



Improving reading comprehension in eighth grade students using active learning strategies



Punsaporn Phuphanbai¹, Autthapon Intasena^{1,*}, Thussaneewan Srimunta², Nattapon Yotha³

¹Department of Curriculum and Instruction, Faculty of Education, Mahasarakham University, Mahasarakham, Thailand

²Department of Arts Program in Chinese, Faculty of Humanities and Social Sciences, Mahasarakham Rajabhat University, Mahasarakham, Thailand

³Department of Educational Measurement, Evaluation and Research, Faculty of Education, Phetchabun Rajabhat University, Phetchabun, Thailand

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ABSTRACT

The purposes of this study were to investigate the effectiveness of a learning management plan integrating active learning strategies on Thai Grade 8 students' reading comprehension and to confirm the construct validity of reading comprehension using Confirmatory Factor Analysis (CFA). The research instruments included a learning management plan incorporating various active learning activities and a reading comprehension test administered as both a pre-test and post-test. Data were analyzed using descriptive statistics, the E1/E2 formula, the Effectiveness Index (E.I.), and a paired-sample t-test to evaluate improvements in students' performance. CFA was conducted to confirm the structure of reading comprehension as a multidimensional construct consisting of four components: identifying main ideas, analyzing and summarizing, interpreting and connecting information, and evaluating and critiquing information. This study was designed as a preliminary investigation using a one-group pre-test-post-test design. The results showed a statistically significant improvement in reading comprehension scores after the intervention, with an E.I. of 0.923, an E1/E2 score exceeding the 80/80 criterion, and a strong model fit confirmed through CFA.

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1. Introduction

Reading comprehension is a fundamental component of language learning, particularly in English as a Foreign Language (EFL) contexts, where learners must process texts that differ linguistically and culturally from their first language. As learners progress through secondary education, they are expected to move beyond basic decoding toward higher-level comprehension skills, including identifying key ideas, interpreting implicit meanings, and critically evaluating information. These skills require not only linguistic knowledge but also cognitive engagement and strategic reading abilities.

In the Thai educational context, reading comprehension remains a persistent challenge for many students. Previous studies have indicated that

learners often struggle with limited vocabulary knowledge, insufficient background knowledge, and underdeveloped reading strategies, which collectively hinder their ability to understand and analyze texts effectively (Vettori et al., 2024; Intasena and Nuangchalerm, 2022). These difficulties are particularly evident when students are required to process different types of texts, such as articles, advertisements, and persuasive writing, each of which demands distinct comprehension skills. As a result, there is a need for instructional approaches that actively engage learners and support the development of multiple dimensions of reading comprehension.

Active learning has been widely recognized as an effective approach to promoting student engagement and improving learning outcomes. Rather than relying on passive reception of information, active learning emphasizes student participation, interaction, and the application of knowledge through meaningful tasks (Prince, 2004). In language classrooms, active learning strategies such as collaborative learning, vocabulary-focused activities, and structured reading techniques have been shown

* Corresponding Author.

Email Address: autthapon.i@msu.ac.th (A. Intasena)

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Corresponding author's ORCID profile:

<https://orcid.org/0000-0003-3628-5805>

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to enhance comprehension by encouraging learners to process information more deeply and to construct meaning through interaction (Li et al., 2022; Maharsi et al., 2021; Mulatu and Regassa, 2022). These approaches also support the development of metacognitive awareness, enabling learners to monitor and regulate their own reading processes.

