

Impact of Optimized Professional Development and Metacognitive Reading Strategies on EFL Students' Reading Comprehension

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Abstract—This study explores the efficacy of a professional development program to equip teachers with the skills necessary to implement metacognitive strategies to improve reading comprehension among English as a Foreign Language (EFL) students who struggle with vocabulary and syntax. The Researchers utilized purposive sampling to select 54 female students from Riyadh who were divided into an experimental group of 33 and a control group of 21. Metacognitive strategy instruction was provided to the experimental group, while the control group received traditional reading instruction with no metacognitive training. Both groups were assessed on their reading comprehension before and after the intervention. The results revealed that students taught metacognitive skills caught up with their more successful classmates regarding reading comprehension. These findings provide valuable insights into the capacity of metacognitive reading strategies to close the comprehension gap among underachieving EFL learners in the Arab context. Based on the findings, the research recommends incorporating these methods into English classes as an effective way to improve student's reading comprehension and overall performance in the classroom.

Index Terms—metacognition, English, foreign language, teacher training

I. INTRODUCTION

The process of learning a language is inherently complex and involves a variety of cognitive and metacognitive factors, with reading ability being paramount (Wang, 2023). Among these factors, metacognition—the ability to actively regulate one's thinking processes—plays a crucial role in language acquisition. This importance is particularly pronounced in English as a Foreign Language (EFL) education, where learners frequently face difficulties related to unfamiliar vocabulary, intricate syntactic structures, and complex thematic content (Azevedo et al., 2013). Numerous studies have demonstrated that strategic reading techniques, such as predicting, summarizing, and questioning, significantly engage learners and improve their comprehension of texts independently (Juliana & Angraini, 2024; Salameh et al., 2019). By actively planning, monitoring, and evaluating their reading strategies, students become more aware of their cognitive processes and equip themselves with the tools necessary to tackle the challenges they encounter in their reading endeavors.

Knowledge and regulation of one's cognition while reading is widely embraced in educational psychology and, more so, as a practical approach to enhancing learners' comprehension, especially those learning EFL. These strategies, for example, predicting, visualizing, and questioning, enable students to take control of their learning process by making them analyze proactively what they understand from the text. Such participation is particularly critical for EFL students as they are usually confronted with factors that affect their understanding, such as new word formation and syntactic density (Afzal, 2019; Rosyada-AS & Apoko, 2023). By using metacognition, the students can regulate their learning and, as a result, try to eliminate language difficulties and enhance their reading performance (Iobidze, 2019).

In EFL education, teachers must guide students in effectively utilizing metacognitive strategies. However, incorporating these strategies into classroom practices can be challenging, as many educators may lack familiarity with them. To enhance their capabilities, ongoing professional development is crucial to equip teachers with the necessary knowledge and techniques to bolster students' metacognition intentionally. Research indicates that when teachers are trained to implement and model metacognitive strategies, there is a notable increase in student engagement and comprehension, particularly among English as a Second Language (ESL) learners (Friesen & Haigh, 2018; Goh & Vandergrift, 2021). Therefore, teacher professional development should emphasize fostering a supportive learning environment that encourages developing and applying metacognitive reading strategies, ultimately boosting EFL students' academic achievements and self-confidence.

The use of metacognitive strategies is particularly noticeable in low-achieving EFL students who often experience challenges in reading comprehension (Momdjian & El Chidiac, 2024). Science proved that applying metacognitive reading strategies significantly improves language development, reading skills, and self-esteem (Milliner & Dimoski, 2024). As the key players in the learning process, educators are pivotal in cultivating these skills among their students.

However, it is also likely that numerous teachers may require support regarding incorporating metacognitive strategies into the teaching and learning process (Nobutoshi, 2023). This underscores the imperative for tailored professional development programs that give educators the knowledge and tools to effectively model and impart metacognitive strategies.

Teachers trained in implementing metacognitive reading strategies can significantly enhance students' reading skills, particularly for those struggling with reading. By incorporating these strategies into lesson plans and classroom organization, educators can effectively guide students through a reflective and controlled approach to their thinking processes (Ali & Razali, 2019; Usman et al., 2017). This study explores the impact of a structured professional development program on educators' abilities to utilize metacognitive reading strategies to improve the reading comprehension of low-performing English as a Foreign Language (EFL) learners. By assessing the effects of targeted metacognitive instruction, the research provides valuable insights into how professional development can empower teachers to enhance their students' understanding of the reading process, ultimately fostering improved comprehension outcomes and greater engagement in EFL classrooms.

