Self-Regulated Learning-Based Chinese Reading Instruction and Grade 7 Students' Reading Strategy Use: A Classroom-Based Quasi-Experimental Study

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ABSTRACT

This classroom-based quasi-experimental study examined whether self-regulated learning (SRL)-based Chinese reading instruction was associated with changes in Grade 7 students' self-reported reading strategy use. Eighty students from two intact classes in public junior secondary schools in Shanxi Province, China, participated in the study. One class received six weeks of SRL-based Chinese reading instruction organized around planning, monitoring, and reflection, while the other continued with conventional Chinese reading instruction. Students' strategy use was measured at pre-test, post-test, and delayed post-test using an adapted 23-item Metacognitive Awareness of Reading Strategies Inventory assessing global, problem-solving, and support strategies. Pre-test MANOVA showed no significant baseline difference between the groups in the overall strategy profile, Pillai's Trace = .039, $F(3, 76) = 1.038$, $p = .381$. At post-test, MANOVA indicated a significant group difference, Wilks' $\Lambda = .460$, $F(3, 76) = 29.750$, $p < .001$, partial $\eta^2 = .540$. Baseline-adjusted ANCOVA results showed that the SRL-based instruction group reported significantly higher scores across all three dimensions. Repeated-measures analyses further revealed significant Time × Group interactions across the three strategy dimensions. Bonferroni-adjusted delayed post-test comparisons confirmed that the experimental group maintained significant relative advantages, with the strongest sustained advantage in problem-solving strategies. These findings provide classroom-based quasi-experimental evidence that SRL-based instruction enhances junior secondary students' perceived strategic reading development by strengthening their awareness of text planning, cognitive monitoring, problem-directed resolution, and post-reading reflection. The results suggest that integrating metacognitive regulation activities into secondary L1 education offers a viable and practical approach to supporting students' strategic reading development within authentic classroom contexts.

Keywords: Chinese reading instruction; Grade 7 students; reading strategy use; self-regulated learning; quasi-experimental study

INTRODUCTION

Reading is central to students' academic development because it supports knowledge acquisition, language growth, and long-term learning capacity. In Chinese junior secondary education, Grade 7 is a particularly important transitional stage. Students are expected to move beyond the basic comprehension developed in primary school and engage with longer, structurally more complex, and more interpretive texts. They need to identify textual organization, infer implicit meanings, integrate information across paragraphs, and evaluate ideas with increasing independence. The Chinese Language Curriculum Standards for Compulsory Education (2022 Edition) also emphasize reading habits, expanded reading experience, appropriate reading methods, and whole-book reading for Grades 7-9 (Ministry of Education of the People's Republic of China, 2022). These

expectations indicate that junior secondary reading instruction should not be limited to helping students understand individual texts. It should also cultivate readers who can approach texts strategically, independently, and reflectively.

A key aspect of such development is reading strategy use. Effective reading requires more than word recognition, sentence-level understanding, or retrieval of explicit information. Readers also need to plan how to approach a text, monitor their comprehension, respond to difficulties, and evaluate their understanding after reading. Mokhtari and Reichard's (2002) metacognitive reading strategy framework, which distinguishes global reading strategies, problem-solving strategies, and support reading strategies, remains widely used in reading strategy research. Recent review evidence also confirms that metacognitive reading strategies continue to be central in studies of reading development, particularly in relation to planning, monitoring, and problem-solving during reading (Kan et al., 2024). Similarly, Awang et al. (2025) reported that metacognitive strategies, especially planning and monitoring, are closely related to learners' use of comprehension strategies. These studies suggest that successful reading is not a passive reception of textual information but an active process of decision-making, adjustment, and meaning construction.

For many students, reading difficulty is not caused solely by limited vocabulary or grammatical knowledge. It may also reflect weak awareness of how to regulate the reading process. In Chinese learner contexts, recent studies have linked reading development with strategy use and self-regulated learning (SRL) in both Chinese and English reading. Tse et al. (2022) found that planning and monitoring strategies were associated with Chinese and English reading performance among bilingual students in Hong Kong. Qi et al. (2025) further showed that SRL strategies were related to L1 Chinese and L2 English reading comprehension among students in mainland China. Li et al. (2024) also found that Chinese secondary EFL learners' reading motivation was closely connected with learning strategies. Taken together, these findings suggest that students' reading challenges should not be understood only as linguistic problems. They also involve students' capacity to select strategies, monitor understanding, regulate effort, and reflect on the effectiveness of their reading actions.

This issue is closely related to classroom practice. In many junior secondary reading classrooms, instruction may still place considerable emphasis on teacher explanation, vocabulary clarification, sentence analysis, text interpretation, and comprehension-question practice. These practices can support understanding of a specific text, but they may not sufficiently help students learn how to read strategically across different texts and tasks. Students may understand a passage after teacher explanation yet remain uncertain about how to regulate their own reading when teacher support is absent. Research on strategy instruction has shown that explicit metacognitive strategy instruction and self-regulated strategy instruction can improve students' strategy awareness, reading processes, reading performance, and reading-related self-efficacy (Khellab et al., 2022; Olivares et al., 2023; Wang, 2023). More recent evidence also suggests that SRL-supported environments, including technology-enhanced or gamified learning contexts, can strengthen strategy use, reading engagement, and self-regulation when learners are guided to plan, monitor, and evaluate their learning (Chen, 2022; Maimaiti & Hew, 2025; Pan et al., 2025).

