

Developing and validating an active learning model to improve reading comprehension in lower secondary education: Evidence from Central Northeastern Thailand



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ABSTRACT

This study developed and validated an active learning model to improve lower secondary students' reading comprehension in Central Northeastern Thailand. A research and development design was conducted in four phases: (1) validating the structure of reading comprehension through confirmatory factor analysis (CFA), (2) assessing instructional problems and priority needs, (3) developing and validating the instructional model and manual, and (4) piloting and implementing the model. Participants included 400 students for CFA, 273 educational stakeholders for the needs assessment, 5 experts for model validation, 30 students for the pilot phase, and 125 students for full implementation. Data were analyzed using descriptive statistics, CFA, the modified Priority Needs Index, E1/E2 efficiency, the effectiveness index, and paired-sample t-tests. The findings confirmed four components of reading comprehension: identifying main ideas, reasoning with supporting details, interpreting and summarizing, and analyzing relationships among ideas. The highest priority needs were assessment and evaluation, learning activities, and instructional design. The model demonstrated high content validity and feasibility (IOC = 0.80–1.00), exceeded the 80/80 criterion (E1/E2 = 83.15/82.93), and had an effectiveness index of 0.6384. Posttest scores were significantly higher than pretest scores ($p < .001$). The model provides a validated and practically tested approach for comparable lower secondary contexts.

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1. Introduction

Active learning has been widely accepted as an appropriate instructional approach for learners in contemporary educational contexts (Fornari and Poznanski, 2021; Jacob, 2023). It emphasizes learner participation, collaboration, and reflection rather than passive reception of information. As education

systems worldwide shift toward fostering 21st-century competencies, active learning has gained significant attention for its ability to promote higher-order thinking skills, creativity, and problem-solving (Fornari and Poznanski, 2021). The approach has been adopted in diverse educational contexts to empower learners to take responsibility for their learning through inquiry, interaction, and application of knowledge in authentic situations (Bonwell and Eison, 1991; Hendy, 2022). Consequently, it has become one of the most influential paradigms guiding instructional innovation in both general and language education.

Reading comprehension, on the other hand, remains one of the fundamental skills in language learning that requires learners to use cognitive and

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metacognitive processes and active engagement with texts (Almasi and Yuan, 2023; Brilliananda and Wibowo, 2023). Students must construct meaning, interpret information, and evaluate ideas across contexts (Griffiths, 2008; Li et al., 2022). However, reading instruction in many traditional classrooms is often limited to teacher explanation and text translation, which may not sufficiently develop comprehension strategies or analytical skills (Kargiotidis et al., 2026). The use of active learning in reading comprehension lessons allows students to become active participants who explore texts, discuss ideas, and reflect on meanings collaboratively. Through such processes, they develop metacognitive awareness and deepen their comprehension abilities.

In Thailand, the Ministry of Education has recognized active learning as a core instructional method for all subject areas, including language education. National policies and curriculum reforms emphasize the need for student-centered learning management, encouraging teachers to design learning experiences that stimulate curiosity, participation, and reflection. Within language teaching, active learning is seen as a key pathway to enhance students' reading and communication competencies, aligning with the country's goals to produce learners capable of critical and creative thinking (Surakarn et al., 2020).

However, establishing an active learning environment within the Thai education system is not an easy task. Many classrooms still follow traditional teacher-led instruction, emphasizing content delivery over learner participation (David, 2018). This challenge is particularly evident in the Northeastern region of Thailand, where students often come from middle- to low-income families in rural communities with limited exposure to academic settings that encourage independent thinking or open discussion. The cultural context values respect for authority and collective harmony, which can discourage active questioning or debate. Furthermore, lower secondary school students in this region are at an age where cognitive maturity and linguistic competence are still developing, making it difficult for them to engage in analytical reading tasks without structured guidance.

Previous studies have attempted to apply active learning strategies in reading comprehension classes through various techniques such as reciprocal teaching, cooperative reading, problem-based learning, and questioning strategies. While these approaches have shown positive outcomes, most have focused on specific classroom techniques rather than a comprehensive instructional model. Moreover, few studies have sought to integrate multiple strategies into a single coherent model, and none have employed Confirmatory Factor Analysis (CFA) to validate the components of reading comprehension ability as part of the model development process.

