transfer theoretical knowledge into practice while developing critical thinking, problem-solving, and self-regulation skills (Nicholus et al., 2023; Ammaralikit & Chattiwat, 2020). This approach also encourages social learning through collaborative interactions, allowing students to build understanding from multiple perspectives while increasing self-awareness in the context of learning (Fan, 2023) In the context of this study, PBL is combined with digital media such as Wordwall, which supports active participation, strengthens motivation, and increases student involvement in the learning process, so that it is effective in improving reading comprehension skills.

2.2.2 Characteristics of PBL

Problem-Based Learning (PBL) has several of characteristics that distinguish it from traditional learning approaches. Structurally, PBL emphasizes the use of problems as a starting point for learning, where complex real-world problems are used to motivate students in identifying and learning relevant concepts and principles (Cahyono, 2019). PBL also utilizes *ill-structured problems*, which are authentic situations that reflect real-life scenarios and have no clear solution (Mariotti, 2024). In addition, *scenario-based learning* is the foundation of PBL, with fictional cases related to real life presented to guide and direct the learning process (Atahan et al., 2021).

In addition to the structural aspect, PBL emphasizes a *student-centered approach*. Students are actively engaged in problem-solving activities, build their own knowledge, and develop awareness of individual learning needs, which are in line with the principles of *Self-Directed Learning* (Malcolm S. Knowles, 1975), where students are responsible for planning, managing, and evaluating their own learning process (Mariotti, 2024; Guo et al., 2024). In this process, students decide for themselves what needs to be learned through problem-solving (*student-determined learning*) (Sipes, 2016), so that they become active and reflective independent learners.

Furthermore, PBL emphasizes collaborative and interactive learning. Students work in groups to solve real-world problems, share ideas, and interact with each other, according to the principles *of Collaborative Learning* (Johnson & Johnson, 1994), which emphasizes that effective learning occurs through cooperation, communication, and mutual support between students (Azizam et al., 2022; Guo et al., 2024). eachers play the role of facilitators who guide the learning process, rather than traditionally presenting material (Sipes, 2016), so that students learn to be independent, active, and responsible for their own learning process. In addition, PBL offers high flexibility and can be integrated with various learning methods, including seminars, assessments, role-playing, and teamwork, allowing for customization as needed within the educational context (Smith et al., 2022; Azizam et al., 2022).

2.2.3 Steps in PBL Implementation

According to Hmelo-Silver (2004), problem-Based Learning (PBL) has a syntax that includes several important stages in the learning process. First, teachers present complex authentic problems as a learning center to orient students to situations that need to be solved. At this stage, students collaboratively investigate and solve the problem, while developing critical thinking skills, problem-solving skills, and independent learning. Teachers act as facilitators who help students determine what needs to be learned, as well as encourage independent learning, group discussions, and reflection.

The PBL syntax generally includes five stages, namely: Student orientation on the problem, organizing students to learn, investigation guidance both individually and in groups, development and presentation of works or solutions, analysis and evaluation of learning processes and outcomes. This syntax directs students to be active in a collaborative and reflective learning process, so that the understanding of concepts can be increased in depth and flexibly (Hmelo-Silver, 2004).

In the context of the application of PBL to reading learning, several studies show challenges that need to be considered. Aulia (2023) found that some students still have difficulty in relating the problem scenario given to the reading text presented, thus having an impact on low student involvement and understanding. In addition, other research shows that when the context of the issue is irrelevant to the student's real experience, their engagement rates decrease significantly. It confirms that the relevance of the context of the issue is essential to maintain student motivation and engagement.

Another factor that affects the success of PBL is the level of cognitive maturity of students as well as the type of reading text used. The study by Akuba (2025) shows that PBL is more effective when applied to narrative and descriptive texts that allow students to conduct active analysis and interpretation. However, students' initial resistance to independent learning methods and difficulties in managing group dynamics are challenges in the implementation of PBL.

2.2.4 PBL in EFL Reading

The application of Problem-Based Learning (PBL) shows significant potential in improving students' reading comprehension in English as a Foreign Language (EFL) settings. Research indicates that the implementation of PBL can significantly enhance reading skills, as it encourages students to engage more actively with the information in the text and connect it to real-world contexts (Song et al., 2024; Fan, 2023).