A growing body of research has consistently demonstrated the effectiveness of active learning strategies in enhancing students' reading comprehension. For example, Al-Magableh et al. (2022) found that the use of multiple active learning strategies, including SQ3R and collaborative techniques, led to significantly higher reading comprehension performance among secondary school students compared to traditional instruction. Similarly, Wael et al. (2023) reported substantial improvements in students' reading comprehension scores through the use of an active knowledge-sharing approach, with learners showing increased participation and engagement during the learning process. In addition, Syahfutra and Niah (2019) highlighted the role of problem-based learning in promoting critical thinking and improving comprehension by situating learning in meaningful, real-world contexts. These findings are further supported by Arsairach et al. (2021), who observed significant gains in reading ability alongside high levels of student satisfaction when active learning strategies were implemented. More recently, Reyes Pihuave et al. (2025) confirmed that active learning approaches not only improve literal comprehension but also enhance deeper levels of understanding, indicating their effectiveness in developing higher-order reading skills. Taken together, these studies suggest that active learning has consistently produced positive outcomes in reading comprehension and provides a strong foundation for its continued application in language classrooms.

Despite the growing body of research supporting active learning, many studies have focused on isolated instructional techniques or specific text types. In contrast, classroom practice often involves the integration of multiple strategies across a range of text formats. Therefore, there is a need to examine how a combination of active learning approaches can be implemented in a coherent instructional plan to support students' overall reading comprehension. In addition, while reading comprehension is widely acknowledged as a multidimensional construct, empirical validation of its underlying components is still limited in many EFL studies.

To address these gaps, this study focuses on the development and implementation of a learning management plan that integrates various active learning strategies to enhance Grade 8 students' reading comprehension. The study also seeks to examine reading comprehension as a multidimensional construct by validating its components through Confirmatory Factor Analysis (CFA). As a preliminary investigation using a one-group pre-test-post-test design, the study aims to provide initial evidence on the potential

effectiveness of active learning in improving reading comprehension in the Thai EFL context.

2. Methodology

This study employed a one-group pre-test-post-test experimental design to examine the effects of an active learning-based instructional plan on students' reading comprehension. A tailored learning management plan incorporating various active learning strategies was implemented in a Grade 8 reading class. Participants completed a pre-test prior to the intervention and a post-test afterward to assess any improvement in their reading comprehension. Additionally, lesson-based formative assessments were conducted throughout the instructional period. These data were analyzed to evaluate the effectiveness of the intervention in enhancing students' reading skills. This design is commonly used in preliminary or exploratory studies; however, it does not include a control group. Therefore, the findings cannot be interpreted as establishing causal relationships, but rather as indicating potential effects of the intervention.

The participants comprised 42 Grade 8 EFL students from a public secondary school in Thailand. Cluster random sampling was employed to select one class from fifteen available groups. None of the students had previous experience studying abroad or within an international curriculum, ensuring comparable educational backgrounds. Ethical approval was obtained from the relevant institutional authority prior to data collection. As the participants were minors, informed consent was obtained from their parents or legal guardians, and assent was obtained from the students before participation. All research procedures adhered to ethical standards for studies involving human participants, including voluntary participation, anonymity, confidentiality, and the protection of participant well-being.

The learning management plan was developed to support Thai Grade 8 students in improving their reading comprehension skills through active learning. The design process began with an analysis of the Thai Basic Education Core Curriculum B.E. 2551 (A.D. 2008) and the identification of relevant learning standards and indicators. The plan comprised five structured lesson plans, each lasting approximately one hour:

- Understanding reading comprehension
- Reading comprehension of articles
- Reading comprehension of event logs
- Reading comprehension of advertisements
- Reading comprehension of persuasive writing

Each lesson integrated specific active learning techniques aimed at developing key sub-skills in reading as follows:

- Collaborative learning: think-pair-share, peer reading

- Vocabulary development: word mapping, contextual analysis
- Strategic reading practice: SQ4R, graphic organizers
- World knowledge expansion: project-based learning (PBL), flipped classroom activities

Each active learning strategy was implemented in a structured manner during the lessons. For example, think-pair-share was used to encourage students to discuss main ideas before sharing with the class. Word mapping and contextual analysis were applied during pre-reading stages to support vocabulary development. The SQ4R strategy was used to guide students through systematic reading processes, while project-based learning activities allowed students to engage with real-world texts such as advertisements and event logs. These strategies were integrated to promote active engagement and deeper comprehension.

