Click, Think, Read: Investigating the Use of Metacognitive Online Reading Strategies among Malaysian ESL Students

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ABSTRACT

The rapid shift towards online learning has emphasised the critical role of metacognitive online reading strategies in enhancing comprehension and engagement with digital texts. This study investigates the use of metacognitive online reading strategies among Malaysian ESL secondary school students, specifically focusing on Form 4 (16 years old) and Form 5 (17 years old) learners. The research utilises the Online Survey of Reading Strategies (OSORS), which categorises metacognitive online reading strategies into three types: global, problem-solving, and support strategies. The findings reveal that problem-solving strategies, such as visualising information and adjusting reading speed, are the most frequently utilised, reflecting students' adaptive responses to digital reading challenges. Conversely, support strategies are the least favoured, indicating potential gaps in students' repertoire of reading strategies. Notable variations in the usage of metacognitive online reading strategies between age groups were also identified, with older students demonstrating greater strategic awareness. These results underscore the need to foster a balanced approach to metacognitive online reading strategies, promoting not only the dominant strategies but also the underutilised ones to enhance overall reading proficiency. Future research should explore interventions to increase students' awareness and application of metacognitive online reading strategies, alongside examining teachers' roles in integrating metacognitive strategies into language instruction. By addressing these aspects, educators can better equip students with the skills needed to navigate the complexities of online reading, thus preparing them for academic and professional success in a digitalised world. The study highlights the importance of tailored pedagogical approaches to strengthen both students' digital literacy and their overall academic outcomes.

Keywords: Digital Literacy, ESL Students, Metacognitive Online Reading Strategies, Online Learning, Reading Comprehension

INTRODUCTION

The global lockdown of Covid 19 pandemic outbreak has resulted in consequential shifts in the pedagogical approach used at all levels of education. One of the major consequences of the pandemic on the education domain is the restructuring of in-person learning experiences and the integration of online education into the curriculum. (Moorhouse, 2020).

In line with the implementation of online learning, teaching and learning materials are now digitalised to suit the current approach. The integration of technology in pedagogical approach is also synonymously associated with Education 4.0 where the most prominent change that characterise the concept is the deeper fusion of technology into teaching and learning (Arif et al., 2020). This view is supported by Wadi et al. (2022) where the shift from printed reading materials to digital formats as a result of the pandemic is concurrently driven by advancements in information, communication and technology (ICT).

Due to the complexity of reading online materials, readers are required to interact actively with the information

and possess the capability to identify and choose which information complements their reading purposes (Hamid et al., 2020). This is also in line with the theory of metacognition where readers have to possess strategic awareness when engaged in reading text (Rianto, 2022). Thus, to cope with online reading challenges effectively, readers have to engage with various strategies known as metacognitive reading strategies to attenuate the lack of language skills and reduce errors in comprehension (Anggraini et al., 2021).

Despite the immense exposure to the Internet, there remains a gap in digital literacy among today's generation (Rinantanti et al., 2024). Learners in the 21st century face noticeable key challenges with online reading, including mastering research skills, developing digital wisdom for learning, embracing new challenges, and fostering positive attitudes toward using the Internet for academics (Rahman et al., 2023). In addition, research concerning online language learning, particularly in relation to the recent pandemic, is scarce, especially when it comes to exploring metacognitive reading strategies among non-native English speakers (Rianto, 2021). Furthermore, Hamid et al. (2020) claimed that most of the studies on metacognitive online reading strategies were targeted on undergraduate students and there is a noticeable gap addressing reading strategies involving secondary school students (Kiu & Yamat, 2020). This highlights the need to investigate the use of metacognitive online reading strategies among ESL secondary school students.

Therefore, this paper addressed the following research questions:

1. What are the most and least frequently utilised categories of metacognitive online reading strategies by ESL secondary school students in Malaysian context?
2. Is there a significant difference in the level of metacognitive online reading strategies used by ESL secondary school students in Malaysian context based on age?

