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Examining the impact of Fix-Up strategies on EFL students' reading comprehension in a senior secondary school: A quasi-experimental study

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ABSTRACT

Purpose — Although metacognitive reading strategies have been widely investigated, empirical evidence on Fix-Up strategies in secondary school contexts remains limited. To fill this void, this study examines the effect of Fix-Up strategies on senior secondary school EFL students' reading comprehension.

Design/methodology/approach — A quasi-experimental method with a matching-only pre-test–post-test control group design was employed. Sixty tenth-grade students in a private senior high school in South Sumatera, Indonesia, participated in the study. Data were collected using a 40-item multiple-choice reading test and analyzed using descriptive statistics, normality and homogeneity tests, paired-samples *t*-tests, and independent-samples *t*-tests.

Results — The results revealed a positive impact on the experimental group's reading comprehension achievement ($p < .001$, Cohen's $d = 3.43$, indicating a very large effect) and a significant difference in posttest scores between the experimental and control groups ($p < .001$, Cohen's $d = 1.10$, indicating a large effect). These results indicate that Fix-Up strategies gave a significant impact on the students' reading comprehension.

Originality/value — This research contributes to the practical application of Fix-Up strategies in EFL instruction to foster students' metacognitive awareness. This assists the students in monitoring their comprehension, exploring reading difficulties, and applying appropriate repair strategies, thereby promoting more independent and strategic reading.

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Introduction

Among the most essential components of English education at the senior high school level is the development of students' reading comprehension ability. Reading is integral to students' academic and cognitive development because it fosters critical and analytical thinking,

expands vocabulary, and enables learners to connect new information with their prior knowledge (Li, 2022; Smith et al., 2021; Vettori et al., 2024). This further aids learners in processing information, integrating ideas across texts, and developing higher-order reading comprehension skills (Kim et al., 2024). Thus, it is essential to strengthen students' reading comprehension skills to help them gain a more comprehensive understanding of the material.

Although reading is important, many students still struggle to develop strong reading skills. One of the major causes of reading comprehension difficulties is poor vocabulary (Nation, 2017; Schmitt et al., 2021). This problem is significant because students will not be able to understand and analyze a given text properly. A poor vocabulary will lead students to have difficulties working through a text and, as a result, prevent them from clearly extracting and processing the information (Hu et al., 2022; Vettori et al., 2024). This scenario can lead students to confusion and frustration if they encounter a range of unfamiliar words. Furthermore, a lack of prior knowledge of a subject will exacerbate these problems. Without prior knowledge, students will not be able to make the important relationships or inferences needed to understand new and unfamiliar ideas (Binhomran & Altalhab, 2023; Carrell & Eisterhold, 1983).

Supporting this concern, according to the Organisation for Economic Co-operation and Development (2023), the Program for International Student Assessment (PISA) 2022 indicated that Indonesia ranked 68th out of 81 participating countries in reading literacy, with an average score of 359, below the OECD average of 476. Only 25% of Indonesian students reached Level 2, suggesting that most struggled with reading. These findings highlight the need for more effective reading instruction that strengthens students' vocabulary knowledge, background knowledge, and reading comprehension.

To address these challenges, teachers need targeted instructional approaches that specifically address students' reading difficulties. Ali et al. (2022) emphasized that implementing appropriate reading approaches can improve students' engagement and reading comprehension in EFL classrooms. Furthermore, instructional approaches that are responsive to learners' characteristics and needs can facilitate reading comprehension and encourage active participation in the learning process (Ali et al., 2022). Strategic reading instruction also enables students to comprehend complex texts more effectively while strengthening their confidence in applying reading strategies independently (Peng et al., 2024; Vettori et al., 2024). Consequently, such instructional approaches can help students overcome reading comprehension difficulties while simultaneously strengthening their academic literacy and independent learning skills (Bassett & Macnaught, 2025; Peng et al., 2024).

Reading comprehension is closely associated with learners' metacognitive awareness, which refers to the ability to plan, monitor, and evaluate one's own understanding during reading (Kan et al., 2024; Pahrizal et al., 2025). Students with strong metacognitive awareness are better able to recognize comprehension breakdowns and apply appropriate repair strategies. Therefore, explicit instruction in metacognitive reading strategies is considered an effective approach for improving reading comprehension in EFL contexts.