II. LITERATURE REVIEW

Metacognitive reading strategies are fundamental to reading comprehension since these involve self-monitoring cognitions in reading. In a broader sense, these strategies correspond to the following activities: Monitoring the process of comprehending and planning further actions, evaluating one's learning outcomes, and adjusting the strategy of comprehension accordingly (Hennecke & Bürgler, 2023; Medina et al., 2017). Metacognition was defined by Flavell in 1979 as being aware of and being able to regulate cognitive processes (Flavell, 1979; Moritz & Lysaker, 2018). These strategies help the learners monitor their progress in achieving desired learning outcomes and modulate their cognition while processing the written content.

A. *Metacognitive Reading Strategies Importance*

Different research works have provided evidence that applying metacognition improves reading skills. Yuksel found that students who used metacognition outperformed those who did not in the reading comprehension tests (Yuksel, 2022). Likewise, for secondary school students, there was an increase in the level of reading and English self-efficacy after being taught metacognitive reading strategies (Bedir & Dursun, 2019). Oguz and Kutlu also found a significant relationship between metacognitive awareness and academic self-efficacy. The authors argued that self-regulated learning strategies enhance the cognitive and motivational aspects (Oğuz & Kutlu, 2018).

Special attention has been paid to metacognition as a key to developing cognitive, linguistic, and social skills that define proficient reading (Hammad Al-Rashidi et al., 2023). The meta-cognition strategies used by students who can strategies, monitor, and assess their learning abilities make them more capable of handling complex reading tasks than students who do not (Çakıcı, 2017). Hartman aggravates specific activities like prediction, comprehension checking, summarisation, and relating new information to previous knowledge as essential parts of metacognitive reading strategies (Alfaifi, 2022). Such activities assist the readers to find their way through texts and make them self-reflect as learners. This self-regulation accounts for better understanding and enhanced memory of information processed.

B. *Teacher Professional Development for Metacognitive Strategy Instruction*

Metacognition is the knowledge of one's learning processes and how they are conducted. Educators are vital in helping students develop such skills; however, few teachers are trained to teach such skills (Perry et al., 2019). This forces targeted professional development programs to ensure teachers learn how to use metacognitive strategies in the classroom. Metacognitively skilled teachers can effectively implement these strategies through modeling, coaching, and framing, fostering self-regulated learning (Bentahar, 2022; Zohar & Ben-Ari, 2022).

Teachers need to be provided with precise structures and approaches to facilitate meaningful instruction of metacognitive strategies to the students. Professional development programs can offer educators product-focused lesson plans, checklists for evaluating students' understanding, and tasks to increase students' metacognition (Kravchuk, 2015; White & Frederiksen, 2005). Kramarski and Michalsky noticed that teachers who engaged in professional development relating to metacognition noticed a noticeable enhancement in students' reading comprehension and awareness (Kramarski & Michalsky, 2015). Their results emphasize the benefits of highly organized training in metacognitive strategy to improve educators' capacity to prepare students for using such strategy.

Nonetheless, although the effectiveness of metacognitive strategy instruction is beyond doubt, only a limited number of investigations have been conducted about the influence of professional development designed specifically for EFL contexts on teacher self-perceived efficacy and student performance. This gap in the literature implies that the study on professional development for metacognitive strategy instruction among EFL teachers can provide helpful information, especially in settings where learners experience linguistic demands.

C. *Metacognitive Reading Strategies in the Study*

Instructed metacognitive strategies draw their basis from well-established theoretical frameworks of education, self-regulated learning, and schema theories. According to Pintrich et al., self-regulated learning theory focuses more on

planning, monitoring, and evaluating learning by students (Pintrich, 2000). This theory also justifies the prediction, summarisation, and self-questioning activities in enhancing students' independent and reflective readers by improving their comprehension. EFL students who self-regulate can flexibly apply strategies in reading to deal with difficult words and syntactic structures, which are typical of second-language texts (Brahimi, 2023; Elçin, 2018).

Metacognitive strategy instruction is also anchored on schema theory because the theory postulates that understanding of the materials increases when the student can relate to prior knowledge (Meylani, 2024). Based on the literature, metacognitive strategies assist students in integrating old and new information, enhancing meaningful learning (Avargil et al., 2018; Mitsea & Drigas, 2019). For EFL students, visualisation and inferencing can improve the impact of the content by filling gaps in one's knowledge and situating new terms and concepts in familiar settings (Godwin-Jones, 2018).