Self-regulated learning offers a useful theoretical lens for addressing this instructional need. SRL emphasizes learners' active engagement in goal setting, strategy selection, self-monitoring, effort regulation, and reflective evaluation (Pintrich, 2000; Zimmerman, 2002). When applied to reading, these processes closely correspond to the actions of strategic readers. Before reading, students clarify purposes, activate prior knowledge, and decide how to approach the text. During reading, they monitor comprehension, identify difficulties, and adjust strategies when understanding breaks down. After reading, they evaluate both comprehension and strategy effectiveness. From this perspective, reading strategy use can be understood as a situated expression of SRL in reading tasks.

Despite increasing attention to SRL in reading research, existing studies remain limited in three respects. First, many interventions have examined reading achievement as the primary outcome, offering insufficient evidence on how students develop strategic reading behaviors themselves. Second, reading strategy use has often been treated as a single aggregated construct, which may mask differences across global, problem-solving, and support strategies. Third, classroom-based quasi-experimental evidence remains limited in Chinese junior

secondary reading contexts, particularly during Grade 7, when students are expected to transition toward more independent and interpretive reading. Consequently, it remains unclear whether SRL-based Chinese reading instruction can support sustained, multidimensional development in students' perceived use of reading strategies over time.

Specifically, the study addresses the following research questions:

RQ1: Were there any significant between-group differences in the overall reading strategy profile and its three dimensions at pre-test?

RQ2: Did students receiving SRL-based Chinese reading instruction differ from students receiving conventional instruction in the overall post-test reading strategy profile, and did they report significantly higher baseline-adjusted post-test scores in the three strategy dimensions?

RQ3: Were the between-group differences in self-reported reading strategy use maintained at the delayed post-test, and did the developmental patterns differ across groups over time?

This study contributes to the literature in three ways. First, it examines reading strategy use as a primary instructional outcome rather than treating it only as a predictor of reading achievement. Second, it investigates students' strategy development through a multidimensional profile consisting of global, problem-solving, and support strategies. Third, by using a pre-test, post-test, and delayed post-test design in Grade 7 Chinese reading classrooms, it provides classroom-based evidence on the immediate and sustained relative advantages associated with SRL-based reading instruction. Practically, the study may inform reading instruction that helps students move beyond dependence on teacher explanation and answer-based practice. Through SRL-based activities, students may become more aware of how to set reading goals, select appropriate strategies, monitor comprehension, respond to reading difficulties, and reflect on their reading actions.

LITERATURE REVIEW

Self-Regulated Learning and Reading Instruction

Self-regulated learning refers to learners' active regulation of cognition, motivation, behavior, and learning conditions in pursuit of academic goals. Zimmerman's cyclical model conceptualizes SRL as a process involving forethought, performance, and self-reflection (Zimmerman, 2002). During forethought, learners analyze tasks, set goals, activate prior knowledge, and select strategies. During performance, they monitor progress, regulate attention, manage effort, and adjust strategy use. During self-reflection, they evaluate outcomes and make decisions for subsequent learning. More recent reviews of SRL models similarly emphasize that SRL involves multiple interacting dimensions, including cognitive, motivational, behavioral, and contextual regulation, rather than a single isolated learning skill (Panadero, 2017).

In reading instruction, these SRL phases correspond closely to strategic reading behaviors. Before reading, students clarify purposes, predict content, activate prior knowledge, and select strategies. During reading, they monitor comprehension, identify difficulties, reread complex sections, adjust reading speed, infer meaning, and mark important information. After reading, they summarize content, evaluate understanding, and reflect on strategy effectiveness. Research on self-regulated reading suggests that effective instruction should connect task demands, strategy selection, monitoring, and reflection rather than treat strategies as isolated techniques (Souvignier & Mokhlesgerami, 2006; Olivares et al., 2023). Awang et al. (2025) similarly emphasized that comprehension involves metacognitive processes through which readers plan, monitor, and evaluate their thinking while constructing meaning from texts.

Recent studies further support the value of SRL-oriented reading instruction. Chen's (2022) meta-analysis showed that SRL interventions can improve L2 learning achievement, strategy employment, and self-efficacy. Wang (2023) found that an online collaborative flipped classroom enhanced Chinese EFL learners' reading skills

and SRL. Maimaiti and Hew (2025) reported that gamified SRL improved EFL reading comprehension, motivation, self-regulation skills, and reading process patterns. Pan et al. (2025) also showed that GenAI-supported interactive SRL assistance improved university EFL students' self-regulated reading strategy use and reading engagement. Although these studies were conducted mainly in EFL, higher education, or technology-enhanced settings, they provide supportive evidence that reading development can be strengthened when learners are guided to regulate goals, strategies, monitoring, and reflection. At the same time, their differences in learner age, language context, instructional medium, and outcome variables limit the extent to which their findings can be directly generalized to Grade 7 Chinese reading classrooms.

Evidence from Chinese-language contexts is also emerging. Tse et al. (2022) reported that planning and monitoring strategies were related to Chinese and English reading performance among Hong Kong bilingual students. Qi et al. (2025) extended this line of work to mainland China and found that SRL strategies were associated with both L1 Chinese and L2 English reading comprehension. More directly related to junior secondary Chinese reading, Lau and Qian (2025) showed that a flipped SRL intervention combining SRL instruction and e-learning activities supported students' classical Chinese reading. These studies suggest that SRL is not merely a general learning theory but a useful framework for designing Chinese reading instruction. However, more classroom-based evidence is needed to examine whether SRL-based Chinese reading instruction is associated with students' reported use of specific reading strategy dimensions.