LITERATURE REVIEW

Metacognitive Strategies

According to Oxford (2003), language learning strategies are generally thought of as tools that support students in planning for language tasks, evaluating their learning, analysing word meanings, and using the information they have learned to better their understanding, retention, and use of it. Lee (2010) condensed the description by referring to the abilities that learners use to take in, store, and retrieve information during the learning process as learning skills, learning-to-learn skills, thinking skills, problem-solving abilities, or strategies.

In a formal context, language learning strategies can be divided into two primary categories: (1) direct strategies, which involve direct engagement with the target language, such as reviewing and practicing; and (2) indirect strategies, which offer secondary support for language learning, such as planning, cooperating, and seeking opportunities. The direct strategy group encompasses memory, cognitive, and compensation strategies, while the indirect strategy group comprises metacognitive, affective, and social strategies (Oxford, 1990). However, there has been a notable shift in emphasis concerning language learning skills, with recent research increasingly focusing on metacognitive skills (Ramli at al., 2011).

Generally, metacognitive strategies are employed for the purpose of overseeing, regulating or self-directed language learning. Metacognitive strategies in second or foreign language learning refer to the amalgamation of individuals' thoughts and corresponding actions aimed at enhancing their proficiency in the target language and improving their linguistic and communicative competence. These strategies involve a conscious awareness of one's own learning process and the ability to make deliberate decisions about how to approach language learning effectively (Varshney & Banerji, 2012).

According to Flavell (1979), a metacognitive strategy is a tool that helps students keep track of and manage their learning. Given that it manages and affects other cognitive abilities, it is regarded as a higher-order cognitive skill (Flavell, 1979). Additionally, O'Malley and Chamot (1990) also believe that metacognitive strategies are considered higher-order executive skills which include planning, monitoring, and evaluating the

success of learning activities. These strategies encompass tasks such as planning the approach to reading a text, conducting self-assessment tests, and making revisions based on the learning purpose and available time.

Online Reading

Online reading is primarily defined as a process of self-directed text production (Coiro & Dobler, 2007). McCrudden et al. (2011) further describe online reading as the real-time processing of text, with hypertext arising from computer programming that enables non-linear reading (Le Bigot & Rouet, 2007; McEneaney et al., 2009).

In general, hypertext refers to an interactive, non-sequential electronic environment that merges text with hypermedia, allowing reading to rely on computers and the interconnectivity of multiple information sources (Altun, 2003). Hypertexts also discard prescribed reading sequences, offering readers the freedom to navigate content non-linearly. This shift facilitates the adaptation of traditional offline reading strategies to the online environment (Akyel & Ercetin, 2009). Online reading, therefore, stands apart from traditional printed texts as it involves not only normal electronic texts but also materials designed explicitly for an online environment. Consequently, readers require information on reading strategies applicable to various digital formats to excel in reading digital texts (Hamid et al., 2020).

According to Sung et al. (2015), there has been a noticeable shift in online reading from the traditional mode of reading written materials like newspapers, books, or magazines to reading non-traditional media like videos, hyperlinks, and sounds. Since the concepts or ideas are provided in a non-linear order, readers are free to read in whatever order they like.

Online Survey of Reading Strategies (OSORS)

Due to the widespread adoption of online reading in the education settings, The Online Survey of Reading Strategies (OSORS) was developed to assess online reading strategies in language learning. It was initially developed as the Survey of Reading Strategies (SORS) by Mokhari & Reichard in 2002 and has since been used in various studies (Victoria, 2012; Hong-Nam & Page, 2014; Yaemtui, 2015; Miller, 2017). OSORS consists of three subscales: global reading strategies, problem-solving strategies, and support strategies. This adaptation of the scale was made to account for online reading practices and distinguish it from the original SORS.

Global reading strategies are purposeful and carefully planned techniques that students use to effectively monitor and manage their reading. These strategies involve setting a specific purpose for reading, previewing the text to understand its length and organization, and utilising typographical aids, tables, and figures to aid comprehension (Mokhtari & Sheorey, 2002).