One teaching strategy proven to enhance students' reading achievement is the use of Fix-Up strategies. These strategies involve explicit instruction that teaches learners how to

monitor their reading and repair comprehension problems. As stated by Duffy and Roehler (1986), Fix-Up strategies are guiding techniques used by teachers to help students identify points at which comprehension breaks down and develop strategies to repair their understanding during reading. Teachers guide students through repair methods such as rereading a passage, summarizing, predicting, and using other clues to understand the passage when they are confused (McLaughlin, 2012). Fix-Up strategies help students become more sophisticated, self-controlled, and independent readers (Fan et al., 2026; Peng et al., 2024).

The preliminary study conducted by the researcher involved an interview with an English teacher in an Islamic senior secondary school in South Sumatera, Indonesia. From the interview, the teacher revealed that students had difficulties in reading comprehension. The teacher explained that students had difficulty with reading, including identifying the main idea, making inferences, and establishing intertextual connections. Many students also experienced difficulties with self-monitoring while reading, leading to misunderstandings of the text. In addition, the teacher explained that Project-Based Learning (PBL) was the instructional approach commonly used in reading classes. Although the curriculum mandates PBL and promotes collaboration and inquiry, students may still require explicit metacognitive support to monitor and repair comprehension difficulties during reading activities. This is consistent with Risti and Irawati (2022), who reported that PBL may require additional metacognitive support to facilitate students' self-monitoring and self-correction during reading activities.

Although Project-Based Learning (PBL) promotes collaboration, inquiry, and critical thinking, it does not always provide explicit metacognitive instruction to help students monitor and repair comprehension during reading. Consequently, students may experience difficulties in identifying comprehension breakdowns and selecting appropriate repair strategies independently. Supporting this view, Wahyuni et al. (2024) reported that students who received explicit metacognitive strategy instruction demonstrated improved reading comprehension. Therefore, Fix-Up strategies can complement PBL by providing explicit metacognitive support that enables students to monitor, evaluate, and repair comprehension during reading.

Numerous studies have demonstrated the effectiveness of Fix-Up strategies in improving students' reading comprehension across different educational levels. Studies conducted at the junior high school level consistently reported that the strategy improved students' reading comprehension while simultaneously increasing their engagement and interest in reading activities (Lubis et al., 2023; Ulfah & Jannah, 2022). Research focusing on senior high school students has likewise shown positive outcomes. Studies conducted at this educational level reported significant improvements in reading comprehension achievement, classroom participation, and students' ability to apply comprehension-repair strategies while reading (Amanda et al., 2022; Awaluddin et al., 2025; Rusmiati et al., 2022). At the higher education level, studies involving second-semester English majors also demonstrated the positive effects of Fix-Up strategies on reading comprehension, indicating its versatility and effectiveness across educational contexts (Yuliana & Sutramakdalena, 2023). Collectively, these findings suggest that the Fix-Up strategies can be successfully implemented across various educational levels to support students' reading comprehension and comprehension-monitoring processes.

Despite the established effectiveness of Fix-Up strategies in various educational contexts, existing studies have predominantly focused on junior high school students and university learners. Although several studies have investigated its implementation at the senior high school level, most have concentrated on eleventh-grade students, leaving limited empirical evidence regarding its application among tenth-grade learners. Furthermore, in Indonesian secondary education, where Project-Based Learning (PBL) has become a central instructional approach, little attention has been given to integrating explicit metacognitive strategies to support students' reading comprehension. Since PBL primarily emphasizes collaborative and inquiry-based learning, students may require additional support in monitoring and repairing comprehension difficulties during reading activities. Therefore, this study extends the existing body of research by examining the effect of Fix-Up strategies among tenth-grade students in Indonesian EFL classrooms, where PBL is the primary instructional approach. By positioning Fix-Up strategies as an explicit metacognitive scaffold that complements PBL, this study will answer two research questions: (1) is there a positive effect of Fix-Up strategies on the senior secondary school EFL students' reading comprehension? and (2) are there significant differences in reading comprehension achievement between students taught using Fix-Up strategies and those taught using conventional instruction?