Therefore, this study was conducted to develop an Active Learning-based Learning Management

Model aimed at enhancing reading comprehension ability among lower secondary school students in Central Northeastern Thailand. The model was designed through systematic research and development procedures to address local educational needs and provide an empirically validated framework for improving reading comprehension instruction in Thai secondary education.

2. Literature review

Reading comprehension is widely regarded as one of the most essential skills in language learning, as it involves the ability to construct meaning from text through the integration of linguistic, cognitive, and metacognitive processes. Grabe (2009) defined reading comprehension as a complex cognitive activity requiring the coordination of bottom-up decoding and top-down interpretation. Similarly, Li et al. (2022) emphasized that comprehension is achieved when readers connect textual information with their existing knowledge, vocabulary, and discourse awareness. According to Griffiths (2008), proficient readers continuously monitor their understanding, use context to infer meaning, and apply strategies such as predicting, questioning, and summarizing. Thus, effective reading instruction must develop both decoding skills and strategic awareness, enabling learners to interact actively with the text rather than passively receive information.

Active learning, as defined by Bonwell and Eison (1991), refers to instructional approaches that engage students in meaningful activities and encourage reflection on what they are doing. Prince (2004) further asserted that active learning is grounded in constructivist principles, which emphasize learners' active role in constructing knowledge through experience, collaboration, and problem-solving. In reading classrooms, active learning transforms students from passive recipients of information into participants who negotiate meaning, question ideas, and connect textual content with their own experiences.

Key principles, such as engagement, collaboration, immediate feedback, and reflection, support deeper comprehension and retention of knowledge (Freeman et al., 2014). Applying active learning principles in reading comprehension instruction provides opportunities for students to internalize strategies through discussion, cooperation, and task-based practice. Activities such as think-pair-share, story mapping, jigsaw reading, and reciprocal teaching enable students to exchange interpretations and co-construct meaning (Palinscar and Brown, 1984). When learners engage in tasks that require predicting outcomes, summarizing sections, or identifying key ideas collaboratively, they not only enhance comprehension but also develop critical and metacognitive skills essential for lifelong learning. As Bonwell and Eison (1991) and Prince (2004) emphasized, active participation

increases motivation and accountability, making reading comprehension lessons more dynamic, reflective, and student-centered.

A growing body of research has examined the effects of active learning strategies on learners' reading comprehension and engagement, revealing diverse approaches and outcomes across contexts. Majidi et al. (2025) demonstrated that implementing active learning strategies in Iranian EFL classrooms significantly improved students' reading comprehension, though no substantial changes were observed in motivation or enjoyment. Similarly, Köseoğlu and Çobanoğlu (2025) found that an active blended learning (ABL) model combining face-to-face and online activities led to higher reading comprehension gains than conventional instruction, emphasizing that structured tasks and collaboration were key to deeper processing. Both studies underline that while active learning can enhance comprehension performance, its success depends on task design, learner interaction, and guided facilitation rather than technological presence alone.

Research in related areas supports these findings and extends them into broader pedagogical frameworks. Howell (2021) reported that integrating active and reflective learning within a flipped classroom structure enhanced student engagement and long-term understanding. Students valued collaborative, hands-on tasks that promoted application and reflection more than lecture-based lessons. Likewise, Öztürk and Çakıroğlu (2021) integrated self-regulated learning strategies into a flipped EFL classroom and found significant gains in reading, speaking, and writing skills. However, they observed that sustaining engagement required ongoing scaffolding and teacher support. Consequently, effective active learning must be grounded in structured participation, reflection, and teacher facilitation to produce meaningful comprehension outcomes.