This research aims to fill this gap by assessing the moderating efficacy of teacher professional development and metacognitive strategy instruction on the reading comprehension of low-performing EFL students. This includes working with students for outcomes or directly training teachers for the latter. At the same time, the current study investigates how a set approach incorporating these aspects affects teaching effectiveness and student understanding. In this way, the research intends to provide new findings concerning the effective practices for reading comprehension improvement that may be helpful for EFL teachers and educational authorities.

III. METHODOLOGY

A. *Research Question and Hypothesis*

This study investigates the impact of metacognitive reading strategies on EFL students' reading comprehension. Specifically, it addresses the following research questions:

1. Which metacognitive reading strategies do EFL students use to enhance their reading comprehension?
2. How does student performance in metacognitive strategy instruction demonstrate different results than traditional learning methods?

The study develops the following research hypotheses using the established questions:

- H1: Metacognitive strategy instruction significantly improves EFL students' reading comprehension.
- H2: Students who received metacognitive strategies demonstrated better cognitive skills than those in the control group.

B. *Study Design*

The study utilized a design structured into seven distinct phases, employing a pretest-posttest control group methodology to investigate the impact of metacognitive reading strategies on the reading comprehension of EFL (English as a Foreign Language) learners. A total of 54 female Saudi students participated in the research, which divided them into two groups: an experimental group of 33 students and a control group of 21 students.

To assess comprehension and gauge students' perceptions of the strategies, the research team implemented pre- and post-tests alongside semi-structured interviews. The training program incorporated various activities designed to enhance the metacognitive learning process.

C. *Population and Samples*

The research focused on English as a Foreign Language (EFL) students and teachers within private educational institutions in Riyadh, Saudi Arabia. Employing a purposeful sampling technique, the study selected 54 female students enrolled in a private school. The participants were divided into two groups: an experimental group of thirty-three students who received metacognitive strategy instruction and a control group of twenty-one students who followed traditional reading instruction methods. This focus on female students aligns with the educational practices prevalent in Saudi Arabia, where schooling is primarily separated by gender. In various areas, especially within private institutions, education is exclusively provided for either males or females. Such a system reflects the cultural norms and regulatory frameworks that promote single-gender educational settings. Thus, the decision to involve only female participants highlights the study's cultural and academic context.

Three EFL teachers participated in implementing the metacognitive strategy instruction. These teachers were purposefully selected based on their tenure at the same private school and their minimum of five years of teaching experience. They underwent a three-day training workshop to equip them with the skills necessary to implement metacognitive strategies effectively in their reading instruction. During the workshop, the teachers were trained in techniques such as predicting, inferring, making connections, and self-monitoring, ensuring a consistent and effective instructional approach.

D. *Study Instruments*

The researcher has employed two main techniques to achieve the set research objectives. The first is a proficiency assessment, a Reading Comprehension Test, which determines the students' English reading skills. In addition, a semi-structured interview has been used to assess the students' strategic use and comprehension.

The reading comprehension test was administered as both a pre-test and post-test to assess students' reading abilities before and after the instructional intervention. The test was adapted from standardized EFL reading assessments and validated by language assessment experts to ensure its suitability for the study context.

E. Data Collection

The interview was structured to allow accurate assessment, and the researcher created a coding framework based on the metacognitive strategy.

(a). Semi-Structured Interviews

To achieve the research objectives, 54 students participated in the semi-structured interviews (see **Appendix A**). Comprehensive, open-ended questions were created to assess the student's understanding and reasoning. They comprised two pre-reading questions, three during-reading questions, and six post-reading questions. After that, written consent was sought from the participants so that they understood the nature of their involvement and could either participate or withdraw from the study without any repercussions.

Following the interviews, the data was transcribed and analyzed to identify emerging patterns and themes from the responses. Partnership with these organizations was instrumental in finding a solution to the research question and attaining the study's goals. However, it would be misleading to think of the students as passive objects in this process; they were active agents. Students were urged to use predictive talking, drawing, relating, guessing meaning, and analyzing the structure of sentences to comprehend the hidden meaning in the texts better. The interviews conducted with the students were tape-recorded, and the actual words said were written verbatim. The transcription was then done by two scholars in the area of education. Furthermore, the students were asked about their understanding of the intervention, how they used the metacognitive strategies taught during reading, and whether they improved their reading comprehension skills, emphasizing the students' part in the research community.

(b). Assessment Test

Assessment development is a complex process that ensures that students' reading comprehension is accurately measured, specifically for sixth graders who need a strong and reliable evaluation. The Reading Comprehension test was carefully constructed in this study to assess the extent of metacognition of the participants in comprehending a passage. The test included seven sections, each evaluating different competencies, and took about 25 to 30 minutes (see **Appendix B**). The test-retest method was used to determine the test's reliability. A set of participants provided their answers to the same questions, and the results were again measured using Pearson's Coefficient. The test has maintained its performance level, as seen from the high correlation coefficient value ($r = 0.836$).