The integration of PBL with multicultural-based materials has been proven to make reading learning more interactive, inclusive, and relevant to students' lives (Song et al., 2024; Han, 2024). Through group discussions and the exchange of ideas, students not only understand the content of the text but also develop critical thinking skills, metacognitive reading strategies, and problem-solving abilities (Guo et al., 2024; Berenji, 2021). This collaborative dimension is in line with the principle *Collaborative Learning* (Johnson, 1994), which emphasizes the importance of cooperation, interaction, and communication between students to improve learning effectiveness (Fathurrohman et al., 2021)

However, effective PBL implementation requires proper guidance and scaffolding, especially for students who are not familiar with this active learning approach. Research highlights that reading skill development pathways can differ among learners with varying levels of proficiency, and adaptive scaffolding support is key to ensuring each student can optimally follow the learning process (Song et al., 2024; Song et al., 2025; (Imbaquingo & Cárdenas, 2023). Thus, PBL not only improves reading skills but also fosters motivation, active engagement, and learning independence, while preparing students to use English communicatively and contextually in accordance with CLT principles.

2.3 Wordwall as Digital Media

2.3.1 Definition of Wordwall

Wordwall is an interactive digital media platform designed to improve vocabulary learning through gamification-based educational activities. The platform operates with three main objectives, namely: connecting the various features and meanings of words with ideas, concepts, and experiences that students are already familiar with; actively engage students to experience the learning process for themselves through practice using the available features and emphasizing student choice in their learning process (Andriyanto et al., 2023). This approach is in line with the Digital Game-Based Learning (DGBL) Theory put forward by Prensky (2001), which emphasizes that the use of digital games in learning can increase student engagement, motivation, and active participation through fun and interactive learning experiences. Thus, Wordwall not only facilitates students' interaction with new vocabulary, but also encourages their active involvement in the learning process.

In addition, Wordwall provides a variety of games that can be adjusted to the student's ability level, such as flashcards, game show quizzes, pop balloons, flip tiles, and find the match exercises (Andriyanto et al., 2023). This variety allows teachers to choose the interactive approach that best suits the learning objectives and needs of the students. This concept supports Multimedia Learning Theory (Mayer, 2010), which states that the use of media that integrates text, images, and interaction can facilitate students' cognitive processes so that the understanding of the material becomes more effective. In other words, the combination of different Wordwall game formats helps students build meaning visually and contextually, thereby improving their ability to understand new vocabulary.

Furthermore, Wordwall's ability to customize its features allows teachers to create a personalized and motivating learning experience for students, while facilitating the understanding of material in a relatively short time (Andriyanto et al., 2023). Thus, the use of Wordwall as an interactive learning medium not only increases students' motivation to learn, but also facilitates effective vocabulary mastery and material understanding. Based on this, the use of Wordwall is very relevant in the context of this study, which aims to explore the effectiveness of Problem-Based Learning (PBL) strategies by utilizing interactive digital media in improving students' reading comprehension.

2.3.2 Features of Wordwall

Wordwall provides a variety of interactive features designed to enhance the learning experience through a gamification approach. The platform offers different types of games, grading systems, and challenges that create a positive learning experience for students (Carmona-Chica et al., 2022). These features encourage students' intrinsic motivation and perseverance in achieving desired goals through healthy competition in game-based activities (Carmona-Chica et al., 2022). Thus, the use of Wordwall not only makes the learning process more enjoyable, but also builds the internal drive of students to continue actively participating.

In addition, Wordwall provides a wide variety of games that can be customized by teachers based on students' ability levels (Andriyanto et al., 2023). Popular and frequently used game formats include flashcards, gameshow quizzes, pop balloons, flip tiles, and find the match exercises (Andriyanto et al., 2023). This variety allows teachers to choose the interactive approach that best suits the learning objectives and needs of the students, making the learning process more effective and relevant.

Furthermore, Wordwall's ability to customize its features makes it easier for teachers to create learning experiences that are tailored to students' characteristics, while motivating them to understand the material better (Andriyanto et al., 2023). The design of this platform allows for rapid understanding of material in a relatively short time, making it an efficient tool for teachers and students to support the learning process. Thus, Wordwall becomes a relevant and potential media in the context of this study, which aims to examine the effectiveness of Problem-Based Learning (PBL) strategies using Wordwall to improve students' reading comprehension.