In addition to this, Poole (2005) further expands the definition of global reading strategies, which include strategies that help learners plan, monitor, and direct their reading process. This encompasses actions like verifying the accuracy of their assumptions, deciding which parts of the text to focus on, and determining what information to ignore. Visualising information is another component of these strategies, aiding in memory retention and deducing the meaning of unfamiliar words.

When reading a text, students also may employ problem-solving techniques to clear up any confusion or difficulty they may be having with text comprehension (Poole, 2005). In their study, Mokhtari and Sheorey (2002) described problem-solving strategies as techniques and activities that readers do while interacting directly with the text. These can be localised, concentrated tactics that are employed when reading comprehension issues develop. They include altering reading pace when reading things that are too difficult or too easy, speculating on the meaning of terms that are new to the reader, and reviewing the book to clarify any unclear passages. It is crucial to keep in mind that problem-solving techniques are used when reading for real, and these include assessing comprehension, altering reading speed, and using close reading when necessary (Pammu et al., 2014).

Supportive methods, which are auxiliary tools and resources used to enhance text comprehension may consist of strategies like taking notes and emphasising important information (Poole, 2005). To put it another way,

support strategies are fundamental aids designed to aid students in comprehending textual content through the use of a few strategies like consulting a dictionary and underlining key points (Mokhtari & Sheorey, 2002).

Metacognitive Online Reading Strategies in EFL/ESL Context

Despite extensive research on second language reading strategies, Anderson (2003) noted that relatively few

empirical studies have examined online reading contexts. However, some notable studies have provided empirical evidence on the role of metacognitive online reading strategies in enhancing reading comprehension.

Harputra et al. (2023) investigated the metacognitive online reading strategies of 76 students in an English Education Study Program at an Indonesian university using Anderson's (2003) Online Survey of Reading Strategies (OSORS). Their findings revealed that participants most frequently employed global reading strategies, followed by problem-solving and support strategies. Furthermore, the study highlighted that students' awareness of their metacognitive reading practices contributed to improved online reading comprehension.

Similarly, Anggia and Habok (2024) explored metacognitive awareness in online reading activities, focusing on gender, reading media preferences, and English proficiency levels. The study, which involved 1,412 university students from thirteen Indonesian universities, employed multiple regression analysis and one-way MANOVA to examine the influence of metacognitive strategies on English reading comprehension. The results indicated that global, support, and problem-solving strategies collectively influenced comprehension scores, with significant differences observed based on gender, reading media preferences, and proficiency levels.

In a study conducted by Do and Phan (2021), the metacognitive online reading strategies of 123 Vietnamese students were explored. The findings revealed that problem-solving strategies were most frequently used, while support and global strategies were employed to a moderate extent.

In the Malaysian context, research on metacognitive online reading strategies remains limited (Hamid et al., 2020). However, several studies have explored students' use of these strategies in online reading. For instance, Sinas et al. (2023) conducted a quantitative study on 90 students, examining their application of metacognitive online reading strategies and its relationship with English comprehension achievement. The findings indicated that support and problem-solving strategies were the most frequently used, whereas global strategies were the least preferred. Additionally, a slight but significant correlation was observed between the use of metacognitive online reading strategies and reading comprehension performance, suggesting that students who actively employed these strategies achieved better comprehension outcomes.

Yacob and Mohamad (2023) further examined the online metacognitive reading strategies of 44 ESL Malaysian undergraduate students through a questionnaire-based study. Their findings revealed that students utilised all three categories of strategies—global, problem-solving, and support strategies—to enhance comprehension, underscoring the importance of integrating these strategies into ESL online reading instruction.

Given the increasing reliance on digital platforms for academic and professional purposes, a deeper understanding of how learners interact with and comprehend digital texts is essential. In the Malaysian ESL context, further research is needed to explore how metacognitive online reading strategies can be effectively integrated into digital learning environments. Such insights could help educators develop targeted interventions to enhance students' reading proficiency in an increasingly digitalised world

Theories and Approaches in the Study

This study is grounded in metacognitive theory and cognitive flexibility theory (Spiro et al., 1995). Metacognitive theory emphasises the deliberate and conscious regulation of cognitive processes, which plays a crucial role in improving reading comprehension (Brown, 1980). Proficient readers demonstrate advanced metacognitive awareness, enabling them to prepare before reading, select appropriate strategies, monitor their application, and evaluate their effectiveness (Anderson, 2002). Research shows that these strategies help

readers overcome challenges, retain conceptually processed information, and interact meaningfully with the text (Pressley & Afflerbach, 1995; Brown, 2004).