The learning management plan was evaluated by three education experts for content relevance, instructional alignment, and pedagogical appropriateness. The evaluation yielded a mean appropriateness score of 4.60 out of 5.00, indicating a very high level of suitability.

The reading comprehension test was designed by the researchers specifically for this study to assess students' ability to understand and analyze texts across four domains:

- Identifying main ideas and supporting details
- Analyzing and summarizing information
- Interpreting and connecting textual meaning
- Evaluating and critiquing content

The test development process involved constructing an initial pool of 45 multiple-choice items based on the curriculum and test blueprint. After expert review and pilot testing with a similar group of students, 30 items were selected based on statistical criteria:

- Item difficulty (p) ranged from 0.30 to 0.82
- Item discrimination (d) ranged from 0.25 to 0.60
- Internal consistency reliability was confirmed (Cronbach's $\alpha = 0.85$)

This ensured that the test was both psychometrically sound and aligned with the targeted reading comprehension outcomes. The instructional activities were aligned with the four components of reading comprehension assessed in the study. Specifically, identifying main ideas was developed through article reading tasks, analyzing and summarizing was emphasized through structured reading exercises, interpreting and connecting information was practiced through inference-based questions, and evaluating and critiquing information was addressed through persuasive text analysis. This alignment ensured consistency between instructional objectives and assessment components.

Data were collected during the 2023 academic year using pre-test and post-test measures, along with lesson-based formative assessments. Descriptive statistics, including mean, standard deviation, and percentage, were used to summarize students' performance. Instructional effectiveness was evaluated using the E1/E2 efficiency index, where E1 represents the average score from formative assessments, and E2 represents the post-test score, compared against the 80/80 criterion. The Effectiveness Index (E.I.) was also calculated to determine the learning gain between pre-test and post-test.

A paired-sample t-test was conducted to examine whether the difference between pre-test and post-test scores was statistically significant.

Confirmatory Factor Analysis (CFA) was performed to validate the construct of the reading comprehension test across four components. The CFA was used for measurement validation rather than to assess the effectiveness of the intervention.

As this study employed a one-group pre-test-post-test design, the results should be interpreted with caution, and causal conclusions cannot be established.

3. Results

Table 1 shows that the study's findings indicated that an average score of 89.72 out of 100 points was achieved by students during the learning management activities, reflecting 89.72% proficiency. Furthermore, the average post-test score was 25.92 out of 30, which corresponds to 80.64% of the total possible score. The effectiveness of the active learning management plan in enhancing participants' reading comprehension was calculated as $89.72/80.64$ ($E1/E2 = 89.72/80.64$), exceeding the set criterion of 80/80. These results suggest that the active learning management approach significantly enhances reading comprehension, both during the instructional activities and after their completion.

According to Table 2, findings indicate that the aggregated scores from the initial assessment totaled 474, while the collective scores from the follow-up evaluation amounted to 926. When compared to the test's maximum achievable score of 1260, the Effectiveness Index (E.I.) for the active learning management plan was calculated to be 0.923. This result reflects a substantial improvement, with students showing an increase of 92.3% in their reading comprehension.

Table 1: Effectiveness of active learning management plan on participants' reading comprehension

Effectiveness	Maximum point	$\bar{x}$	%
The effectiveness of the process (E1)	100	89.72	89.72
The effectiveness of the product (E2)	30	25.92	80.64
The effectiveness of the active learning management $E1/E2 = 89.72/80.64$			

Table 2: The effectiveness index of active learning management

n	Sum		Effectiveness index
	Pre-test	Post-test	
42	474	926	0.923

Moreover, when comparing the students' performance in the initial and final assessments, significant improvements in reading comprehension were observed (Table 3). The results demonstrated a clear difference between the participants' pre-test

scores ($\bar{x} = 11.85$, $SD = 2.16$) and post-test scores ($\bar{x} = 25.92$, $SD = 2.93$), $t = 32.00$, $p < .001$. The substantial increase in post-test scores indicates that the active learning management plan had a positive impact on enhancing the participants' reading comprehension. Table 4 indicates that second-order confirmatory factor analysis of the reading comprehension ability model revealed the structural relationship between the four main components and their respective behavioral indicators.