F. Data Analysis

The evaluation used quantitative and qualitative data analysis approaches to determine the effects of metacognitive strategy instruction on EFL students' reading comprehension abilities.

(a). Quantitative Data Analysis

Reading comprehension assessment used Wilcoxon Signed-Rank tests to analyze the pre/post score changes between experimental and control groups. The researchers chose this non-parametric test because it functions well for data sets with small sizes and non-normal distributions. The Mann-Whitney U test measured post-test scores between the experimental and control groups to establish a statistical effect of the intervention. The study presented descriptive data through mean scores, standard deviations, and percentage changes, illustrating the reading comprehension performance patterns.

Cohen's d-test was conducted, particularly for the t-test comparison of the two groups, and the results showed contrasting effects between the control and experimental groups. The control group had a Cohen's d value of -0.234, indicating a small effect size, with scores improving slightly from 60.60% to 62.00%, likely due to chance. In contrast, the experimental group yielded a significant Cohen's d value of -0.870, reflecting a large effect size and considerable performance improvement, with pre-test scores of 55.85% increasing to 76.60% after the intervention. This difference in effect sizes underscores the effectiveness of the intervention for the experimental group, suggesting it could be highly beneficial. Therefore, the notable effect size supports the broader implementation of the new teaching strategy to improve learning outcomes.

(b). Qualitative Data Analysis

Qualitative interview data from students before and after the metacognitive strategy intervention underwent Wilcoxon Signed-Rank test evaluation for assessment purposes. The researchers selected this non-parametric test because it provided a means to evaluate students' metacognitive strategy use following the intervention period, as presented in **Table 3** and **Table 4**. Research participants answered interview questions through which their involvement with eight metacognitive tactics was rated on a five-point scale, including making connections, resource utilization, visualization, key details, inferring, prediction before and during reading, and fix-up strategies.

The Wilcoxon Signed-Rank test assessed the statistical significance of students using metacognitive strategies between the pre-and post-intervention periods. The Z-value designates the standardized test statistic in the Wilcoxon Signed-Rank

test to determine significant differences in pre-intervention and post-intervention responses. According to the results of this test, post-intervention scores exhibit consistent improvement above pre-intervention scores, demonstrating a positive impact of intervention. The research used two independent raters who achieved an interrater reliability between 80% and 90% while analyzing the data. Detailed information about the analysis coding framework exists in **Appendix D**.

(c). *Coding Scheme for Interview*

The study employed a research approach that focused on the verbal communication of participants before and after the interview. This involved emphasizing the anonymity of the participants and the ethical conduct that has to be observed. In particular, each student's data was filed systematically using Microsoft Excel, which aided the analysis. One of the main components of the study was to create a complex coding scheme based on the systematic literature review. This approach made it possible to develop a multi-level assessment tool for metacognitive reading strategies and was a significant factor in studying the project's validity. Two coders were used to code the data, and student responses were then classified based on the criteria and words associated with each reading strategy being assessed. They adhered strictly to specific procedures for evaluating strategies such as making connections, visualization, inferring, resource utilization, prediction while and before reading, key details, and fix-up.

In assessing the *Making Connections*, coders looked for evidence of understanding between semiotic and syntactic linkages and assigned a rating from 1 to 5 according to the strategy used (see **Appendix C**). Specific criteria were applied to all the strategies; for prediction, coders assessed the accuracy in the context of textual references and the inference capability. Discrepancies between the two coders were resolved through discussion; the two coders had an interrater reliability of 93%. This coding scheme ensured a systematic approach and high credibility of the findings. It offered reliable insights into participants' use of metacognitive strategies and the intervention's effectiveness, firmly anchoring the analysis in evidence-based practices.

IV. RESULTS

The Wilcoxon Signed-Rank test compared the experimental and control groups' pre-test and post-test scores, assessing individual progress. Additionally, the Mann-Whitney U test was used to compare the post-test scores between the experimental and control groups to determine the effectiveness of metacognitive strategy instruction. The researchers selected non-parametric statistical methods because their study included small sample size and non-normal score distributions. The results indicate a statistically significant improvement in the experimental group compared to the control group.

(a). *The Reliability Assessment*

Several EFL specialists and language assessment professionals observed the validity of the reading comprehension test by evaluating each item for its relevance to the content, language accuracy, and educational targets. The testing items received expert feedback, which improved the content's clarity and accuracy.