Reading Strategy Use

Reading strategy use refers to deliberate actions readers employ to support comprehension, solve difficulties, and regulate reading. This study adopts Mokhtari and Reichard's (2002) metacognitive reading strategy framework, which includes global reading strategies, problem-solving strategies, and support reading strategies. Global strategies involve planning and managing reading, such as setting a purpose, previewing text structure, predicting content, and using textual features. Problem-solving strategies are used when comprehension becomes difficult, including rereading, slowing down, inferring meaning from context, and focusing on confusing sections. Support strategies include auxiliary actions such as note-taking, underlining, consulting reference materials, and summarizing ideas.

In the present study, Mokhtari and Reichard's (2002) metacognitive reading strategy framework was used as the theoretical basis for conceptualizing reading strategy use, and the Metacognitive Awareness of Reading Strategies Inventory (MARSI) developed by Mokhtari and Reichard (2002) provided the measurement basis for assessing students' perceived use of reading strategies. This framework is appropriate because it provides both the conceptual classification of reading strategies and an instrument for measuring learners' reported strategy use. The instrument was adapted to remove wording that was less suitable for the Chinese reading classroom and to align the items with Grade 7 Chinese reading tasks.

This framework remains relevant in recent research. Kan et al. (2024) reported that MARSI and its revised versions continue to be widely used, with particular attention to problem-solving strategies in EFL/ESL contexts. Recent empirical and review evidence also supports the instructional value of metacognitive reading strategies. Khellab et al. (2022) found that explicit metacognitive strategy instruction improved students' reading comprehension, while Awang et al. (2025) showed that learners with stronger metacognitive awareness tended to apply comprehension strategies more effectively. Dermitzaki (2025) further found that self-regulation training focused on reading comprehension improved elementary students' text comprehension, strategy use, and self-efficacy.

For Chinese Grade 7 students, the three dimensions are particularly relevant because they capture both general reading management and responses to comprehension difficulty. The Chinese Language Curriculum Standards for Compulsory Education (2022 Edition) emphasize reading methods and whole-book reading in Grades 7-9, implying that students need strategies transferable across texts and tasks (Ministry of Education of the People's Republic of China, 2022). Recent Chinese reading research points in the same direction. Lau and Qian (2025) showed that SRL-oriented instruction can support junior secondary students' classical Chinese reading. More

broadly, Frey et al. (2025) emphasized that adolescent reading instruction should provide systematic support for complex text comprehension, including word knowledge, sentence analysis, verbal reasoning, background knowledge, and reading-related self-efficacy. Thus, reading strategy use should be viewed not as a collection of classroom techniques, but as students' capacity to manage reading purposes, comprehension difficulties, and meaning construction across tasks.

Relationship Between SRL and Reading Strategy Use

SRL and reading strategy use are closely connected because strategic reading is itself a self-regulated activity. SRL provides a theoretical structure for understanding how learners plan, monitor, control, and evaluate learning; reading strategies represent how these regulatory processes are enacted during reading (Pintrich, 2000; Zimmerman, 2002). When students set goals, preview texts, activate background knowledge, and choose reading approaches, they engage in forethought regulation. When they monitor comprehension, reread, infer, adjust pace, or use contextual clues, they regulate performance. When they summarize, evaluate comprehension, and reflect on strategy effectiveness, they engage in self-reflection.

This relationship is central to SRL-based reading instruction. Such instruction does not simply provide strategies; it helps students understand when, why, and how strategies should be used in relation to specific texts and tasks. A coherent instructional sequence may include goal setting, strategy awareness, guided practice, self-monitoring, reflection, and adjustment. Through repeated practice, students can gradually internalize strategies and use them more flexibly. In this sense, reading strategy use represents not only students' knowledge of reading techniques but also their capacity to regulate the reading process according to task demands.

Empirical studies indicate that explicit metacognitive strategy instruction and self-regulated strategy instruction can improve reading processes, strategy-related outcomes, and reading performance (Khellab et al., 2022; Olivares et al., 2023; Wang, 2023). Chen's (2022) meta-analysis further supports this relationship by showing that SRL interventions can improve learners' strategy use, although many studies still focus more heavily on achievement outcomes than on strategy development itself. In Chinese learner contexts, Li et al. (2024) found significant relationships between reading motivation and learning strategies among Chinese secondary EFL learners, suggesting that strategic engagement is closely tied to how students approach reading tasks. Qi et al. (2025) further showed that SRL strategies were associated with reading comprehension in both Chinese and English. These findings support the assumption that reading strategy use should be examined as part of a broader self-regulatory process rather than as a set of disconnected reading skills.

Empirical Studies and Research Gap

Recent studies provide growing support for SRL-oriented reading instruction. Khellab et al. (2022) showed that explicit metacognitive strategy instruction improved reading comprehension, indicating that strategy use can be developed through systematic teaching. Olivares et al. (2023) found that self-regulated strategy instruction influenced reading processes, performance, and self-efficacy. Dermitzaki (2025) provided further evidence that training self-regulation skills in reading comprehension can improve strategy use and that some effects may remain observable at follow-up. Wang (2023), Maimaiti and Hew (2025), and Pan et al. (2025) also suggest that learning environments encouraging planning, monitoring, active participation, and personalized support can strengthen reading-related outcomes and SRL.

In Chinese reading, Lau and Qian (2025) demonstrated the feasibility of integrating SRL instruction into junior secondary classical Chinese reading through a two-year flipped intervention. Tse et al. (2022) and Qi et al. (2025) further indicate that SRL strategies are relevant to Chinese and English reading performance, suggesting that self-regulated reading applies to Chinese reading development as well as foreign language learning. The study by Awang et al. (2025) is also relevant because it highlights the role of metacognitive planning and monitoring in learners' comprehension strategy use, reinforcing the need to make reading processes explicit in instruction.