Table 3: The comparison between participants' pre- and post-tests

Score	n	Mean	SD	t	Sig.
Pre-test	42	11.85	2.16	-	-
Post-test	42	25.92	2.93	32.00	$p < .001$

Table 4: Confirmatory factor analysis on the results

Behavioral indicators	Factor loading		SE	Z	p-value	R-squared	Factor score coefficient
	b	β					
First-order confirmatory factor analysis							
Identifying main ideas (MI)							
1. Identifying key sentences	1.00	0.79	0.01	58.51	0.000	0.63	0.13
2. Analyzing the topic/title	1.31	0.91	0.01	111.63	0.000	0.83	0.31
3. Distinguishing between main ideas and supporting details	1.24	0.79	0.01	59.82	0.000	0.63	0.11
Analyzing and summarizing (MS)							
1. Identifying the structure of the text	1.00	0.74	0.02	50.04	0.000	0.55	0.03
2. Finding supporting information	1.17	0.77	0.01	54.48	0.000	0.60	0.04
3. Summarizing essential content	1.65	0.78	0.01	56.32	0.000	0.61	0.18
Interpreting and connecting information (IC)							
1. Interpreting implicit information	1.00	0.87	0.01	77.44	0.000	0.75	0.24
2. Reading between the lines	0.99	0.83	0.01	71.84	0.000	0.69	0.12
3. Connecting with prior experience	1.07	0.93	0.01	114.33	0.000	0.86	0.36
Evaluating and critiquing information (EC)							
1. Analyzing the accuracy of information	1.00	0.91	0.01	83.45	0.000	0.83	0.28
2. Evaluating the credibility of information sources	0.96	0.89	0.01	76.80	0.000	0.80	0.20
3. Expressing opinions and providing critique	0.70	0.72	0.02	43.22	0.000	0.52	0.02
Second-order confirmatory factor analysis							
MI	1.00	0.92	0.01	113.24	0.000	0.85	-
MS	1.05	0.91	0.01	109.23	0.000	0.83	-
IC	1.25	0.94	0.01	116.88	0.000	0.89	-
EC	1.39	0.95	0.01	85.20	0.000	0.91	-

χ^2 : 36.05; df: 29; χ^2/df : 1.24; p: 0.172; CFI: 1.00; TLI: 1.00; RMSEA: 0.02; SRMR: 0.01

The first-order analysis examined how the four components were related to 12 behavioral indicators. All behavioral indicators had positive standardized factor loadings ranging from 0.91 to 0.95. Among them, the most significant indicator was evaluating and critiquing information, followed by interpreting and connecting information, identifying main ideas, and analyzing and summarizing, respectively. The details of each component are as follows.

Identifying Main Ideas (MI): The standardized factor loadings of its indicators were 0.79, 0.91, and 0.79, with the explained variance ranging from 63% to 83%. The most significant behavioral indicator was analyzing the topic, followed by distinguishing between main and supporting ideas, and identifying key sentences, respectively.

Analyzing and Summarizing (MS): The standardized factor loadings were 0.74, 0.77, and 0.78, with explained variance between 55% and 61%. The most significant indicator was summarizing essential content, followed by finding supporting information, and identifying the structure of the text, respectively.

Interpreting and Connecting Information (IC): This component had standardized factor loadings of

0.87, 0.83, and 0.93, with the variance explained ranging from 75% to 86%. The highest loading indicator was connecting with prior experience, followed by interpreting implicit information, and reading between the lines.