In digital contexts, hypertext introduces unique challenges due to its non-linear and interactive nature. Navigating hypertext demands problem-solving skills, which are closely tied to cognitive flexibility theory. This theory emphasises adapting strategies to dynamic and evolving tasks (Krems, 1995). In particular, hypertext learning environments leverage interconnected and multi-representational knowledge, customisation of abstract concepts, and early integration of domain complexity to cultivate adaptability and deeper learning (Spiro et al., 1992). A hypertext learning environment can be defined as an interactive educational system that organises information into a network of interconnected nodes, where each node represents a piece of content such as text, images, or multimedia elements (Conklin, 1987; Kim & Hirtle, 1995).

Extensive research reveals that proficient readers employ metacognitive strategies more frequently and effectively than their less proficient counterparts, significantly enhancing their reading comprehension (Pressley et al., 1998; Ahmadi et al., 2013). Awareness of these strategies fosters better engagement with both traditional and digital texts, leading to improved performance in reading tasks (Yuksel & Yuksel, 2012). Combining metacognitive strategies with cognitive flexibility enables learners to navigate the complexities of digital reading environments, achieve deeper comprehension, and enhance overall learning outcomes.

METHODOLOGY

Research Design

This research employed quantitative research method with survey research design. According to McClosky (1969), a survey research design involves the systematic collection of data from a population or a representative sample through direct solicitation such as interviews and questionnaires where information can be gathered in a structured manner. Christensen et al. (2015) also claim that “survey research is the best method to use for assessing individuals' behaviours, opinions, and beliefs”. As this study sought to determine the use of metacognitive online reading strategies among ESL students in Malaysia, survey research design is deemed to be the most appropriate.

Population and Sampling

The research population consists of 45 Form 4 (16 years old) and Form 5 (17 years old) students from a secondary school located in Penang, Malaysia. The sampling strategy employed is probability sampling, with a stratified random sampling method. Since this study aims to examine the use of metacognitive online reading strategies based on age, the entire population is divided into subgroups or strata. Respondents are then selected proportionally and randomly from these strata. According to Salkind (2018), stratified random sampling ensures that key subgroups, as well as the overall population, are accurately represented. As such, this method was chosen for the study.

To determine the sample size, the study refers to the population sample table by Krejcie and Morgan (1970). This table indicates that with a population of 45, the appropriate sample size is 40. Therefore, the total sample size for this study is 40.

Table 1: Table of Population and Sampling; adapted from Krejcie and Morgan (1970)

	n
Respondents of the study: Form 4 students	20
Respondents of the study: Form 5 students	20
TOTAL	40

Research Instrument

The research instrument utilised in this study encompasses a questionnaire, namely the Online Survey of Reading Strategies (OSORS), developed by Anderson (2003). The OSORS employed in this study comprises a total of 38 items, categorised into three sections: global reading strategies (18 items), problem-solving strategies (11 items), and support strategies (9 items). These strategies are evaluated using a 5-point Likert scale, ranging from 1 (Never or almost never do this) to 5 (Always or almost always do this). The reliability of the instrument is robust; achieving the score of 0.92 as reported by Anderson (2003). Other study that has shown the reliability of the instrument is by Anggraini et al., (2021) where the instrument was tested for its reliability factor. It was found that the coefficient α obtained was .892, thus resulting in a degree of confidence in the survey instrument.

Data Collection and Analysis

To ensure the reliability of the instrument, a pilot study was conducted before the actual data collection process using a group of students who represented a sub-sample of the intended study population. A week after the pilot test was conducted, the real sampling procedure was held involving 40 Form 4 and Form 5 students with various language proficiency levels.