Method

Research design and sample

This study employed a quantitative quasi-experimental design with a matching-only pretest–posttest control group design to investigate the effect of Fix-Up strategies on students' reading comprehension achievement. This design was considered appropriate because it allowed the researcher to examine the effects of the instructional intervention by comparing the outcomes of the experimental and control groups (Cham et al., 2024; Creswell & Creswell, 2023). The matching-only pretest–posttest control group design was selected because the participants were drawn from existing classes rather than randomly assigned (Campbell et al., 2002; Fraenkel et al., 2023).

The study was conducted in an Islamic senior secondary school in South Sumatera, Indonesia during the 2024/2025 academic year. The population consisted of 210 tenth-grade students from eight classes. Using purposive sampling and a matched-pairs technique based on students' pretest scores, two classes with relatively similar initial abilities were selected (Fraenkel et al., 2023). Tenth-grade students of Science Class 1 (30 students) served as the experimental group and received instruction using Fix-Up strategies. In contrast, Tenth-grade students of Science Class 2 (30 students) served as the control group and received the regular Project-Based Learning (PBL)-based instruction implemented by the school. Therefore, the total sample comprised 60 students. The study was conducted with informed consent obtained from the school administration and the participants prior to data collection.

Content validity was established through expert validation by two English education lecturers to ensure that the test items adequately represented the curriculum objectives and reading skills being assessed. Following the item validity analysis, 40 of the original 60 items met the validity criteria and were retained for the final instrument, while the remaining 20 items were excluded due to invalidity. Reliability analysis using Cronbach's Alpha yielded a

coefficient of 0.748, indicating acceptable internal consistency (Nunnally & Bernstein, 1987; Tavakol & Dennick, 2011).

Data collection

In both the experimental and control classes, data collection involved administering a reading comprehension examination before and after the classes. This test included 40 multiple-choice questions from descriptive, recount, and procedure texts in the Grade 10 English curriculum. The test assessed the students' ability to identify the main ideas of the texts, recognize the topics and supporting details, draw the necessary inferences, determine the meanings of words based on context, and understand the references made in the texts. The test was originally constructed with 60 items and piloted in classes with almost identical characteristics. Following the validity analysis, the instrument was reduced to 40 items. Reliability analysis using Cronbach's Alpha yielded a coefficient of 0.748, indicating acceptable internal consistency.

The activities and assessments were conducted across 12 sessions: one pretest, one posttest, and ten treatment sessions. The class that received an intervention was taught Fix-Up strategies, in which students paused and circumvented their reading to monitor comprehension and use one of the following strategies: rereading, prior knowledge activation, sentence structure analysis, visualization, or contextual analysis. The control class was taught through Project-Based Learning (PBL), with participants working in groups on the same reading topics, without teaching them any metacognitive strategies. The students' pretest and posttest were graded using the school's assessment system, in which correct answers were scored 2.5 points, with 100 the highest possible score.

Data analysis

The pretest and posttest scores were then processed quantitatively using IBM SPSS Statistics. As a first step, descriptive statistics were calculated to show the students' reading comprehension performance in the experimental and control classes, including the lowest and highest scores, the average score, and the standard deviation. Before testing the hypotheses, assumption tests were conducted. The normality of the data in each group was examined using the Shapiro–Wilk test. In contrast, the homogeneity of variances between the experimental and control groups was tested using Levene's Test at the 0.05 significance level (Creswell & Creswell, 2023).

After the prerequisite tests were satisfied, hypothesis testing was carried out. To determine whether there was a significant improvement in the experimental class after implementing Fix-Up strategies, a paired-samples t-test was used to compare the pretest and posttest scores of the experimental group. To examine whether there was a significant difference in reading comprehension achievement between the experimental and control groups after treatment, an independent-samples t-test was used to compare posttest scores (Cham et al., 2024). A p-value (two-tailed) less than 0.05 was considered to indicate a statistically significant effect of Fix-Up strategies on students' reading comprehension. In addition to the significance tests, Cohen's *d* was calculated to quantify the effect size and practical magnitude of the intervention on students' reading comprehension gains.