The reliability assessment of the reading comprehension test used the test-retest method. The test-retest procedure with similar conditions revealed high reliability through Pearson's correlation coefficient, which produced a value of $r = 0.836$. The research team developed interview questions for the semi-structured interviews by referring to proven metacognitive strategy frameworks to guarantee content validity. The interview data reliability was achieved through a double-coding process by two independent raters who reached an agreement rate of 93% (see Appendix D for complete coding scheme information).

(b). *The Reading Comprehension Test*

The study conducted an extensive analysis of an intervention aimed at improving the capacity to read and understand what is being read by a control group of 21 students and an experimental group of 33 students using pre-and post-test designs. However, the control group, which was not exposed to the intervention, recorded a slightly improved mean percentage of reading comprehension from 60.60% to 62.00%. However, using statistics, it was found that this change was very marginal and insignificant (Z -score = -0.573 , $p = 0.567$). The reference source was not found, meaning the improvement could be due to variations in response or chance factors.

TABLE 1
COMPARING STUDENTS' GRADES ON PRE- AND POST-READING TESTS BY GROUPS

GROUPS	MEANS %		N			MEAN RANK		Z	P -VALUE
	Pre test	Post test	Neg. Ranks	Pos. Ranks	Ties	Neg. Ranks	Pos. Ranks		
CONTROL GROUP	60.60%	62.00%	6	10	5	9.50	7.90	-0.573	0.567
EXPERIMENTAL GROUP	55.85%	76.60%	1	32	0	1.00	17.50	-5.005	0.000**

On the other hand, the experimental group that participated in the intervention program recorded improved reading comprehension mean scores of 55.85 % to 76.60%. A highly significant improvement was obtained in the reading

comprehension scores ($Z = -5.005$, $p = 0.000$), which supports the effectiveness of the intervention in enhancing reading skills.

(c). *Interviews Data Analysis*

As presented in the experimental group **Table 2**, showed a notable improvement in all eight essential metacognition strategies, with all having p values ≤ 0.001 . They demonstrated a fair amount of improvement in making connections, managing resources, using visualization techniques, pinpointing key details, inferring abilities, and prediction skills before and during reading. Also, they could use fix-up strategies to address comprehension gaps significantly improved ($p < 0.001$). These results further support the practice of the intervention in enhancing deeper cognitive processes and the techniques used in reading. The critical Z values of ± 3.291 reveal a critical level in assessing the experimental group's performance. The Z -scores were calculated to range from -3.317 to -3.766 , indicating the significance of all the metacognitive strategies used in the study, which were above the critical Z -value linked to a p -value of 0.0001 . The scores did improve from the pre- to post-test assessment, and the consistent pattern also removed the possibility of chance as a factor in these changes. Notably, the high Z -scores in all the strategies show that the effect of the intervention on the students' metacognition is statistically significant and robust.

TABLE 2
GENERAL AVERAGES OF INTERVIEW RESPONSES FOR THE EXPERIMENTAL GROUP

METACOGNITIVE STRATEGIES	MEANS		Z	P-VALUE
	Pre	Post		
MAKING CONNECTION	1.83	3.92	-3.724	0.000**
RESOURCES	1.83	3.08	-3.317	0.001**
VISUALISING	1.62	2.73	-3.724	0.000**
KEY DETAILS	1.73	2.93	-3.726	0.000**
INFERRING	1.77	3.90	-3.728	0.000**
PREDICT BEFORE	2.03	3.22	-3.486	0.000**
PREDICT DURING	1.29	3.44	-3.766	0.000**
FIX UP	1.73	3.39	-3.725	0.000**

On the other hand, the control group, **Table 3**, only shows a slight improvement in the same metacognitive strategies. However, the improvement was statistically insignificant with p -values such as 0.068 for making connections, 0.414 for using resources, 0.068 for visualization strategies, and 0.66 for identifying key details. Although there was a specific progress score in different aspects, it did not reach a significant performance level. Overall, the results of the control group suggest that the learning methodologies used by this group did not foster the level of cognitive processes and metacognitive strategies observed in the experimental group, therefore supporting the rationale for the targeted intervention in enhancing metacognition.