2.3.3 Benefits of Using Wordwall in EFL Classrooms

The use of Wordwall in learning English as a Foreign Language (EFL) provides a variety of significant advantages to enhance the learning experience of students. This interactive platform delivers a positive learning experience through different types of games, grading systems, and challenges that effectively engage students (Carmona-Chica et al., 2022). The gamification element on Wordwall, in accordance with Gamification in Learning Theory put forward by Krath (2021), Not only does it increase students' intrinsic motivation, but it also encourages their perseverance in achieving goals through healthy competition created in educational games. Thus, this game-based learning is able to create higher engagement as well as a more enjoyable learning experience for students.

In addition, Wordwall has proven to be effective in enriching students' vocabulary. The platform is one of the most efficient learning mediums to help students master new vocabulary, with a variety of game formats that can be customized by teachers based on students' ability levels (Andriyanto et al., 2023). The platform actively engages students through hands-on experiential learning with available features, while emphasizing student choice in their learning process (Andriyanto et al., 2023).

Furthermore, online learning using the Wordwall vocabulary game media is able to motivate students significantly and help them understand the learning material more effectively (Andriyanto et al., 2023). The platform facilitates teachers and students in understanding topics quickly and in a relatively short time, thus becoming an efficient educational tool in EFL teaching (Andriyanto et al., 2023). In other words, the use of Wordwall not only increases student motivation and engagement,

but also supports vocabulary mastery and understanding of the material effectively, so it is very relevant to be applied in the Problem-Based Learning (PBL) strategy that is the focus of this research in improving students' reading comprehension.

2.3.4 Wordwall in Teaching Reading

The integration of technology in language learning has emerged as a transformative approach to addressing traditional pedagogical limitations in EFL reading teaching. Over the past few decades, the increasing use of Computer Assisted Language Learning (CALL) has prompted numerous studies investigating the impact of technology implementation on students' language learning outcomes and their motivation to learn (Lotfi Sin & Siahpoosh, 2020). Research shows that CALL improves language proficiency, communicative competence, and student autonomy because it has flexible access, and allows learners to adjust their own learning pace and therefore increases learning motivation and confidence (Lotfi Sin & Siahpoosh, 2020).

Web-based techniques have shown very promising results in improving reading comprehension outcomes across different skill dimensions. Research shows that web-based techniques significantly improve overall reading comprehension skills, including creative, critical, and literal comprehension (Nasim et al., 2024). These findings emphasize that web-based approaches are useful in language education, especially in improving reading comprehension skills, offering additional instruction to assist learners in overcoming challenges in English reading comprehension (Nasim et al., 2024).

Among technology-based platforms, Wordwall represents a specific innovation that addresses the engagement challenges prevalent in traditional EFL teaching. The platform offers a variety of educational games that can help improve students' vocabulary mastery and reading comprehension through its interactive features (Perdana et al., 2023). The effectiveness of Wordwall is evidenced by research showing that its use can improve students' motivation to learn and test results, as evidenced by a significant increase in pre-test and post-test scores (Perdana et al., 2023). These platforms have great potential as a learning medium that can make the reading process more engaging and meaningful, overcoming the motivation deficits that often characterize traditional instructional approaches (Song et al., 2024).

The theoretical foundation for the integration of technology in reading instruction rests on its ability to create a more interactive and enjoyable learning experience compared to conventional methods (Song et al., 2024). However, despite these demonstrated benefits, the integration of technology in language learning remains an important opportunity to increase student engagement and motivation, but its implementation is still not optimal in many educational institutions (Song et al., 2024). This implementation gap is a significant obstacle to realizing the full potential of technology-enhanced reading instruction in the context of EFL.

2.4 Students' Perceptions

2.4.1 Definition of Students' Perceptions

Students' perceptions, in the context of education, this perception includes students' interpretation and experience of the learning context, methods, and tools used (Ali et al., 2024). Perception is subjective and influenced by the background,

previous experience, and cognitive processes of each student. Perception has an important role because it directly influences students' attitudes, motivation, and engagement in learning activities (Ali et al., 2024).