In the Thai context, several studies have explored active learning for improving reading comprehension with promising results. Setachan (2023) implemented the MIAP (Motivation–Information–Application–Process) model with upper secondary students, which indicated strong learning outcomes. Similarly, Joomsimma and Seubsang (2025) found that active learning activities significantly enhanced Grade 9 students' comprehension and satisfaction. This study highlights how collaboration, discussion, and enjoyment improved understanding of texts. These findings confirm that active learning is suitable for Thai classrooms, where interactive, student-centered activities can transform passive reading instruction into an engaging and reflective process.

Studies linking active learning with digital or goal-oriented environments also stress the importance of learner autonomy and self-regulation. Li et al. (2021) developed the Goal-Oriented Active Learning (GOAL) system to foster reading engagement, self-directed learning behavior, and motivation in extensive reading programs. Students

with higher self-directed learning ability demonstrated greater engagement and persistence, suggesting that structured active learning environments can effectively support independent comprehension and motivation.

Synthesizing across these studies, a consistent pattern emerges: active learning—whether applied through classroom-based collaboration, blended learning, or self-directed systems—enhances reading comprehension and engagement when instruction is well structured, interactive, and reflective. Nonetheless, several gaps remain. First, most prior research focuses on single techniques or contexts rather than developing a comprehensive learning management model integrating multiple active learning strategies. Moreover, few studies validate the construct of reading comprehension underlying these interventions using robust statistical methods such as Confirmatory Factor Analysis (CFA). Third, there is limited evidence from regional-scale studies in Thailand, particularly in the Central Northeastern provinces, where educational contexts and learner backgrounds differ from metropolitan settings.

Therefore, the current study extends the literature by developing and validating an active learning-based learning management model specifically designed to enhance reading comprehension among lower secondary school students in Central Northeastern Thailand. By integrating empirical validation through CFA, instructional efficiency testing, and regional contextualization, the study provides a practical and research-based framework for improving reading instruction and learner engagement in Thai secondary education.

3. Methodology

3.1. Research design

This study employed a research and development design to develop and validate an active learning model for improving reading comprehension among lower secondary school students. The design comprised four sequential phases: Phase 1 validated the component structure of reading comprehension through confirmatory factor analysis; Phase 2 examined instructional problems and priority needs; Phase 3 developed the instructional model and implementation manual and submitted them to expert review; and Phase 4 piloted and implemented the model to examine its efficiency and effects. This phased design allowed the model to be conceptually grounded, context-responsive, and empirically tested before full implementation.

3.2. Context and participants

Four participant groups were involved, each aligned with a phase of the study. The first group consisted of 400 lower secondary school students

(Grades 7–9) from Phadungnaree School, Maha Sarakham Province. These data were used in Phase 1 to test the measurement model of reading comprehension. The second group comprised 273 participants, including 20 educational supervisors and 253 Thai language teachers from Roi Et, Khon Kaen, Maha Sarakham, and Kalasin Provinces. This group provided data for the analysis of current conditions and priority needs in reading comprehension instruction. The third group included 5 experts in curriculum and instruction, Thai language education, and educational measurement and evaluation. They evaluated the content validity, suitability, and feasibility of the developed model and its implementation manual. The fourth group consisted of students involved in the try-out and implementation stages.

A pilot group of 30 Grade 8 students from Nacheuak Pittayasan School, Maha Sarakham Province, participated in the initial trial of the model to examine feasibility and preliminary efficiency. An implementation group of 125 students from Phadungnaree School, Maha Sarakham Province, participated in the full-scale application of the model and completed the pretest and posttest assessments.

3.3. Instruments

This questionnaire was developed to identify and confirm the core components of students' reading comprehension as the conceptual basis of the instructional model. The instrument contained 20 indicators representing four hypothesized dimensions: identifying main ideas, reasoning with supporting details, interpreting and summarizing, and analyzing relationships among ideas. These dimensions were synthesized from previous studies on reading comprehension and active learning environments, which consistently emphasize learners' abilities to construct meaning, interpret information, summarize content, evaluate supporting evidence, and establish relationships among ideas during the reading process (Howell, 2021; Joomsimma and Seubsang, 2025; Köseoğlu and Çobanoğlu, 2025; Li et al., 2021; Majdi et al., 2025; Öztürk and Çakiroğlu, 2021; Setachan, 2023). Content validity was reviewed by experts before the instrument was administered to the Phase 1 sample for confirmatory factor analysis (CFA).