TABLE 3
GENERAL AVERAGES OF INTERVIEW RESPONSES FOR THE CONTROL GROUP

METACOGNITIVE STRATEGIES	MEANS		Z	P-VALUE
	Pre	Post		
MAKING CONNECTION	2.09	2.95	-1.826	0.068
RESOURCES	1.94	2.13	-0.816	0.414
VISUALISING	1.71	2.68	-1.826	0.068
KEY DETAILS	1.99	2.83	-1.841	0.066
INFERRING	2.03	3.08	-1.826	0.068
PREDICT BEFORE	1.88	2.75	-1.841	0.066
PREDICT DURING	2.00	3.31	-1.841	0.066
FIX UP	2.03	3.17	-1.826	0.068

V. DISCUSSION

The research results validate **H1** since students who received metacognitive strategy instruction achieved superior reading comprehension results compared to their control group counterparts. Research findings show that **H2** holds validity because the experimental group participants displayed improved cognitive abilities to predict and infer while establishing connections. The collected data demonstrates that metacognitive strategies produce successful results in acquiring English as a foreign language.

This study clearly illustrates the improvement in implementing metacognitive strategies after targeted professional development, leading to better comprehension of what students read. Our analysis revealed that the provision of metacognitive reading strategy instruction led to an increase in reading comprehension among EFL students, with their overall reading comprehension scores increasing from 55.85% (pre-test) to 76.60% (post-test) in the experimental group ($p < 0.001$). Similarly, Perry et al. (2018) found that explicit metacognitive training improved reading comprehension scores by 22% among students, which aligns with our findings (Perry et al., 2019). Similarly, Iobidze (2019) found that when learners engaged in structured metacognitive reflection before, during, and after reading, their comprehension performance increased by 19.4% (Iobidze, 2019). Although our study was limited to Saudi Arabian EFL learners, Perry et al. and Iobidze investigated various educational settings. However, all studies support the inference that metacognitive

strategies are conducive to better reading comprehension. Further, the planned activities that address collaboration and reflection also align with Zohar and Ben-Ari's suggestion that for professional development results to be sustainable, they need to produce self-regulated teaching practices (Zohar & Ben-Ari, 2022). The negligible gains in the control group suggest that the conventional modes of teaching and learning do not adequately equip EFL learners for the various difficulties they encounter. This gap addresses the assertion made by Bentahar that structured training is essential in changing classroom practices mainly because language barriers affect students' understanding (Bentahar & Alalou, 2022).

The significant improvement in inferring, making connections, and prediction further supports the utility of metacognitive strategies for raising cognitive presence. For instance, the increase in prediction during and before reading ($p < 0.001$) on the subject's ability to employ anticipatory skills. In the same way, the improvement in establishing relations may be explained by the schema theory, indicating that learning is made easier since learners relate new information to their prior knowledge (A. Meylani, 2024). Most importantly, the findings confirm that metacognitive strategies are most beneficial for low performers. This finding supports the study by Milliner and Dimoski, showing that metacognition effectively addresses difficulties connected with the vocabulary and syntactic density of a given text (Milliner & Dimoski, 2024). The possibility of using the fix-up strategies when some content is poorly understood also explains how these approaches promote learning resilience and flexibility.

Overall, this work contributes to the discussion of the need to incorporate metacognitive strategies into the learning of EFL. The findings corroborate that intervention programs should consider EFL learners' linguistic and cognitive demands. For instance, the visualization and resource predictability features show how effective strategies can improve understanding by making students embody the learned knowledge. The study also emphasizes the teachers' need for continuous professional development, especially when learners cannot benefit from traditional teaching approaches. The control group educators shared informal knowledge with their colleagues, implying that peer learning might be supportive in improving teaching practices. However, as Michalsky has pointed out, formal training offers the framework and tools to accomplish greater and more systematic gains (Michalsky, 2021).

The study's findings provide several insights for curriculum planning and policymaking in EFL education. The effectiveness of the intervention supports the idea that using metacognition in lesson plans and teacher training can be helpful for students and teachers in the long run. Furthermore, the study reveals that metacognitive strategy instruction may help close academic achievement gaps, particularly for underperforming students.

VI. CONCLUSION

This present research underscores the importance of metacognitive strategies in improving the reading comprehension of low-performing EFL students. The fact that students' learning outcomes have increased in the experiment group proves the efficacy of structured interventions, including focused professional development for teachers and research-based practices. As educators are given the resources and strategies to implement metacognitive activities, students gain from increased cognitive engagement, self-regulation, and academic performance. The results underscore the significance of selective professional development for teachers in promoting change by considering EFL learners' difficulties. In contrast to the minor and statistically insignificant improvements in the control group, the growth of the experimental group calls for the rejection of traditional educational practices. This study also strengthens schema theory and self-regulated learning in real-life educational contexts, especially in enhancing language acquisition through metacognition. In this way, educators and policymakers must prioritize structured professional development, allowing classrooms that support students in breaking down linguistic barriers and succeeding academically.