This study contributes to SRL and reading instruction research by examining reading strategy use as a central outcome in Grade 7 Chinese reading classrooms. It focuses on students' reported use of global, problem-solving, and support strategies and considers whether instructional differences are maintained beyond the immediate post-test. Practically, the study may inform reading instruction that helps students move beyond dependence on teacher explanation and answer-based practice by learning to set reading goals, monitor comprehension, respond to difficulties, and reflect on their reading actions.

METHOD

Research Design

This study adopted a classroom-based, non-equivalent control group quasi-experimental design to examine the association between SRL-based Chinese reading instruction and Grade 7 students' self-reported reading strategy use. Two intact classes were involved: one class received SRL-based Chinese reading instruction, whereas the other continued with conventional Chinese reading instruction. Students' perceived reading strategy use was assessed at three time points: before the intervention (pre-test), immediately after the six-week instructional period (post-test), and eight weeks after the post-test (delayed post-test).

A quasi-experimental design was considered appropriate because the intervention was embedded in regular Chinese reading lessons where individual random assignment was not feasible. Instead of creating an artificial experimental setting, this three-wave design allowed for the comparison of students' initial strategy profiles, post-intervention outcomes, and the extent to which any between-group differences were maintained over time within ordinary classroom conditions.

Participants and Educational Context

The participants were 80 Grade 7 students (approximately 12 to 13 years old) from two public junior secondary schools in Shanxi Province, China, studying the regular national Chinese language curriculum. One naturally formed class was assigned to the SRL-based instruction condition and the other to the conventional instruction condition, with 40 students in each group.

The two schools followed the same national compulsory education curriculum, utilized the same textbook, and allocated the same instructional duration for Chinese language lessons. However, because each condition was represented by one intact class from a different school and was taught by a different Chinese language teacher, potential class-, teacher-, and school-level influences (such as instructional style, classroom management, feedback practices, and school reading culture) were nested within the instructional conditions. Consequently, the findings are interpreted as classroom-based evidence of group differences associated with the instructional context, rather than as evidence from a fully randomized controlled trial.

Instructional Procedure

The study spanned 14 weeks. The pre-test was administered at the beginning of Week 1. The six-week intervention was implemented during regular Chinese reading lessons from Week 1 to Week 6 (two 45-minute lessons per week for both groups). The post-test was administered at the end of Week 6, and the delayed post-test was conducted in Week 14.

Instruction in the experimental class was structured around the SRL cycle of planning, monitoring, and reflection. Before reading, students were guided to clarify reading goals, preview textual features, activate prior knowledge, and select appropriate strategies. During reading, they monitored comprehension, identified difficulties, reread challenging sections, inferred meaning from context, adjusted reading pace, and recorded key information. After reading, they summarized textual meaning, evaluated the usefulness of the strategies applied, and considered how these strategies could be transferred to future reading tasks.

The intervention positioned reading as a regulated and reflective process rather than as a teacher-led sequence of explanation and question-answer practice. Teacher modelling made strategic thinking explicit, guided practice supported students' initial strategy use, classroom discussion enabled comparison of strategy choices, and individual reflection encouraged students to evaluate their own reading processes. Across the six weeks, teacher support was gradually faded to promote independent self-regulation.

To support implementation consistency, the experimental lessons followed standardized weekly lesson plans aligned with the planning–monitoring–reflection cycle (see Table 1). These plans specified the weekly SRL focus, reading activities, teacher support, and expected student output. Student process materials, including reading goal sheets, strategy checklists, monitoring logs, problem-solving strategy records, summary sheets, and reading reflection forms, were collected as artifact evidence of instructional enactment. While these materials served as internal documentation of procedural fidelity, it is important to note that implementation was not independently verified through external classroom observations; thus, potential variation in teacher enactment should be considered when interpreting the outcomes.

Table 1 Overview of the Six-Week SRL-Based Chinese Reading Instruction

Week	SRL Focus	Reading Activity	Teacher Support	Student Output
Week 1	Planning	Goal setting, previewing, and identifying reading purposes	Modelling of strategic reading and think-aloud demonstration	Reading goal sheet
Week 2	Planning and monitoring	Predicting content and identifying text structure	Guided questioning and strategy prompts	Strategy checklist
Week 3	Monitoring	Identifying confusion, rereading, and marking difficult parts	Scaffolded practice and corrective feedback	Monitoring log
Week 4	Monitoring and problem solving	Inferring meaning, adjusting reading pace, and using contextual clues	Teacher modelling followed by guided practice	Problem-solving strategy record
Week 5	Support strategies and reflection	Note-taking, underlining, summarizing, and consulting references	Peer discussion and teacher feedback	Summary sheet
Week 6	Integrated SRL cycle	Independent application of planning, monitoring, and reflection	Fading of teacher support and whole-class reflection	Reading reflection form

The control class followed the regular curriculum using the same reading texts, instructional duration, and lesson frequency. The instruction focused on conventional teacher-led explanation, vocabulary clarification, sentence-level analysis, text interpretation, and comprehension-question practice. The control group completed regular text-based exercises corresponding to the same curriculum units, ensuring comparable reading practice opportunities. The critical distinction was that only the experimental group engaged in explicit, systematic SRL-oriented strategy routines and post-reading reflection forms.

Instrument

Students' reading strategy use was measured using an adapted version of the Metacognitive Awareness of Reading Strategies Inventory (MARSI; Mokhtari & Reichard, 2002). The original 30-item instrument was translated into Chinese and contextually adapted to fit Grade 7 Chinese reading tasks. Items that were redundant, linguistically mismatched, or less applicable to junior secondary classroom practice were revised, simplified, or removed based on expert feedback and pilot testing.