This questionnaire examined existing problems and priority needs in learning management for promoting reading comprehension through active learning. It covered five aspects: curriculum content, learning design, learning activities, learning media, and assessment and evaluation. Responses from supervisors and teachers were used to calculate the modified Priority Needs Index and to inform model development. The model and accompanying manual were designed to provide a coherent framework for reading instruction based on active learning principles. The model translated the validated reading comprehension construct into classroom processes and included guidance on lesson structure,

classroom interaction, learning tasks, and assessment procedures. The expert evaluation form was used to assess the consistency, appropriateness, and feasibility of the developed model. Experts rated the model and manual and provided suggestions for refinement prior to the pilot implementation.

The achievement test was used to assess students' reading comprehension before and after implementation. It consisted of 40 multiple-choice items aligned with the four components of reading comprehension targeted by the model.

3.4. Data collection and analysis

Data collection was conducted over six months, from May to October 2024. Phase 1 involved administering the reading comprehension questionnaire for CFA. Phase 2 collected ratings from supervisors and teachers on current conditions and desired conditions in reading instruction. Phase 3 synthesized the results of the first two phases to develop the model and manual and then submitted the materials to expert review. Phase 4 included a pilot implementation followed by full implementation with pretest and posttest assessment.

Data analysis combined descriptive and inferential procedures. Percentage, mean, and standard deviation were used to summarize expert ratings and needs assessment data. Confirmatory factor analysis was used to test the structure of reading comprehension. The modified Priority Needs Index was used to rank instructional needs. Model efficiency was examined using E1/E2, effectiveness was examined using the effectiveness index (E.I.), and paired-sample t-tests were used to compare students' pretest and posttest scores. Qualitative evidence from classroom observations and teacher reflections was used to support the interpretation of implementation results.

4. Results

4.1. Confirmatory factor analysis on reading comprehension ability

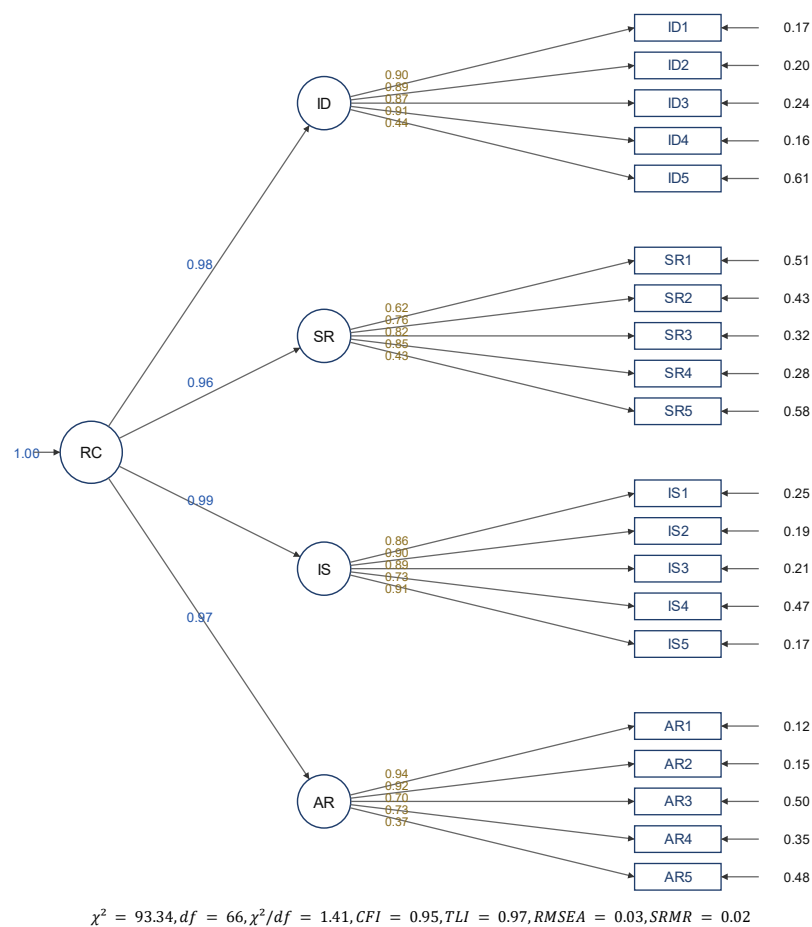
The confirmatory factor analysis was conducted to test whether reading comprehension could be represented as a higher-order construct composed of four related dimensions: identifying main ideas, reasoning with supporting details, interpreting and summarizing, and analyzing relationships among ideas.