The importance of student perception becomes more pronounced when educational technology is integrated into learning. Positive perceptions of interactive media and digital tools can increase student engagement and encourage independent learning behaviors (Shadiev et al., 2020). Research shows that students who have a positive perception of interactive media, such as Wordwall, report better understanding of material through more engaging visualizations and simulations, making learning more meaningful and memorable (Susanti et al., 2024). In addition, positive perceptions also contribute to the development of digital literacy skills, enabling students to use digital tools effectively and understand digital content critically (Susanti et al., 2024).

The formation of such positive perceptions is closely related to an active learning environment, where students take a participatory role while the teacher functions as a facilitator (Susanti et al., 2024; Hayati et al., 2023). In line with Perception Theory, this shows that the way students interpret and understand the use of learning tools such as Wordwall can affect their learning outcomes. Therefore, the implementation and presentation of technology-based learning strategies, especially in the Problem-Based Learning (PBL) approach, is very important to form positive perceptions of students and improve their reading comprehension abilities.

2.4.2 The Role of Students' Perceptions in PBL and Wordwall Integration

Student perception plays an important role in determining the effectiveness of integrating Problem-Based Learning (PBL) with digital tools such as Wordwall. Research shows that perception directly influences students' attitudes, motivation, and learning experiences in a technology-based language learning environment (Ali et al., 2024; Shadiev et al., 2020). When students have a positive perception of technology integration, they show higher levels of engagement and self-learning ability, which is an important component for successful PBL implementation.

The integration of interactive tools such as Wordwall within the framework of PBL creates a dynamic learning environment, allowing students to take on participatory and collaborative roles more actively (Susanti et al., 2024; Hayati et al., 2023). Students who have a positive perception of this interactive technology report that the tool helps them understand concepts more clearly through better visualization and simulation, making the problem-solving process more engaging and memorable (Susanti et al., 2024).

In addition, students' perception of the integration of technology in various dimensions of teaching quality also directly affects their learning outcomes (Consoli et al., 2025). When students assess digital tools as a support for their learning process, self-assessed digital competencies as well as behavioral engagement increase, which contributes to improved learning performance (Consoli et al., 2025). This is especially important in a PBL environment, where students are required to be actively involved in the problem-solving process while utilizing digital tools that support their learning.

The success of PBL and Wordwall integration is highly dependent on creating conditions where students can take an active role while teachers act as facilitators.

Positive perceptions are formed when students feel they have control and involvement in their learning process (Susanti et al., 2024). In addition, students often express interest in replacing traditional learning materials with smart media and e-learning tools to improve their reading skills, suggesting that positive perceptions can drive demand for sustainable technology integration (Ali et al., 2024).

2.5 Previous Studies

2.5.1 Research on PBL in EFL Reading Learning

Several previous studies have shown that Problem-Based Learning (PBL) has a significant positive impact on improving students' reading skills, especially in the context of English as a Foreign Language (EFL). Berenji (2021) conducted quasi-experimental research comparing the effectiveness of PBL strategies with traditional lecture methods. The results of the study showed that students in the experimental group had higher awareness of metacognitive reading strategies and better reading comprehension abilities compared to the control group. These findings provide strong evidence that PBL is more effective than conventional approaches in developing students' strategic reading skills and reading comprehension outcomes.

The success of PBL is inseparable from its constructivist nature, where students learn through experience, exploration, and reflection. When students are faced with problem-solving tasks, they are required to relate new information to existing knowledge, thus encouraging the development of critical thinking skills and collaborative skills. This is in line with the findings Utami et al. (2025) which explains that PBL makes students more motivated and actively participate in the learning process, because they have to build meaning from the reading text to solve authentic problems.

Further, the research Sidik et al. (2021) also researched the effectiveness of PBL on reading comprehension, content mastery, and vocabulary acquisition. The results showed a significant difference between the experimental group and the control group, where students who learned using PBL achieved higher learning outcomes compared to conventional learning methods. These findings are in line with (Akuba & Pido, 2025) who found that the application of PBL helped students significantly improve their reading comprehension skills.