Findings and discussion

Positive impact of Fix-Up strategies on students' reading comprehension

This sub-section addresses the first research question (RQ1), which examines whether there is a positive effect of Fix-Up strategies on the senior secondary school EFL students' reading comprehension. The descriptive statistics of the experimental group's pretest and posttest scores are presented in Table 1.

Table 1

Descriptive Statistics of Pretest and Posttest Scores in the Experimental Group

Test type	N	Minimum	Maximum	Mean	Std. deviation
Pretest experiment	30	55.0	77.5	69.417	5.5197
Posttest experiment	30	77.5	90.0	85.083	3.3142

Table 1 demonstrates that the experimental group's mean score increased from 69.42 in the pretest to 85.08 in the posttest. The minimum score rose from 55.0 to 77.5, and the maximum score from 77.5 to 90.0. The decrease in standard deviation from 5.52 to 3.31 shows that the students' scores became more tightly grouped around the average. In other words, after Fix-Up strategies were applied, their reading performance became more consistent and less spread out. These results indicate that Fix-Up strategies not only significantly improved students' reading comprehension but also stabilized their overall achievement.

Before performing the paired-samples t-test, a Shapiro–Wilk test was used to assess normality. The obtained p-values for the pretest ($p = .127$) and posttest ($p = .061$) indicated that both sets of scores met the normality assumption ($p > .05$), thereby justifying the use of a parametric test. Levene's test revealed that the posttest scores between the two groups were not homogeneous ($p = .014$). However, this result does not affect the paired-samples t-test because the analysis compares scores within the same group rather than between different groups.

A paired-samples t-test was therefore carried out to determine whether the observed increase in reading comprehension scores was statistically significant. The results of this analysis are summarized in Table 2 and are elaborated on in the following section.

Table 2

Result of Paired Sample T-Test

Pair	T	df	Sig. (2-tailed)
Pre vs. posttest experimental	-35.015	29	0.000

The paired-samples t-test yielded a statistically significant improvement in students' reading comprehension scores, $t(29) = -35.015$, $p < .001$. The magnitude of the intervention was very substantial, with a Cohen's d of 3.43, indicating a very large practical effect of Fix-Up strategies on students' reading comprehension achievement.

The positive influence of Fix-Up strategies in this investigation is consistent with Duffy and Roehler's (1986) theory, which holds that the strategy is intended to train learners to plan, self-monitor, and self-evaluate their comprehension, thereby improving learning outcomes. When students encountered unfamiliar vocabulary or experienced comprehension breakdowns, they were taught to apply several Fix-Up techniques, including rereading the entire text, activating prior knowledge, analyzing sentence structure, visualizing textual information, and making inferences (Neufeld, 2005; Ramadhona, 2022; Said 2020). Rereading enabled students to revisit unclear sections and identify important information that might have been overlooked during the initial reading (Ulfah, 2022; Said, 2020).

Activating background knowledge helped students connect new information with their existing knowledge, thereby facilitating meaning construction. Analyzing sentence structure allowed students to understand grammatical relationships and interpret unfamiliar vocabulary through contextual clues. Visualization encouraged students to form mental images of the text, thereby enhancing comprehension and information retention (Herwanis, 2021; Safrudin, 2020). In addition, making inferences helped students draw conclusions from implicit information and integrate ideas across the text. By applying these strategies, students were able to construct clearer, more organized mental representations of the texts, thereby improving reading comprehension during assessment tasks.

The findings of this study align with previous research showing that Fix-Up strategies are an effective instructional approach for improving students' reading comprehension (Amanda et al., 2022; Lubis et al., 2023; Muhassin et al., 2021; Rusmiati et al., 2022). As in earlier studies, the use of explicit teaching, modeling, and guided practice in applying Fix-Up procedures helped students make steady progress in understanding the texts they read. The strategy enabled students with varying reading abilities to identify points of confusion, select appropriate repair actions, and monitor their understanding more effectively (Herwanis et al., 2021; Pahrizal et al., 2025). These outcomes support the view that Fix-Up strategies function as a powerful teaching method, equipping learners with metacognitive tools to manage comprehension breakdowns and become more independent readers.