The analysis supported the hypothesized measurement structure and indicated that the proposed construct was appropriate for model development (Table 1). The results of the second-order confirmatory factor analysis are presented in Table 2. Table 2 presents the results of the second-order confirmatory factor analysis for the measurement model of reading-comprehension ability. All 20 observed indicators showed positive

and statistically significant loadings at the .01 level, ranging from 0.37 to 0.94, indicating that each behavior reliably represented its corresponding latent component. Among the four first-order components, interpreting and summarizing had the highest standardized loading ($\beta = 0.99$), followed closely by identifying main ideas ($\beta = 0.98$), analyzing relationships among information ($\beta = 0.97$), and reasoning and supporting details ($\beta = 0.96$). The overall goodness-of-fit indices ($\chi^2/df = 1.41$, CFI = 0.95, TLI = 0.97, RMSEA = 0.03, SRMR = 0.02) confirmed that the hypothesized model fitted the empirical data well. These results verify that reading-comprehension ability can be explained through four interrelated components integrated under a single higher-order construct. The validated structural model of reading comprehension ability is presented in Fig. 1.

4.2. Problems and needs in learning management for reading comprehension

The priority needs for learning management are presented in Table 3. The analysis of needs and problems in learning management for promoting reading comprehension through active learning revealed that all five aspects required development. The highest priority need was assessment and evaluation (PNImodified = 0.55), followed by learning activities (0.54) and learning design (0.52). The lowest-priority areas were curriculum content and learning media utilization (both 0.50). These results suggest that improving the processes of authentic assessment, interactive activity design, and lesson planning should be emphasized in developing an active learning model for enhancing students' reading comprehension ability.



$\chi^2 = 93.34, df = 66, \chi^2/df = 1.41, CFI = 0.95, TLI = 0.97, RMSEA = 0.03, SRMR = 0.02$
Fig. 1: Confirmatory factor analysis of the measurement model of reading comprehension ability

4.3. Model development

Results from the validated reading comprehension framework and the needs assessment were synthesized to construct the active learning model. The model was designed around four core elements: principles, objectives, instructional process, and assessment. Its purpose was to translate the four dimensions of reading comprehension into a feasible classroom approach that promotes active engagement, collaborative interpretation, reflection, and authentic evaluation.

The developed model comprised four main elements:

- **Principles:** Based on constructivist and active learning theories, with an emphasis on student participation, interaction, and reflection.
- **Objectives:** To improve students' reading comprehension through active participation and collaborative learning.
- **Instructional process:** The learning process consisted of four steps:
 - **Preparation:** Activating students' prior knowledge and establishing learning goals.

- Activity: Engaging students in interactive reading activities, including identifying key ideas and supporting details through group discussion.
- Reflection: Encouraging students to summarize the text, explain their reasoning, and share their understanding.
- Application and evaluation: Applying reading skills to new texts and assessing comprehension through authentic tasks.
- Assessment and evaluation: Using both formative and summative assessment to evaluate students' comprehension processes, reasoning, and accuracy of interpretation.