The final adapted version retained 23 items across the original three-dimensional structure: Global Reading Strategies (10 items; e.g., setting purposes, predicting content), Problem-Solving Strategies (7 items; used when comprehension difficulties occur, such as rereading or adjusting pace), and Support Strategies (6 items; auxiliary actions such as note-taking or underlining). Responses were rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), with higher scores indicating stronger perceived strategy use. The scale measured students' self-reported strategy awareness rather than directly observed reading behavior.

Content validity was evaluated by five experts (one English language expert, three junior secondary Chinese language teachers, and one university curriculum expert) who reviewed the items for linguistic accuracy, relevance, and contextual fit. Twenty-two items obtained an item-level content validity index (I-CVI) of 1.00, and one item scored 0.80, which was subsequently revised. At the scale level, the adapted MARSI demonstrated excellent content validity, with an S-CVI/Ave of 0.99 and an S-CVI/UA of 0.96.

A pilot study with 30 students outside the formal sample was conducted to examine internal consistency. Cronbach's alpha coefficients were 0.932 for global reading strategies, 0.898 for problem-solving strategies, 0.839 for support strategies, and 0.965 for the overall 23-item scale. These coefficients indicated strong internal consistency, though the high overall reliability suggests potential item overlap to be explored in future validation work. Given the sample size constraints, confirmatory factor analysis was not performed; hence, this 23-item shortened version should be interpreted as theoretically grounded but requiring further structural validation in larger samples.

Table 2 Adaptation Procedure for the Metacognitive Awareness of Reading Strategies Inventory

Step	Procedure	Outcome
Translation and contextual revision	The original MARSI items were translated into Chinese and revised to fit Grade 7 Chinese reading tasks	Items became more appropriate for Chinese reading instruction
Expert review	One English language expert reviewed translation accuracy, three junior secondary Chinese language teachers evaluated content relevance and classroom suitability, and one university curriculum expert reviewed content validity	S-CVI/Ave = 0.99; S-CVI/UA = 0.96
Pilot testing	Internal consistency was examined with 30 students who were not included in the formal study	α = 0.839-0.965
Final scale	Items that were redundant, difficult for Grade 7 students, or less applicable to Chinese reading classroom practice were deleted or adjusted	23 items were retained: 10 GRS, 7 PSS, and 6 SS items

Data Analysis

Data analysis proceeded in four distinct stages to evaluate the intervention effects while addressing the multivariate nature of the data.

First, preliminary analyses were conducted to evaluate data assumptions for parametric and multivariate analyses. Descriptive statistics (means and standard deviations) were calculated across the three MARSI dimensions at all three time points. Normality was assessed using the Shapiro-Wilk test, and correlations among the three dimensions were inspected to check for potential multicollinearity. Box's M tests and Levene's tests were applied to evaluate the equality of covariance matrices and homogeneity of variance, respectively.

Second, baseline equivalence between the experimental and control groups was examined. A one-way multivariate analysis of variance (MANOVA) was conducted using the three pre-test MARSI dimensions as dependent variables and group as the independent variable. This tested whether the two classes differed

significantly in their baseline reading strategy profiles prior to the intervention. Follow-up one-way ANOVA tests were planned at the dimension level to pinpoint any specific pre-existing differences.

Third, post-test instructional differences were analyzed to capture immediate intervention effects. A one-way MANOVA was performed to examine overall group differences in the post-test reading strategy profile. To ensure a robust, baseline-adjusted interpretation at the specific dimension level, separate analyses of covariance (ANCOVA) were subsequently conducted for global, problem-solving, and support strategies, with the corresponding pre-test score entered as the covariate. Prior to interpreting the adjusted group effects, the homogeneity of regression slopes assumption was verified by testing the significance of the Group × Pre-test interaction for each model.

Fourth, sustained between-group differences were examined through longitudinal analysis. Mixed-design repeated-measures analyses were conducted separately for each of the three MARSI dimensions. In these models, Group (SRL-based vs. conventional instruction) served as the between-subjects factor, and Time (pre-test, post-test, and delayed post-test) served as the within-subjects factor. The Time × Group interaction effect was used to evaluate whether the developmental trajectories of self-reported reading strategy use differed between the two instructional conditions over time. When a significant interaction was detected, Bonferroni-adjusted pairwise comparisons were utilized to determine specific group differences at the post-test and delayed post-test intervals.

For all statistical procedures, the reading strategy profile was operationalized as the multivariate combination of the three MARSI dimensions rather than a single aggregated total score; thus, all dimension-level findings are interpreted in tandem with the multivariate results.

FINDINGS

Preliminary and Descriptive Analyses

Preliminary analyses were conducted before the main inferential tests. The normality of the reading strategy scores was examined using the Shapiro-Wilk test. Across the three MARSI dimensions, two groups, and three measurement points, the Shapiro-Wilk statistics ranged from $W = .949$ to $W = .986$, with p values ranging from .072 to .898. Since all p values were greater than .05, the distributions did not significantly deviate from normality. Correlations among the three MARSI dimensions were moderate at both the post-test and delayed post-test, with no coefficient exceeding .90, indicating no evidence of severe multicollinearity. Box's M tests were non-significant at the post-test, $p = .665$, and delayed post-test, $p = .365$. Levene's tests were also non-significant for all three dimensions at both time points. These results suggested that the assumptions required for MANOVA, ANCOVA, and repeated-measures analyses were adequately met. Table 3 presents the descriptive statistics for global reading strategies, problem-solving strategies, and support strategies across the three measurement points.