Then, the quantitative data collected from the OSORS questionnaire were analysed using the latest version of SPSS. Descriptive analyses, including means and standard deviations, were conducted to examine the average scores and frequency distributions regarding the use of metacognitive online reading strategies by the participants. To address the second research question, inferential analysis (independent T-test) was used to determine whether there were significant differences in the use of online metacognitive reading strategies among readers of different age groups.

RESULTS AND DISCUSSION

The findings of this study revealed that Malaysian ESL students utilised diverse metacognitive strategies to regulate, evaluate, and improve their comprehension of online texts. This indicates that the students demonstrated a strong level of metacognitive awareness while engaging with English texts in an online setting.

4.1Research Question 1: The Most and the Least Used Metacognitive Online Reading Strategies by ESL Secondary School Students in Malaysian Context

The following table shows five most used metacognitive online reading strategies based on the data gathered:

Table 2: Five Most Used Metacognitive Online Reading Strategies

No.	Items	Mean	Std. Deviation	Strategy Types
22	I try to picture or visualize information to help remember what I read on-line.	4.62	.490	PSS
9	I read slowly and carefully to make sure I understand what I am reading on-line.	4.60	.496	PSS
16	When on-line text becomes difficult, I pay closer attention to what I am reading.	4.60	.496	PSS
13	I adjust my reading speed according to what I am reading on-line,	4.50	.506	PSS
11	I try to get back on track when I lose concentration.	4.35	.483	PSS

*Indication: PSS (Problem Solving Strategies); GS (Global Strategies); SS (Support Strategies)

The data reveals that respondents exhibit the highest proclivity towards problem-solving strategies when reading online. As seen in Table 2, the top five strategies employed by students included actions like

visualising information and reading carefully to ensure understanding. These strategies in particular, were consistently rated highly by participants. The high mean score for visualisation (M=4.62) shows that students tend to rely on mental imagery to better understand and retain the material. This aligns with the view that visualisation aids comprehension by helping readers form mental images of the text (David & Sulaiman, 2021).

This finding also aligns with previous studies by Mukhlif and Amir (2017), Ahmadian and Pasand (2017), and Hamid et al. (2020), which also identified problem-solving strategies as the most utilised metacognitive online reading strategies, surpassing global and support strategies. Such consistency across studies suggests that problem-solving strategies are particularly prevalent among ESL learners (Ramli et al., 2011). Furthermore, the prominence of problem-solving strategies in the five most frequently used approaches implies that the respondents are effective problem solvers in online reading contexts. This inference is consistent with Kymes (2007), who reported similar conclusions. Moreover, online reading is regarded as a problem-solving process (Leu et al., 2004) in which readers actively construct mental representations of texts (Coiro & Dobler, 2007), requiring the acquisition of new skills and strategies. Consequently, it is understandable that ESL students rely more heavily on problem-solving strategies during online reading (Rianto, 2022).

As for the least used metacognitive online reading strategies, the table below depicts the five least utilised based on the analysis:

Table 3: Five Least Used Metacognitive Online Reading Strategies

No.	Items	Mean	Std. Deviation	Strategy Types
21	I paraphrase (restate ideas in my own words) to better understand what I read on- line.	1.70	.464	SS
25	I go back and forth in the on-line text to find relationships among ideas in it.	1.80	.405	SS
29	I ask myself questions I like to have answered in the on-line text.	2.03	.530	SS
7	When on-line text becomes difficult, I read aloud to help me understand what I read.	2.10	.709	SS
14	When reading on-line, I decide what to read closely and what to ignore.	2.55	.504	GS

*Indication: PSS (Problem Solving Strategies); GS (Global Strategies); SS (Support Strategies)

The findings indicate that support strategies, with the exception of item 14 categorised under global strategies, were the least utilised metacognitive online reading strategies. This limited reliance on support strategies contrasts with Rianto (2022), who reported frequent use of such strategies among respondents. However, the current study aligns with the findings of Jusoh and Abdullah (2015), Incecay (2013), Azmuddin et al. (2017), and Ramli et al. (2011).