Table 1: Results of the first-order confirmatory factor analysis of the reading comprehension measurement model

Indicator behavior	Factor loading (b)	Standardized loading (β)	S.E.	Z	p-value	R ²	Factor score coefficient
1. First-order confirmatory factor analysis							
1. Identifying Main Ideas							
1.1. Identify the main topic of the passage correctly	1.00	0.90	0.01	112.33	0.00	0.83	0.46
1.2. Summarize the essential content of the text within a short time	1.09	0.89	0.01	92.70	0.00	0.79	0.81
1.3. Understand the key issue addressed in the text	0.97	0.87	0.01	80.38	0.00	0.76	0.78
1.4. Distinguish between main and supporting ideas in the article	0.98	0.91	0.01	122.98	0.00	0.84	0.40
1.5. Select the sentence that best represents the main idea	0.41	0.44	0.03	13.11	0.00	0.29	0.02
2. Reasoning and supporting details							
2.1. Explain how details support the main idea	1.00	0.62	0.03	23.35	0.00	0.38	0.28
2.2. Distinguish between facts and opinions in the text	1.03	0.76	0.02	40.24	0.00	0.57	0.04
2.3. Provide examples of information used to support the main idea	1.27	0.82	0.01	57.85	0.00	0.67	0.33
2.4. Explain the author's reasoning to persuade readers	1.29	0.85	0.01	62.77	0.00	0.71	0.14
2.5. Identify which sentence best supports the main idea	0.77	0.43	0.03	12.71	0.00	0.29	0.01
3. Interpreting and summarizing							
3.1. Understand implicit meanings in the text	1.00	0.86	0.01	73.72	0.00	0.74	0.14
3.2. Interpret the author's intention from the story	0.99	0.90	0.01	109.62	0.00	0.80	0.01
3.3. Summarize the text in one's own words	0.98	0.89	0.01	96.00	0.00	0.79	0.15
3.4. Explain the author's implied message	0.74	0.73	0.02	35.99	0.00	0.53	0.06
3.5. Rephrase difficult sentences for easier understanding	1.05	0.91	0.01	110.17	0.00	0.83	0.06
4. Analyzing relationships among information							
4.1. Connect events within the story logically	1.00	0.94	0.01	53.71	0.00	0.88	0.56
4.2. Identify causes and effects of events	0.88	0.92	0.01	48.64	0.00	0.85	0.43
4.3. Explain relationships between characters or ideas	0.69	0.70	0.02	32.25	0.00	0.49	0.25
4.4. Correctly analyze the sequence of events	0.78	0.73	0.02	40.11	0.00	0.54	0.13
4.5. Explain how one event leads to another	0.48	0.37	0.04	10.42	0.00	0.28	0.02

Table 2: Results of the second-order confirmatory factor analysis of the reading comprehension measurement model

Component	b	β	S.E.	Z	p-value	R ²
1. Identifying Main Ideas	1.00	0.98	0.01	81.07	0.00	0.98
2. Reasoning and Supporting Details	0.70	0.96	0.04	36.69	0.00	0.94
3. Interpreting and Summarizing	0.99	0.99	0.01	82.91	0.00	0.99
4. Analyzing Relationships Among Information	1.09	0.97	0.02	61.45	0.00	0.98

The model and implementation manual were reviewed by five experts in Thai language education, curriculum design, and educational measurement. The evaluation indicated high suitability and feasibility, with item-objective congruence values

ranging from 0.80 to 1.00. A pilot implementation with 30 students also met the efficiency criterion ($E1/E2 = 82.50/81.77$), suggesting that the model was sufficiently robust for full classroom use.

Table 3: Priority needs for active learning-based reading comprehension instruction

Aspect	Need (I)	Current condition (D)	PNImodified	Rank
Curriculum content	4.61	2.29	0.50	4
Learning design	4.68	2.25	0.52	3
Learning activities	4.65	2.13	0.54	2
Learning media utilization	4.62	2.29	0.50	4
Assessment and evaluation	4.59	2.08	0.55	1
Overall	4.63	2.21	-	-

4.4. Model implementation

The efficiency of the developed model is presented in Table 4 and shows that the developed learning management model based on Active

Learning achieved an efficiency of 83.15 / 82.93, which is higher than the standard criterion of 80/80. This indicates that the model was both effective and practical for classroom implementation. The results confirm that students were able to learn actively,

perform well during the learning process, and demonstrate strong comprehension outcomes upon completion of instruction. Thus, the model was associated with improvements in reading comprehension ability among lower secondary students.