Table 3 Descriptive Statistics for Reading Strategy Scores by Group and Time

Dimension	Group	Pre-test *M* (*SD*)	Post-test *M* (*SD*)	Delayed post-test *M* (*SD*)
Global reading strategies	Control	29.70 (5.02)	32.83 (4.39)	35.07 (4.76)
	Experimental	30.78 (4.80)	39.65 (3.12)	37.53 (4.76)
Problem-solving strategies	Control	21.53 (3.88)	23.80 (3.32)	26.52 (3.74)
	Experimental	20.90 (3.29)	29.38 (3.79)	30.15 (2.97)
Support strategies	Control	17.55 (3.27)	20.33 (3.80)	21.32 (4.00)
	Experimental	17.05 (2.72)	24.25 (3.54)	23.80 (3.46)

Note. GRS = global reading strategies; PSS = problem-solving strategies; SS = support strategies; M = mean; SD = standard deviation. Scores are summed subscale scores rather than item mean scores.

The descriptive results show that the two groups began with comparable mean scores across the three strategy dimensions. At the post-test, the experimental group showed larger increases than the control group in all three dimensions. At the delayed post-test, the experimental group continued to report higher mean scores than the control group, although the group difference in global reading strategies became smaller than at the immediate post-test. The control group also showed gradual increases over time, suggesting that regular reading instruction, continued curriculum exposure, maturation, or repeated familiarity with the questionnaire may also have supported some development in students' reported strategy use.

Pre-test Equivalence of the Reading Strategy Profile

RQ1 asked whether there were any significant between-group differences in the overall reading strategy profile and its three dimensions at pre-test. A one-way MANOVA was conducted using the three pre-test MARSI dimensions as dependent variables and group as the independent variable. The multivariate group effect was not significant, Pillai's Trace = .039, $F(3, 76) = 1.038$, $p = .381$, partial $\eta^2 = .039$. Follow-up univariate ANOVA tests also showed no significant group differences for global reading strategies, $F(1, 78) = 0.958$, $p = .331$, partial $\eta^2 = .012$; problem-solving strategies, $F(1, 78) = 0.605$, $p = .439$, partial $\eta^2 = .008$; or support strategies, $F(1, 78) = 0.554$, $p = .459$, partial $\eta^2 = .007$.

Table 4 Pre-test Group Differences in the Overall Reading Strategy Profile and Three Dimensions

Analysis	Outcome	Statistic	*p*	Partial η^2
MANOVA	Overall reading strategy profile	Pillai's Trace = .039, $F(3, 76) = 1.038$	.381	.039
ANOVA	Global reading strategies	$F(1, 78) = 0.958$	.331	.012
ANOVA	Problem-solving strategies	$F(1, 78) = 0.605$	.439	.008
ANOVA	Support strategies	$F(1, 78) = 0.554$	.459	.007

These results indicate that the experimental and control groups were statistically comparable in their overall reading strategy profile and in each of the three dimensions before the intervention.

Post-test Instructional Differences

RQ2 examined whether students receiving SRL-based Chinese reading instruction differed from students receiving conventional instruction in the overall post-test reading strategy profile and in baseline-adjusted post-test scores across the three strategy dimensions. A one-way MANOVA was first conducted using the three post-test MARSI dimensions as the combined dependent-variable profile. The multivariate effect of group was statistically significant, Wilks' $\Lambda = .460$, $F(3, 76) = 29.750$, $p < .001$, partial $\eta^2 = .540$. This result indicates that the two groups differed significantly in their overall post-test reading strategy profile.

To obtain baseline-adjusted comparisons at the dimension level, separate ANCOVA analyses were conducted for global reading strategies, problem-solving strategies, and support strategies. The homogeneity of regression slopes assumption was met, as the Group × Pre-test interaction was not significant for global reading strategies, $p = .959$; problem-solving strategies, $p = .372$; or support strategies, $p = .342$.

Table 5 Post-test Group Differences in the Overall Reading Strategy Profile and Adjusted Dimension Scores

Outcome	Analysis	Group Effect	*p*	Partial η^2	Adjusted M: Control	Adjusted M: Experimental
Overall post-test profile	MANOVA	Wilks' $\Lambda = .460$, $F(3, 76) = 29.750$	< .001	.540	—	—

Global reading strategies	ANCOVA	$F(1, 77) = 68.045$	< .001	.469	32.20, *SE* = 0.650, 95% CI [30.906, 33.494]	39.73, *SE* = 0.650, 95% CI [38.436, 41.025]
Problem-solving strategies	ANCOVA	$F(1, 77) = 47.301$	< .001	.381	23.81, *SE* = 0.566, 95% CI [22.683, 24.938]	29.30, *SE* = 0.567, 95% CI [28.172, 30.429]
Support strategies	ANCOVA	$F(1, 77) = 25.396$	< .001	.248	20.33, *SE* = 0.543, 95% CI [19.245, 21.408]	24.19, *SE* = 0.544, 95% CI [23.102, 25.268]

Note. Values reported as .000 in SPSS are presented as $p < .001$. The overall post-test profile result is based on MANOVA. Dimension-level results are based on ANCOVA controlling for the corresponding pre-test scores. Adjusted means are reported with standard errors and 95% confidence intervals.

After controlling for the corresponding pre-test scores, the experimental group reported significantly higher scores than the control group on all three post-test strategy dimensions. The largest adjusted effect was observed for global reading strategies, followed by problem-solving strategies and support strategies. These findings indicate that students in the SRL-based Chinese reading instruction condition reported significantly higher post-test reading strategy outcomes than students in the conventional instruction condition.