Differences in reading comprehension achievement between students taught with Fix-Up strategies

This subsection focuses on the second research question, which examines whether there was a significant difference in reading comprehension outcomes between students who received instruction on Fix-Up strategies and those who did not. Descriptive statistics for both the experimental and control groups' posttest scores are presented in Table 3.

Table 3

Result of Descriptive Statistics

Test type	N	Minimum	Maximum	Mean	Std. deviation
Posttest control	30	75.0	87.5	81.167	3.8132
Posttest experiment	30	77.5	90.0	85.083	3.3142

Informed in Table 3, the posttest scores of the experimental group (N = 30, Minimum = 77.5, Maximum = 90.0, Mean = 85.083, Std. Deviation = 3.3142) were higher than those of the control group (N = 30, Minimum = 75.0, Maximum = 87.5, Mean = 81.167, Std. Deviation = 3.8132). These findings suggest that students taught using Fix-Up strategies not only obtained higher scores but also showed slightly tighter score patterns, suggesting a more even level of performance across the group.

Before running the independent-samples t-test, the necessary assumptions were examined. The Shapiro–Wilk test indicated that the posttest scores in both the experimental ($p = 0.061$) and control ($p = 0.069$) groups were normally distributed ($p > 0.05$), thereby fulfilling the normality requirement for each group. In addition, Levene's test showed that the variances were homogeneous ($p = 0.282 > 0.05$), confirming that the equality of variances assumption was fulfilled. Since both assumptions were met, the independent-samples t-test was used to compare the posttest scores between the experimental and control groups. The detailed test results are presented in Table 4 as follows.

Table 4

Result of the Independent Sample t-test

	Statistics	t	df	Sig. (2-tailed)
Posttest control and experimental	Equal variances assumed	-4.246	58	0.000
	Equal variances are not assumed	-4.246	56.896	0.000

Table 4 examines that the independent-samples t-test showed a significant difference in posttest scores between the experimental and control groups, $t(58) = -4.246$, $p < .001$. The effect size was large (Cohen's $d = 1.10$), indicating a substantial practical difference between the two groups. Students who were taught using Fix-Up strategies achieved significantly higher reading comprehension scores than those who received the teacher's usual instruction.

The independent-samples and paired-samples t-tests showed that the experimental group received higher reading comprehension scores than the control group. This suggests that Fix-Up strategies positively affected reading comprehension. The positive effect of the Fix-Up strategies may be attributed to its emphasis on comprehension monitoring and strategic reading processes (Grabe & Stoller, 2019).

Fix-Up strategies describe an instructional approach in which teachers demonstrate how students can recognize comprehension difficulties and overcome obstacles when they encounter unfamiliar words or unclear ideas in a text (Afflerbach, 2006). Through modeling, scaffolding, and repeated guided practice, students learn to return to unclear sentences, identify key ideas, draw on contextual clues to interpret unfamiliar vocabulary, and pose clarifying questions while reading (Duffy & Roehler, 1986). In classroom practice, the teacher first modeled the use of Fix-Up techniques by reading a passage aloud and demonstrating how to respond when comprehension problems occurred. For example, when students encountered unfamiliar vocabulary, they were encouraged to reread the surrounding sentences, analyze the sentence structure, connect the information to their prior knowledge,

visualize the content, or make inferences based on contextual clues. During guided practice, students applied these strategies individually or in small groups while the teacher provided prompts and feedback. Through repeated practice, students gradually became more capable of monitoring their own understanding and selecting appropriate strategies to resolve comprehension difficulties.