Evaluating and Critiquing Information (EC): The indicators had standardized loadings of 0.91, 0.89, and 0.72, with explained variance between 52% and 83%. The most significant indicator was analyzing the accuracy of information, followed by evaluating the credibility of information sources, and expressing opinions and critiques, respectively.

In the second-order CFA, which analyzed the relationship between the overall construct of Reading Comprehension (RC) and the four components (MI, MS, IC, EC), all standardized factor loadings were positive and ranged from 0.91 to 0.95. The shared variance between RC and its components was between 83% and 91%.

The most significant component was evaluating and critiquing information (EC), followed by interpreting and connecting information (IC), identifying main ideas (MI), and analyzing and summarizing (MS), respectively. The CFA forms a model shown in Fig. 1.

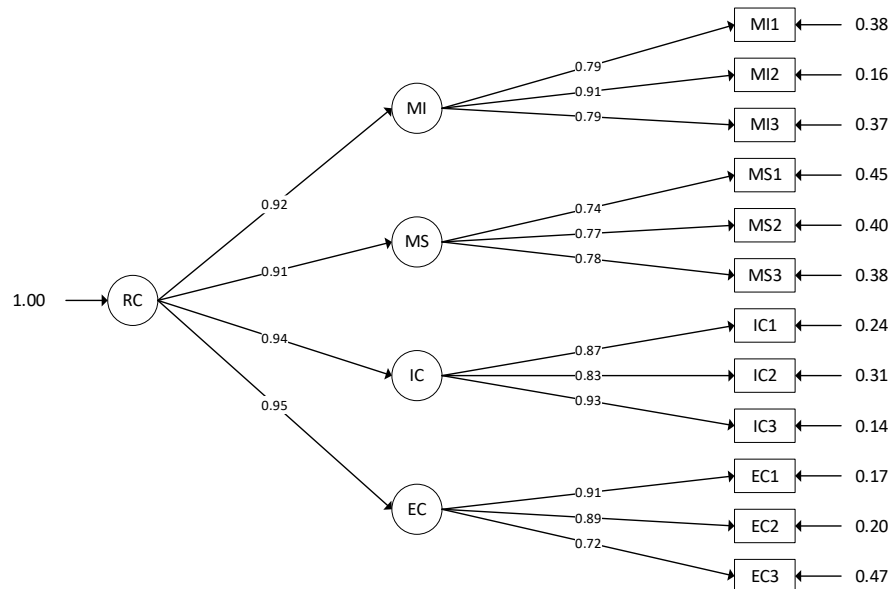


Fig. 1: Second-order confirmatory factor analysis model of reading comprehension ability

4. Discussion

The findings of this study suggest that the implementation of an active learning-based instructional plan may contribute to improvements in Grade 8 students' reading comprehension. The observed increase in post-test scores and the high Effectiveness Index (E.I.) indicate that integrating multiple active learning strategies can support students' engagement with texts and enhance their comprehension performance. These findings are consistent with previous studies which have reported positive effects of active learning on reading comprehension in EFL contexts, including improved performance, increased participation, and deeper levels of understanding (Al-Magableh et al., 2022; Wael et al., 2023; Arsairach et al., 2021; Reyes Pihuave et al., 2025). This consistency suggests that active learning provides a supportive environment for developing reading skills across different educational settings.

One possible explanation for this improvement lies in the integration of vocabulary-focused activities within the instructional plan. Strategies such as word mapping and contextual analysis helped students build lexical knowledge, which plays a critical role in reading comprehension. As Nation (2022) emphasized, vocabulary knowledge enables learners to access meaning and interpret texts more effectively. In the present study, students demonstrated improved ability to identify key ideas and supporting details, which may be attributed to their increased familiarity with vocabulary encountered in the reading materials.