Sustained Between-Group Differences Across Time

RQ3 asked whether the between-group differences associated with SRL-based Chinese reading instruction were maintained at the delayed post-test and whether the developmental patterns differed across groups over time. Mixed-design repeated-measures analyses were conducted separately for global reading strategies, problem-solving strategies, and support strategies, with Time as the within-subjects factor and Group as the between-subjects factor. Mauchly's tests were non-significant for global reading strategies, $p = .586$; problem-solving strategies, $p = .623$; and support strategies, $p = .910$, indicating that the sphericity assumption was satisfied.

As an omnibus test, the multivariate repeated-measures analysis indicated significant overall change across time and a significant Time × Group interaction. The multivariate repeated-measures results showed a significant main effect of Time, Wilks' $\Lambda = .297$, $F(2, 77) = 91.058$, $p < .001$, partial $\eta^2 = .703$, indicating substantial overall change in reading strategy use across the three measurement occasions. The multivariate Time × Group interaction was also significant, Wilks' $\Lambda = .707$, $F(2, 77) = 15.936$, $p < .001$, partial $\eta^2 = .293$, indicating that the overall developmental pattern differed between the two groups. Dimension-specific repeated-measures analyses were then interpreted as the primary evidence for changes in each strategy dimension. The dimension-level repeated-measures effects are presented in Table 6.

Table 6 Repeated-Measures Effects for Reading Strategy Dimensions

Outcome	Time Main Effect	Group Main Effect	Time × Group Effect
Global reading strategies	$F(2, 156) = 39.279$, $p < .001$, $\eta p^2 = .335$	$F(1, 78) = 41.540$, $p < .001$, $\eta p^2 = .347$	$F(2, 156) = 9.283$, $p < .001$, $\eta p^2 = .106$
Problem-solving strategies	$F(2, 156) = 82.555$, $p < .001$, $\eta p^2 = .514$	$F(1, 78) = 47.658$, $p < .001$, $\eta p^2 = .379$	$F(2, 156) = 15.046$, $p < .001$, $\eta p^2 = .162$
Support strategies	$F(2, 156) = 59.278$, $p < .001$, $\eta p^2 = .432$	$F(1, 78) = 21.146$, $p < .001$, $\eta p^2 = .213$	$F(2, 156) = 8.595$, $p < .001$, $\eta p^2 = .099$

Note. Dimension-level effects are based on mixed-design repeated-measures analyses. Values reported as .000 in SPSS are presented as $p < .001$.

As shown in Table 6, the main effects of Time were significant for global reading strategies, $F(2, 156) = 39.279$, $p < .001$, partial $\eta^2 = .335$; problem-solving strategies, $F(2, 156) = 82.555$, $p < .001$, partial $\eta^2 = .514$; and support

strategies, $F(2, 156) = 59.278$, $p < .001$, partial $\eta^2 = .432$. These results indicate that students' reported strategy use changed significantly over time across all three dimensions. The between-subjects effects of Group were also significant for global reading strategies, $F(1, 78) = 41.540$, $p < .001$, partial $\eta^2 = .347$; problem-solving strategies, $F(1, 78) = 47.658$, $p < .001$, partial $\eta^2 = .379$; and support strategies, $F(1, 78) = 21.146$, $p < .001$, partial $\eta^2 = .213$, suggesting overall between-group differences across the three measurement occasions.

Most importantly, the Time × Group interactions were significant for all three dimensions: global reading strategies, $F(2, 156) = 9.283$, $p < .001$, partial $\eta^2 = .106$; problem-solving strategies, $F(2, 156) = 15.046$, $p < .001$, partial $\eta^2 = .162$; and support strategies, $F(2, 156) = 8.595$, $p < .001$, partial $\eta^2 = .099$. These findings indicate that the two groups followed different developmental patterns over time across all three reading strategy dimensions. To further examine whether the between-group differences were sustained at the delayed post-test, Bonferroni-adjusted group comparisons were conducted. The delayed post-test comparisons are presented in Table 7.

Table 7 Bonferroni-Adjusted Delayed Post-test Group Comparisons

Outcome	Delayed Difference: EG − CG	*SE*	95% CI	*p*
Global reading strategies	2.45	1.077	[0.316, 4.584]	.025
Problem-solving strategies	3.63	0.694	[2.250, 5.000]	< .001
Support strategies	2.48	0.769	[0.952, 3.998]	.002

Note. Delayed differences are Bonferroni-adjusted comparisons between the experimental group and the control group. EG = experimental group; CG = control group; *SE* = standard error; *CI* = confidence interval. Delayed differences are reported as EG − CG. Values reported as .000 in SPSS are presented as $p < .001$.

Bonferroni-adjusted pairwise comparisons showed that the two groups did not differ significantly on any dimension at pre-test. At post-test, the experimental group reported significantly higher scores than the control group across all three dimensions. These advantages remained significant at the delayed post-test: global reading strategies, mean difference = 2.45, *SE* = 1.077, $p = .025$, 95% *CI* [0.316, 4.584]; problem-solving strategies, mean difference = 3.63, *SE* = 0.694, $p < .001$, 95% *CI* [2.250, 5.000]; and support strategies, mean difference = 2.48, *SE* = 0.769, $p = .002$, 95% *CI* [0.952, 3.998].

These findings indicate that the experimental group maintained significant between-group advantages at the delayed post-test. The strongest retained advantage was observed for problem-solving strategies, suggesting that students in the experimental group continued to report stronger use of strategies for managing comprehension difficulties after the intervention. The effects on global reading strategies and support strategies were also maintained in terms of significant delayed post-test group differences, although the delayed group difference in global reading strategies was smaller than the immediate post-test difference. Therefore, the delayed post-test results should be interpreted as evidence of sustained between-group advantages rather than full maintenance of all immediate post-test gains.