In contrast, PBL, implemented in the control class, emphasizes collaboration, problem-solving, and project completion rather than explicit instruction in reading strategies (Thomas, 2000). During project-based activities, students are generally encouraged to discuss ideas, gather information, and work collaboratively to complete tasks (Rupita, 2026; Rehman, 2023; Owens, 2020). Although these activities can promote critical thinking, communication, and teamwork, they may not inherently prioritize explicit metacognitive strategy instruction for reading comprehension (Dias-Olivera, 2024; Thio, 2025; Putri, 2021). When students encounter unfamiliar vocabulary, unclear sentences, or comprehension breakdowns, PBL does not necessarily provide systematic guidance on how to repair understanding. Students may rely on their peers or teacher assistance rather than independently applying comprehension-monitoring strategies. In contrast, Fix-Up strategies explicitly teach students to identify comprehension difficulties, reread problematic sections, use contextual clues, activate prior knowledge, visualize information, and make inferences to restore understanding. These findings do not suggest that PBL is ineffective. Rather, they indicate that reading comprehension instruction may require additional metacognitive scaffolding to address linguistic processing difficulties and support students in becoming independent readers.

The outcomes of this study corroborate previous studies showing that Fix-Up strategies improve students' reading comprehension (Amanda et al., 2022; Lubis et al., 2023; Rusmiati et al., 2022; Ulfah & Jannah, 2022). What distinguishes this study from previous research is its focus on tenth-grade students during the transition from junior to senior high school. At this stage, students encounter more complex texts and increased cognitive demands. Since most previous studies have concentrated on junior high school students, eleventh-grade students, or university students, the present study helps fill an important transitional gap in the Indonesian secondary curriculum. The findings demonstrate that Fix-Up strategies can effectively support students during this critical stage of academic development.

Conclusion

The findings of this study demonstrate that Fix-Up strategies significantly improved the reading comprehension of tenth-grade students in a private senior secondary school in South Sumatra. Students who received the intervention achieved markedly higher posttest scores than those in the conventional instruction group, showing noticeable progress in identifying main ideas, interpreting vocabulary in context, and drawing valid inferences. Beyond these quantitative gains, the core value of the strategy lies in enhancing students' metacognitive awareness. Rather than passively continuing through text when understanding fails, students learned to pause, identify the source of difficulty, and actively deploy repair techniques such as rereading, self-questioning, visualizing, and using contextual clues. This shift transforms reading from a mechanical decoding task into an active, self-regulated process of meaning-making.

These outcomes offer timely pedagogical insights for secondary EFL education, particularly in bridging the transitional hurdle faced by tenth-grade students in Indonesia. At this level, learners are abruptly confronted with longer expository and narrative texts with elevated lexical complexity, often without systematic strategic tools to navigate them. By embedding explicit repair strategies into regular classroom routines, teachers can demystify the reading process and reduce comprehension anxiety among developing readers. Instructional programs should therefore move away from solely testing reading outcomes and focus more on teaching students how to monitor their understanding during the reading process itself.

Nonetheless, several limitations must be acknowledged. The study was conducted within a single private school using a relatively small sample, meaning the findings cannot be broadly generalized to all Indonesian secondary contexts, where instructional resources and student proficiencies vary widely. Additionally, the assessment measured immediate post-intervention performance without tracking how well students retained and transferred these strategies to autonomous reading over an extended period. To build on these findings, future research should implement longitudinal designs with larger cohorts across both public and vocational secondary schools. It would also be valuable to examine how Fix-Up strategies can be integrated into digital reading environments and applied across content-area subjects beyond the standard English curriculum.

Declaration of the use of AI-assisted technologies

During the article-writing process, the AI is used to a limited extent to help refine the English and improve the clarity and readability of the text. The use of AI is not intended to replace the authors' academic contributions to the research and writing of the article.

Credit authorship contribution statement

Mirella Angelina: Writing – original draft, Methodology, Formal analysis, Investigation. Annisa Astrid: Supervision, Conceptualization, Methodology, Writing – review & editing. Husnaini: Writing – review & editing.

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Declaration of competing interest

There were no conflicts of interest among the authors during the research process or the writing of this article. All authors contributed according to their respective roles in the preparation of this article.

Ethics approval and consent to participate

The authors declare that the research was conducted in accordance with the code of ethics of the Institute for Research and Community Services, Universitas Islam Negeri K.H.

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