Table 4: Efficiency of the active learning-based learning management model (n = 125)

Evaluation aspect	Full score	Mean	S.D.	Percentage (%)
Process efficiency (E ₁)	100	83.15	6.22	83.15
Product efficiency (E ₂)	30	24.88	2.51	82.93

The effectiveness index of the developed model is presented in Table 5 and presents the effectiveness index of the Active Learning-based learning management model for promoting reading comprehension ability. The calculated E.I. = 0.6384, indicating that students achieved 63.84% of the possible gain after participating in the learning activities. This result reflects a substantial gain in students' ability to identify main ideas, interpret information, and analyze relationships within texts. Combined with the E1/E2 results, the findings suggest that the developed learning management model was associated with improvements in students' reading comprehension ability through an active, student-centered learning process.

Table 5: Effectiveness index of the active learning-based learning management model (n = 125)

Test occasion	Full score	Total score	Mean	E.I.
Pre-test	30	1,980	15.84	-
Post-test	30	3,110	24.88	0.6384

Table 6: Comparison of reading comprehension scores before and after implementation of the active learning-based learning management model (n = 125)

Reading comprehension ability	n	full score	M	S.D.	t	Sig. (2-tailed)
Pre-test	125	30	15.84	3.12	-	-
Post-test	125	30	24.88	2.51	21.55	p < .001

5. Discussion

The present study examined the structure of reading comprehension ability, identified instructional needs related to reading instruction, and developed an Active Learning-based learning management model for lower secondary school students. Three major findings emerged from the study: the confirmation of a four-component structure of reading comprehension, the identification of priority areas for instructional improvement, and the positive outcomes associated with the implementation of the developed model.

The first finding revealed that reading comprehension ability consists of four closely related components: identifying main ideas, reasoning and supporting details, interpreting and summarizing, and analyzing relationships among ideas. This finding supports the view that reading comprehension is a multidimensional construct involving several interconnected cognitive processes

The comparison of students' reading comprehension scores before and after learning through the model is presented in Table 6. Table 6 presents the comparison of students' reading comprehension ability before and after learning with the Active Learning-based learning management model. The results indicate that the post-test mean score ($\bar{X}$ = 24.88, S.D. = 2.51) was markedly higher than the pre-test mean score ($\bar{X}$ = 15.84, S.D. = 3.12). The paired-sample t-test (t = 21.55, p < .001) confirmed a statistically significant difference, demonstrating that students showed higher reading comprehension scores following participation in the model. The calculated effect size was very large (Cohen's d = 1.93), indicating that the model was associated with substantial improvements in students' reading comprehension ability. Moreover, qualitative evidence from classroom observations and teacher reflections supported the quantitative findings. During the implementation phase, students demonstrated active engagement in group reading discussions and participated enthusiastically in activities that required identifying main ideas, analyzing details, and summarizing information. Teachers observed that students became more confident in expressing opinions, more collaborative during peer interactions, and better able to connect ideas across paragraphs and texts. Reflection sessions revealed that students valued opportunities to explain their reasoning, which enhanced their comprehension and critical thinking. Teachers also noted that the Active Learning approach created a more positive classroom atmosphere, transforming reading lessons from teacher-centered instruction into interactive, student-driven learning experiences.

rather than a single skill. Among the four components, interpreting and summarizing demonstrated the highest standardized loading (β = 0.99), indicating that it was the strongest indicator of overall reading comprehension ability. One possible explanation is that interpreting and summarizing require learners to integrate multiple comprehension processes simultaneously. Before students can summarize a text effectively, they must identify important information, distinguish between main and supporting ideas, establish relationships among concepts, and infer meanings that are not explicitly stated. As a result, successful summarization reflects not only understanding of textual information but also the ability to synthesize ideas into a coherent representation of meaning. This finding suggests that higher-order comprehension skills may serve as more comprehensive indicators of reading ability than skills involving information identification alone. From an instructional perspective, the result

highlights the importance of designing reading activities that encourage students to explain, summarize, interpret, and justify understanding rather than merely locate information within a text.