As shown in Table 3, respondents were less likely to paraphrase to enhance their understanding of online texts. This limited use of paraphrasing may be due to the common challenge L2 learners face with paraphrasing skills (Badiozaman, 2014). As a result, these learners may not fully utilise this strategy, which could explain the lower scores for Item 21.

Additionally, strategies such as reading aloud (Item 7) and going back and forth in the text (Item 25) were also infrequently used. These strategies, although useful, may require more practice to become effective tools for comprehension. Item 14, categorised under global strategies, involves deciding which sections of text to focus on and which to ignore. While this strategy was more commonly used than the others in the support strategies category, it still reflects the challenges students face when determining the importance of content while reading online.

To improve students' ability to use support strategies, particularly paraphrasing and reading aloud, educators can integrate targeted activities into the curriculum. For example, providing students with opportunities to practice paraphrasing texts or engaging them in activities where they must read aloud to others could help reinforce these strategies. Moreover, curriculum developers may also design a structured and intentional curriculum that incorporates activities aimed at strengthening students' use of support strategies like paraphrasing and reading aloud. By focusing on these areas, educators as well as curriculum developers can support students in developing better online reading comprehension skills, especially for those struggling with online text.

4.2Research Question 2: The Level of Metacognitive Online Reading Strategies Used by ESL Secondary School Students in Malaysian Context Based on Age

The study also aims to examine whether there is a significant difference in the use of metacognitive online reading strategies between Form 4 (16 years old) and Form 5 (17 years old) students. An independent T-test is conducted to explore the potential variation in the strategies employed by the two groups during online reading. The data is summarised in the table below.

Table 4: Independent T-Test Result between Form 4 and Form 5 Students

Group Statistics					
	Age	N	Mean	Std. Deviation	Std. Error Mean
GS	FORM 4	20	3.2472	.10886	.02434
	FORM 5	20	3.3583	.12419	.02777
PSS	FORM 4	20	4.1636	.14329	.03204
	FORM 5	20	4.2727	.15326	.03427
SS	FORM 4	20	2.5222	.19778	.04422
	FORM 5	20	2.6222	.17807	.03982

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Significance	
						One-Sided p	Two-Sided p
GS	Equal variances assumed	2.973	.093	-3.009	38	.002	.005
	Equal variances not assumed			-3.009	37.359	.002	.005
PSS	Equal variances assumed	.012	.914	-2.325	38	.013	.025
	Equal variances not assumed			-2.325	37.829	.013	.026
SS	Equal variances assumed	.062	.805	-1.680	38	.051	.101
	Equal variances not assumed			-1.680	37.589	.051	.101

*Indication: PSS (Problem Solving Strategies); GS (Global Strategies); SS (Support Strategies)

The independent samples t-test results reveal mixed findings regarding the use of metacognitive online reading strategies between the two groups. For Global Strategies (GS), a statistically significant difference was observed, as the p-value ($p = 0.005$) is below the 0.05 threshold, indicating that Form 5 students ($M = 3.3583$) use these strategies more frequently than Form 4 students ($M = 3.2472$). Similarly, Problem-Solving Strategies

(PSS) showed a significant difference (p = 0.025), with Form 5 students (M = 4.2727) again employing these strategies more often than their Form 4 counterparts (M = 4.1636).

In contrast, no significant difference was found for Support Strategies (SS), as the p-value (p = 0.101) exceeds the 0.05 threshold. However, the mean scores indicate that Form 5 students (M = 2.6222) still use these strategies slightly more frequently than Form 4 students (M = 2.5222), although the difference is not statistically significant.