APPENDIX A. INTERVIEWS

Reading the title:

Hiding in a tree



- ✚ What does the title mean?
- ✚ What do you know about this topic?

Reading the full story

Now, we will read a story together. Please stop me whenever you want to share what is on your mind or when you do not understand something. And sometimes, I will stop reading to ask you questions.

When students say that they do not understand a word or sentence, the interviewee asks:

- What can you do now to understand it?
When students do not speak after two or three sentences, the interviewee will stop the reading and ask:
- What do you understand from what we've read so far?
- What does help you understand that?

Then, we proceed to read the story.

High on a sturdy branch, hidden away behind a mass of green leaves, Andy watched everyone scurrying around the backyard. He laughed quietly to himself. No one knew he was hidden in the tree.

After reading the text:

Now, I have a few general questions to ask.

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- ✚ Which part of the story do you like most, and why?
- ✚ What is this text about?
- ✚ Where do you think the most important part of this story is? Why?
- ✚ What might you visualize happening next?
- ✚ Do you learn anything new from this short story?
- ✚ What new information do you learn from reading this text?

In general, if the student does not reply, replies minimally, or says, 'don't know,' you can prompt further with open questions such as:

Examples of direct probing questions for clarification:

- ✚ What do you mean when you say . . . ?
- ✚ Can you tell me more?
- ✚ Can you please elaborate?

Examples of direct probing questions for going into more depth:

- ✚ Why do you think . . . ?

APPENDIX B. COMPREHENSION TEST

<p>The Reading Comprehension Test</p> <p>When the test questions are different from the reading text, the student will receive the story, audio, and video files first and then do the ground. Lastly, after reading the material in which during the test, the test is completed around at night.</p> <p>All of these are not, reading for food and water, and the test does not come up again.</p> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr> <th colspan="2">WEEKS</th> </tr> <tr> <th>Week</th> <th>Number of questions</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>10</td> </tr> <tr> <td>2</td> <td>10</td> </tr> <tr> <td>3</td> <td>10</td> </tr> <tr> <td>4</td> <td>10</td> </tr> </tbody> </table> <p>1) Circle the letter of the box, that best completes each of the sentences below.</p> <p>A) When the test was given, the student was . . . (10 pts)</p> <p>a) happy b) sad c) angry d) none</p> <p>B) The student was found in the . . . (10 pts)</p> <p>a) mountain b) ground c) house</p> <p>C) Lastly, when the student was asked during the . . . (10 pts)</p> <p>a) night b) day c) test</p> <p>D) The student was . . . (10 pts)</p> <p>a) happy b) sad c) test</p>	WEEKS		Week	Number of questions	1	10	2	10	3	10	4	10	<p>2) Write True or False, and correct the false sentences. (2 pts)</p> <p>a) The student was not in the tree. _____</p> <p>b) All of the students are watching for food. _____</p> <p>c) Lastly, when the student was asked . . . _____</p> <p>d) The student was found in the . . . _____</p> <p>3) Fill in the empty boxes with the right answer. (10 pts)</p> <ul style="list-style-type: none"> • During the . . . , the student was found in the tree. • In the . . . , the student was found in the tree. • In the . . . , it is very hot during the . . . and cool during the . . . 	<p>4) Number the following errors in the order they happen. (3 pts)</p> <p><input type="checkbox"/> The student was not in the tree.</p> <p><input type="checkbox"/> The student was not in the tree.</p> <p><input type="checkbox"/> The test was not given.</p> <p>5) Complete the circles by a sentence word. (3 pts)</p> <div style="text-align: center;"> <p>1. One of the test</p> </div>	<p>6) Answer the following questions. (2 pts)</p> <p>A) When did you give the test during the day?</p> <p>Lastly, when the student was asked during the day . . . _____</p> <p>B) Why do you think the student was only seen at night?</p> <p>When the student was only seen at night because . . . _____</p> <p>C) What might the student do when they see at night?</p> <p>When they see at night, the student . . . _____</p> <p>D) What are you giving happening when the test comes up again?</p> <p>_____</p>	<p>7) Circle the wrong answer from the group. (2 pts)</p> <p>a) None of the student was not.</p> <p><input type="checkbox"/> None</p> <p><input type="checkbox"/> None</p> <p><input type="checkbox"/> None</p> <p>b) To share, the student was not.</p> <p><input type="checkbox"/> Not</p> <p><input type="checkbox"/> Not</p> <p><input type="checkbox"/> Not</p>
WEEKS																
Week	Number of questions															
1	10															
2	10															
3	10															
4	10															