In addition, the use of structured reading strategies, particularly SQ4R and graphic organizers, likely supported students in approaching texts more systematically. These strategies function as cognitive scaffolds that guide learners through processes such as predicting, questioning, summarizing, and reviewing. Previous research has shown that such strategies promote metacognitive awareness and

improve reading performance (Li et al., 2022). In this study, the structured nature of these activities appears to have facilitated students' ability to analyze and synthesize information, which are essential components of higher-level comprehension.

Moreover, the incorporation of collaborative learning techniques, including think-pair-share and peer reading, created opportunities for active engagement and knowledge construction. Through interaction and discussion, students were able to clarify their understanding, exchange ideas, and relate textual content to their own experiences. This aligns with the principles of active learning, which emphasize learner participation and social interaction as key drivers of learning. The use of multiple interactive strategies may therefore explain the observed improvements in students' ability to interpret and evaluate texts.

Another important contribution of this study is the validation of reading comprehension as a multidimensional construct. The results of the Confirmatory Factor Analysis (CFA) support the view that reading comprehension consists of four interrelated components: identifying main ideas, analyzing and summarizing, interpreting and connecting information, and evaluating and critiquing content. The strong factor loadings indicate that the assessment instrument was able to capture these dimensions effectively. This finding contributes to the existing literature by providing empirical support for the structural complexity of reading comprehension, which is often assumed but not always validated in EFL research.

Despite these positive findings, the results should be interpreted with caution. This study employed a one-group pre-test-post-test design without a control group, which limits the ability to establish causal relationships. The observed improvements may have been influenced by external factors beyond the instructional intervention. In addition, the relatively small sample size and the absence of

qualitative data restrict the generalizability of the findings and limit deeper understanding of students' learning processes. Future research should employ more rigorous experimental designs, include control groups, and incorporate qualitative methods to provide a more comprehensive explanation of how active learning influences reading comprehension.

5. Conclusions

This study investigated the use of active learning strategies to improve Grade 8 students' reading comprehension and to validate the construct of reading comprehension as measured in the study. The findings suggest that the instructional approach was associated with improved reading performance among the participants. In addition, the confirmatory factor analysis supported reading comprehension as a multidimensional construct consisting of four interrelated components: identifying main ideas, analyzing and summarizing, interpreting and connecting information, and evaluating and critiquing information.

These findings contribute to language education by demonstrating that active learning strategies can be meaningfully integrated into reading instruction in the Thai educational context. The study also offers practical implications for teachers, who may apply collaborative learning techniques, vocabulary-building activities, and structured reading strategies to promote students' engagement and comprehension. At the policy level, the findings support the inclusion of active learning approaches in language teaching and curriculum development.

However, this study has several limitations, including the use of a one-group pre-test-post-test design without a control group, a relatively small sample size, and the absence of qualitative data to explain students' learning processes in greater depth. Therefore, future research should employ more rigorous experimental designs, include comparison groups, and incorporate qualitative methods to provide a more comprehensive understanding of how active learning influences reading comprehension.

List of abbreviations

A.D.	Anno Domini
B.E.	Buddhist era
CFA	Confirmatory factor analysis
CFI	Comparative fit index
df	Degrees of freedom
EC	Evaluating and critiquing information
EFL	English as a foreign language
E.I.	Effectiveness index
E1	Effectiveness of the process
E2	Effectiveness of the product
IC	Interpreting and connecting information
MI	Identifying main ideas
MS	Analyzing and summarizing
PBL	Project-based learning
RC	Reading comprehension
RMSEA	Root mean square error of approximation

SD	Standard deviation
SE	Standard error
SQ3R	Survey, question, read, recite, review
SQ4R	Survey, question, read, reflect, recite, review
SRMR	Standardized root mean square residual
TLI	Tucker–Lewis index

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Compliance with ethical standards

Ethical considerations

All data were collected in accordance with ethical standards for human research. Participants were informed about the purpose of the study, participation was voluntary, and confidentiality and anonymity were ensured throughout the research process.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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