In addition, the research Ke et al. (2023) showed that the combination of grammar interventions with the PBL approach was able to significantly improve students' English reading skills, as measured through formal evaluation tools. This shows that PBL is not only effective for general understanding of texts, but also supports the mastery of specific reading skills in the context of language learning. These findings are reinforced by Song et al. (2024) who found that the application of PBL in reading learning encourages students to be more active in understanding the information in the text and connecting it to real context. The integration of PBL with multicultural-based materials has also been proven to make reading learning more interactive, inclusive, and relevant to students' lives.

Further, Guo et al. (2024) conducted a systematic review of 27 research articles related to the implementation of PBL and found that 25 of them reported the positive impact of PBL in improving learning behavior, academic performance, and critical

thinking skills of EFL students. Guo asserts that PBL's main strength lies in its ability to encourage independent learning, interaction, engagement, and active learning, making it a highly relevant method for improving students' reading comprehension skills in the context of English language learning.

Although previous findings have consistently shown the effectiveness of PBL in improving students' reading ability (Song et al., 2024; Utami et al., 2025), Research gaps are still visible. Most studies focus on the conventional implementation of PBL without utilizing technology-based media that can maximize student engagement and motivation (Marlinton et al., 2023). In addition, few studies have examined the integration of PBL with interactive digital platforms, such as Wordwall, to improve reading comprehension skills, particularly in context EFL (Song et al., 2024). Therefore, this study was conducted to fill this gap by investigating the effectiveness of the implementation of PBL strategies assisted by Wordwall in improving EFL students' reading comprehension skills.

2.5.2 Research on the Use of Wordwall in Language Learning

Recent studies show that Wordwall is one of the technology-based learning media that is effective in increasing student engagement, motivation, and learning outcomes, especially in vocabulary mastery and reading comprehension skills. Mazelin et al. (2022) found that the use of Wordwall had a positive impact on student participation and helped improve their understanding of English language material. Similar findings were reported by Jannah et al. (2022), which shows that students respond positively to the use of Wordwall because it is perceived as engaging, fun, and motivating, thus encouraging active engagement in the learning process.

A number of studies have also highlighted the effectiveness of Wordwall in improving student learning outcomes. Cahya et al. (2024) found a significant increase in reading achievement scores, from 77.24 to 86.24 after the application of Wordwall in recount text learning. These findings are reinforced by Yusri et al. (2024), who reported that students who learned using Wordwall obtained an effectiveness rate of 80.28%, higher than the conventional approach of 75.25%.

In addition, vocabulary mastery is one of the most researched aspects of Wordwall implementation. Aisiyah et al. (2024) shows that the integration of digital game-based Wordwall not only improves the vocabulary acquisition process, but also increases students' motivation to learn. These results are consistent with research Sakkir et al. (2023), which found a significant increase in students' vocabulary scores from 82.34 in the pretest to 98.31 in the posttest. Furthermore, the gamification feature in Wordwall is proven to help students better understand, remember, and master vocabulary through more interactive and fun learning (Komang et al., 2024; Aisiyah et al., 2024).

On the other hand, several studies highlight the effectiveness of Wordwall in improving reading comprehension skills. Research Amri et al. (2023) and Rahmawati et al. (2022) found that the Wordwall-based learning approach was able to improve students' reading skills, because its interactive design made the learning process easier to understand and engaging. Syarifah et al. (2025) also confirms the positive relationship between student perception and the effectiveness of Wordwall, with gamification features that can increase students' motivation, focus, and comfort during the reading learning process.

From the teacher's perspective, Wordwall is also considered effective in creating an interactive learning environment. Khasyi (2024) found that the use of Wordwall helped improve student engagement and vocabulary comprehension. These results are reinforced by Kariyati et al. (2024), which states that Wordwall is very beneficial, especially for beginner learners, because it makes the learning process more fun, easy to understand, and relevant to the needs of students.

Overall, previous findings show that Wordwall is an effective technology-based learning medium to improve motivation and reading comprehension skills (Mazelin et al., 2022; Amri et al., 2023). However, most studies still examine the use of Wordwall separately and not many have examined its effectiveness when integrated with Problem-Based Learning (PBL) learning strategies (Song et al., 2024). Therefore, this study is here to fill this gap by examining the effectiveness of PBL strategies using Wordwall in improving EFL students' reading comprehension skills.