SUMMARY OF FINDINGS

The empirical findings provided supportive evidence for the planned analytical framework and shed light on the three primary research questions. Regarding baseline equivalence, the two groups exhibited no statistically significant differences in either their overall multivariate reading strategy profile or any of the three individual dimensions at the pre-test. In terms of immediate intervention effects, students in the SRL-based instruction condition demonstrated significantly higher post-test reading strategy outcomes than those in the conventional instruction condition, a pattern that remained robust after adjusting for pre-test scores across all three strategy dimensions. Finally, with respect to longitudinal trajectories, significant Time × Group interactions emerged for all three dimensions. Pairwise comparisons confirmed that the experimental group sustained a significant advantage in global, problem-solving, and support strategies at the delayed post-test.

Taken together, these results demonstrate that the SRL-based Chinese reading instruction yielded both substantial short-term gains from the pre-test to the post-test and sustained relative advantages at the delayed post-test in students' self-reported reading strategy use compared to conventional instruction.

DISCUSSION

The current study provides critical insights into the integration of self-regulated learning (SRL) principles within secondary-level L1 reading contexts. The finding that the SRL-based intervention yielded higher self-reported reading strategy use across all three dimensions underscores the potential of converting implicit cognitive processing into explicit, classroom-based regulation routines.

The granular analysis of the three MARSI dimensions reveals distinct developmental trajectories. The immediate post-test advantage was most pronounced in global reading strategies. This rapid growth suggests that structured macro-level behaviors, such as setting reading purposes, previewing textual landmarks, and identifying text structures, are highly receptive to explicit teacher modeling and structured planning scaffolds like reading goal sheets.

In contrast, problem-solving strategies demonstrated the most robust sustained advantage at the delayed post-test. Cognitive and metacognitive actions such as rereading, inferring meaning from context, and dynamically adjusting reading pace are inherently problem-driven. Because secondary students inevitably encounter comprehension challenges during regular text engagement, these strategy routines were likely reactivated repeatedly post-intervention, thereby embedding themselves more deeply into students' autonomous reading repertoires. Conversely, the relatively smaller growth observed in support strategies implies that auxiliary actions like note-taking and underlining may require more prolonged instructional cycles or direct alignment with high-stakes analytical reading tasks to show comparable gains.

Notably, the control group also exhibited gradual strategy increases over time. This longitudinal trend highlights the confounding roles of natural cognitive maturation, standard curriculum exposure, and questionnaire familiarity. Therefore, the empirical value of this intervention lies not in the exclusive orchestration of strategy growth, but in generating significantly accelerated and sustained relative advantages for students in the SRL-based condition.

These pronounced differences can be attributed to the synergistic alignment of the planning, monitoring, and reflection cycle. Rather than operating as isolated strategy instruction, the intervention positioned reading as a continuously regulated process, wherein teacher-led modeling gradually faded into independent student reflection.

LIMITATIONS AND FUTURE RESEARCH

Despite these encouraging findings, several limitations bound the generalizability of the study and suggest directions for future inquiry:

1. Clustering and Confounding Effects: The study involved two intact classes from two different schools, each taught by a different teacher. Consequently, potential school-level reading cultures and teacher-level factors, such as instructional style and feedback practices, were methodologically nested within the instructional conditions. Future research should implement multi-classroom, multi-teacher designs and utilize multilevel modeling or cluster-robust inference to statistically account for the nested data structure.

2. Procedural Fidelity Quality Control: Implementation fidelity was primarily monitored through internal documentation and student process artifacts rather than being independently validated via external classroom observations or video coding. Future replication studies should incorporate standardized observation checklists and inter-rater reliability assessments to empirically verify the consistency of teacher enactment.

3. Reliance on Self-Report Measures: Strategy use was captured exclusively through students' perceived strategy awareness via the adapted MARSI, which may reflect social desirability or an increased familiarity with SRL terminology rather than actual cognitive behavior. Future designs should triangulate self-reports with online process data, such as think-aloud protocols, log files, and eye-tracking measures, alongside standardized reading comprehension achievements.

4. Intervention Duration and Generalizability: The six-week intervention and eight-week delayed follow-up cannot guarantee long-term habituation or cross-domain transfer. Longitudinal tracking across varied text genres, including informational versus literary texts, is necessary to evaluate the durable stability of these newly acquired regulatory habits.

5. Psychometric Validation of the Adapted Instrument: While the 23-item adapted MARSI demonstrated strong content validity and internal consistency, its modified factor structure was not subjected to confirmatory factor analysis due to sample size constraints. Large-scale validation studies are required to confirm its construct validity and measurement invariance within Chinese educational contexts, while exploring whether strategy use mediates the link between SRL instruction and actual reading achievement.

CONCLUSION

This study demonstrates that transforming junior secondary Chinese reading instruction from conventional teacher-led text explanation into an explicit SRL routine organized around planning, monitoring, and reflection can significantly optimize students' perceived reading strategy awareness. The relative advantages achieved at the post-test and maintained at the delayed post-test, particularly regarding problem-solving mechanisms, suggest that strategic reading awareness is highly malleable within authentic classroom ecologies.

Ultimately, moving beyond passive text interpretation toward structured cognitive and metacognitive regulation empowers junior secondary students to navigate textual challenges with greater autonomy and reflective awareness.

ETHICAL APPROVAL

This study received ethical approval from the Human Research Ethics Committee of Universiti Sains Malaysia (Jawatankuasa Etika Penyelidikan Manusia Universiti Sains Malaysia, JEPeM-USM). The approved study protocol code was USM/JEPeM/PP/25080693.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this study.

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