These findings suggest that Form 5 students demonstrate higher usage in most categories of metacognitive online reading strategies compared to Form 4 students. The significant differences in GS and PSS may reflect greater maturity, academic experience, and exposure to more complex reading tasks among Form 5 students. These findings differ from those of Ramli et al. (2011), who reported no statistically significant differences in the use of the three types of metacognitive online reading strategies between two age groups. However, since their study focused on adult learners rather than secondary school students, the results may suggest that younger learners are more adaptable to changes in metacognitive online reading strategy skills, as reflected in the contrasting findings of both studies. This also suggests that metacognitive awareness improves with age and experience, reinforcing the importance of introducing these strategies early in the ESL curriculum to ensure long-term academic success in digital learning environments.

For educators, these findings highlight the importance of considering students' age and experience when designing reading comprehension tasks. As Form 5 students tend to employ more problem-solving and global strategies, providing them with complex and challenging reading material could further enhance their use of these strategies. For Form 4 students, integrating more support strategies in their reading tasks may be beneficial, especially through activities that encourage paraphrasing and self-questioning, which could help them improve their comprehension and metacognitive awareness.

CONCLUSION

This study aimed to investigate the use of metacognitive online reading strategies among ESL secondary school students, specifically targeting Form 4 (16 years old) and Form 5 (17 years old) learners. The findings revealed that while all respondents employed metacognitive online reading strategies, the extent of their usage varied across different categories. Notably, students demonstrated a stronger preference for problem-solving strategies, such as visualising information gathered online to aid memory and paying closer attention when encountering challenging online texts. Conversely, support strategies were the least utilised, with paraphrasing being the least favoured among them.

These results highlight the need for sustained efforts to promote the balanced and effective use of all metacognitive online reading strategies. To improve students' metacognitive online reading practices, it is recommended that educators explicitly teach and encourage the use of all metacognitive strategies, including global, problem-solving, and support strategies. Regular classroom activities should incorporate strategies such as visualising, summarising, and paraphrasing to enhance reading comprehension, especially in online contexts. Additionally, educators should leverage technology and digital platforms to offer students tools for reflecting on their reading processes, such as interactive annotation tools or digital note-taking apps. Policymakers are also encouraged to support professional development initiatives to help teachers integrate metacognitive strategies into their teaching practices, ensuring these strategies are effectively used in online learning environments. By fostering greater awareness and practice of these strategies, students can improve their overall online reading comprehension and engagement.

Limitations and Recommendations for Future Research

The current study faced several limitations. First, the sample size (n=40) was relatively small, which could restrict the ability to generalize the findings to a larger population of ESL students. Additionally, the study focused on a specific age group (Form 4 and Form 5) in one state, limiting the ability to compare the findings across different grade levels or educational contexts. Future research should consider expanding the sample

size and exploring a wider range of participants, including students from various schools, regions, and diverse socioeconomic backgrounds, to ensure the findings are more representative.

Another limitation of the study lies in its reliance on self-reported data, which may have introduced biases such as social desirability or inaccurate self-assessment. Future studies could address this limitation by using a mixed-methods approach, incorporating both quantitative measures and qualitative methods to gain deeper insights into students' metacognitive practices.

Future research should also investigate how different factors, such as students' English proficiency levels, reading preferences, and exposure to different types of digital platforms, influence the use of metacognitive online reading strategies.

Finally, given the growing role of digital literacy in academic success, future research could examine the longitudinal effects of metacognitive online reading strategies. Specifically, researchers could explore whether sustained practice of these strategies over time leads to improved long-term reading outcomes and greater engagement with digital texts.

By addressing these limitations and exploring these recommended areas, future studies can contribute to a more comprehensive understanding of how metacognitive strategies can enhance ESL students' online reading experiences, ultimately fostering greater academic success in an increasingly digital learning environment.

Ethical Approval

This study was approved by the Faculty of Education, Universiti Kebangsaan Malaysia, Bangi. All research procedures adhered to the ethical guidelines for studies involving human participants, including obtaining informed consent from all participants prior to data collection.

CONFLICT OF INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship, and publication of this study.

Data Availability Statement

The data supporting the findings of this study are not publicly available due to privacy and confidentiality considerations, as they involve responses from ESL secondary school students. Data access may be granted upon reasonable request to the corresponding author, provided that all ethical guidelines and permissions are adhered to.

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