APPENDIX C. CODING SCHEME

Interview rubric						Prediction (Before reading the text)	The student doesn't make predictions of the title and the pictures	The student makes inaccurate predictions	The student makes accurate predictions but without imagery or title information references	The student makes accurate predictions with inaccurate imagery or title references	Student makes accurate prediction by referencing imagery or title information accurately
Name:	1	2	3	4	5	Prediction (While reading the text)	The student doesn't predict what will happen next in the story	The student makes inaccurate predictions	The student makes accurate predictions without textual references	The student makes accurate predictions with textual inaccurate references	The student makes accurate predictions with accurate textual references
Making meaningful connections	No evidence of understanding or evidence of not understanding the title	Syntactic addition with one info (about who, where, or what) from the text	Syntactic addition with more than one info (about who, where, or what) from the text	Semiotic (or explanatory) addition only by connecting info from the prompt	Semiotic (or explanatory) addition by adding info that is not included in the prompt (under either textual or pictorial modalities)	The Key details of the text	The student doesn't provide accurate key information from the text	The student provides accurate information with some details about one of the components either character, setting or the events	The student provides accurate information with some details about two components either character, setting or the events	The student provides accurate but little information about the three components characters, setting, and events.	The student provides accurate rich and efficient information about the three components characters, setting, and events.
Visualizing:	No evidence of demonstrating a literal interpretation or visualization of images and text	Demonstrates use of literal interpretation of images and text	Demonstrates use of visualization with creative inaccurate interpretation of either text or images	Demonstrates use of visualization with creative accurate interpretations of either text OR images	Demonstrates use of visualization with creative accurate interpretations of text AND images	Fix-up (re-read, and use context clues)	No evidence of applying OR Evidence of not applying any fix-up strategies in the reading process.	Re-reads the text aloud but no evidence of using context clues to understand the text.	Re-reads the text aloud AND uses context clues inaccurately.	Re-reads the text aloud AND uses context clues partially accurately or without self-criticism.	Re-reads the text aloud AND uses context clues fully and accurately or with self-criticism.
Inferring	The student doesn't draw any inference	The student draws an inaccurate inference	The student draws an accurate inference without justifying it with evidence from the text OR images	The student draws an accurate inference with justification from the text OR images	The student draws an accurate inference with justification from the text AND images OR draws more than one accurate inference						
Resources	No evidence of use of resources.	Seeks help from others to find the meanings of the words and sentences.	Translates the text into Arabic language via application.	Look up the meanings of words and sentences on the internet or dictionaries.	Uses context clues and prior knowledge to identify the new meanings of the words and sentences.						

APPENDIX D. CODING SCHEME FOR INTERVIEW DATA ANALYSIS

ASSESSMENT AREA	LEVEL	DESCRIPTION
Understanding	1	No signs of understanding.
	2	Syntactic addition without prompt information.
	3	Extended syntactic addition with prompt information.
	4	Semiotic addition using prompt information.
	5	Semiotic addition introducing novel information not in the prompt.
Visualisation	1	No evidence of literal interpretation.
	2	Evidence of literal interpretation of visuals and text.
	3	Imaginative interpretation of text or visuals.
	4	Accurate synthesis of information from text and images.
	5	Comprehensive understanding demonstrating proficiency in visualisation skills.
Inferring	1	No assumptions or consideration of evidence.
	2	Incorrect assumptions made.
	3	Accurate inferences made without supporting evidence.
	4	Evidence-supported inferences made.
	5	Accurate inferences made from both text and pictures with robust support.
Resource Utilisation	1	No use of resources.
	2	Seeking assistance from others.
	3	Application used for translation into Arabic.
	4	Use of dictionaries or the internet.
	5	Context clues and prior knowledge used to decipher new meanings.
Prediction (Pre-Reading)	1	No predictions made.
	2	Incorrect predictions made.
	3	Correct predictions without textual references.
	4	Correct predictions with incorrect textual references.
	5	Impeccable predictions aligned with the text.
Prediction (During Reading)	1	No predictions made.
	2	Inaccurate predictions made.
	3	Accurate predictions without textual references.
	4	Accurate predictions with textual inaccuracies.
	5	Precision with accurate textual references.
Key Details	1	No accurate information from the text.
	2	Evidence of precise information about one component.
	3	Accurate information about two components.
	4	Rich, accurate details about all three components (characters, setting, events).
	5	Reading aloud with complete, accurate context clue utilisation.
Fix-up Technique	1	No evidence of reading process strategies.
	2	Rereading aloud without context clues.
	3	Rereading with inaccurate context clue application.
	4	Rereading with partial, accurate application of context clues.
	5	Reading aloud with complete, accurate context clue utilisation.

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