2.5.3 Joint Research of PBL and Digital Technology

The theoretical basis for the application of technology-based PBL is based on constructivist problem solving, social interaction, and scaffolding-based learning (Sayed, 2020). Guided by these principles, digital PBL has evolved into a motivating and interactive learning environment that significantly increases student engagement and motivation (Rathleff et al., 2025). Studies have reported significant improvements in learning; for example, Hafsah et al. (2024) found a 75% increase in problem-solving skills and a 45% increase in learning motivation through the use of digital PBL materials. Similarly, Suhirman et al. (2023) and Erwanto et al. (2025) confirmed that digital simulations and interactive media integrated into PBL effectively develop students' critical thinking skills. In addition, Qotrunnada et al. (2022) showed that digital books equipped with PBL models improve problem-solving skills in science subjects.

Furthermore, research indicates that digital PBL significantly enhances collaboration and communication skills. A comprehensive review of 377 studies by Muzsalyiné Molnár Henrietta et al. (2022) revealed that PBL supported by digital tools is more effective in promoting teamwork, creativity, critical thinking, and communication than non-digital approaches. In line with this, these findings align with the growing adoption of various digital tools in PBL, such as video-based learning Purnama et al. (2023), 3D animation and digital books Sunarti et al. (2024), digital comics Sarki & Reinita (2024), interactive platforms such as Canva and Quizizz Meka et al. (2024), and AI-based tools like ChatGPT (JG, 2024)

Moreover, comprehensive digital ecosystems including Google Classroom, Seesaw, and Madrasati have been developed to support various PBL activities such as project management and collaborative learning (Alenezi, 2023; Kalogeropoulos et al., 2021; Yaniawati et al., 2019). In addition, the emergence of Electronic Problem-Based Learning (e-PBL) models provides flexible, constructivist environments that integrate videos, digital texts, and discussion forums to encourage active inquiry and reflective learning (Arwidiyarti et al., 2022).

Although the application of technology-based PBL has been proven effective in increasing motivation, critical thinking, and collaborative skills, there is still little research that combines PBL with digital media such as Wordwall to improve reading skills in junior high school students, particularly in English education. Most existing

studies still focus on high school levels (Song, 2024), so further research is needed on the effectiveness of integrating PBL and Wordwall in improving reading comprehension in junior high school English learning contexts.

2.5.4 Conclusion of Previous Studies

Based on the study of previous studies, it can be concluded that Problem-Based Learning (PBL) has been proven to be effective in improving EFL students' reading comprehension skills. Various studies (Berenji, 2021; Utami et al., 2025; Sidik et al., 2021; Song et al., 2024) shows that PBL encourages active engagement, increases awareness of reading strategies, and helps students relate new information to previous knowledge through an authentic problem-solving process.

In addition, research related to Wordwall shows that the platform is effective in improving motivation, vocabulary mastery, student engagement, and reading comprehension through a gamification-based approach (Mazelin et al., 2022; Rika et al., 2024; Syarifah et al., 2025). Wordwall is proven to be able to create a more interactive and fun learning environment, thus helping students understand the text better.

Some recent research has also begun to explore the integration of PBL with digital technologies. Study Sayed (2020) reports that the use of interactive platforms in PBL strategies can improve students' learning outcomes, motivation, and critical thinking skills. However, the amount of this kind of research is still very limited and mostly focuses on the level of higher education, rather than on the secondary school context (Meka et al., 2024; Putra et al., 2023).

Although previous findings provide strong evidence of the effectiveness of Problem-Based Learning (PBL) and Wordwall in improving EFL students' reading comprehension skills (Song et al., 2024; Utami et al., 2025), The research gap is still evident. Most studies still examine PBL and Wordwall separately and rarely test the integration of the two in reading learning (Song et al., 2024). In fact, in the Indonesian context, reading skills are very important to acquire knowledge, while many students still have difficulty understanding English texts due to limited vocabulary, lack of reading strategies, low motivation, and the use of less interactive learning media (Rahayu et al., 2024; Song et al., 2024).

Therefore, this research is important to fill the gap by investigating the effectiveness of Wordwall-assisted PBL strategies in improving EFL students' reading comprehension skills. The results of this research are expected to contribute to the development of technology-based learning strategies that are more innovative and relevant to the needs of students in the digital era.