The second finding concerned the needs assessment. The results indicated that assessment and evaluation, learning activity design, and instructional planning were the areas requiring the greatest improvement. These findings suggest that challenges in reading instruction may be related not only to students' reading ability but also to classroom practices and instructional support systems. Although Active Learning has become a major educational policy direction in Thailand, teachers may still encounter difficulties translating broad pedagogical principles into practical classroom strategies.

The prominence of assessment and evaluation as the highest-priority need is particularly noteworthy because traditional reading instruction often emphasizes correct answers and factual recall rather than comprehension processes. Similarly, the identified needs in activity design and instructional planning indicate that teachers require support in creating learning environments where students actively engage with texts through discussion, reflection, reasoning, and collaborative learning. These findings suggest that effective reading instruction requires alignment among instructional goals, classroom activities, and assessment practices.

The third finding showed that the developed Active Learning-based learning management model was associated with improvements in students' reading comprehension ability. The model exceeded the established efficiency criterion ($E1/E2 = 83.15/82.93$), produced a substantial effectiveness index ($E.I. = 0.6384$), and was associated with significantly higher posttest scores. These findings support a growing body of research indicating that active learning can promote reading comprehension when learners are actively involved in constructing meaning from texts.

Across different educational contexts, previous studies have consistently shown that reading comprehension improves when instruction incorporates interaction, reflection, collaboration, and learner participation (Howell, 2021; Köseoğlu and Çobanoğlu, 2025; Majdi et al., 2025; Öztürk and Çakıroğlu, 2021). Although these studies employed different instructional approaches, including flipped classrooms, active blended learning environments, and self-regulated learning frameworks, they collectively suggest that comprehension develops most effectively when learners engage actively with textual information rather than passively receive knowledge.

The findings of the present study are particularly consistent with those of Köseoğlu and Çobanoğlu (2025) and Majdi et al. (2025), who reported that active learning environments improve reading comprehension by encouraging learners to process information more deeply through discussion, interaction, and collaborative problem solving. The

developed model incorporated similar mechanisms through its Activity and Reflection stages, where students were required to analyze texts, discuss interpretations, justify reasoning, and construct summaries. These activities encouraged students to move beyond surface-level understanding toward deeper meaning construction. Consequently, the positive outcomes observed in this study may be attributed to the opportunities provided for learners to actively engage with textual content and negotiate meaning with peers.

The results also align with the work of Howell (2021) and Öztürk and Çakıroğlu (2021), who emphasized the importance of reflection and self-regulation in active learning environments. Both studies suggested that meaningful learning occurs when students are given opportunities to monitor understanding, evaluate interpretations, and connect new information with prior knowledge. Reflection constituted a central element of the developed model, enabling students to articulate understanding, examine alternative perspectives, and refine interpretations through discussion. Therefore, the findings suggest that the effectiveness of active learning may derive not only from participation itself but also from opportunities for learners to reflect on and regulate their comprehension processes.

The present findings are also supported by previous studies conducted in the Thai educational context. Joomsimma and Seubsang (2025) and Setachan (2023) reported that active learning activities contributed positively to students' reading achievement, engagement, and satisfaction. Taken together, these studies suggest that the benefits of active learning are not restricted to specific instructional techniques or educational settings. Rather, active learning appears to create conditions that encourage learners to discuss, interpret, evaluate, and apply information, thereby supporting deeper comprehension. The classroom observations in the present study provide additional support for this interpretation, as students demonstrated greater participation, collaboration, and confidence throughout the learning process.

Finally, the findings correspond with those of Li et al. (2021), who found that goal-oriented active learning environments promote learner engagement and self-directed learning. Although the developed model did not incorporate digital learning systems, it shared a similar emphasis on learner responsibility and active knowledge construction. Students were encouraged to generate interpretations, summarize information, and evaluate understanding independently and collaboratively. This suggests that learner autonomy may represent an important mechanism through which active learning contributes to reading comprehension development.

6. Conclusions

This study developed and validated an active learning model for improving reading

comprehension among lower secondary school students in Central Northeastern Thailand. Using a research and development design, the study first confirmed a four-component structure of reading comprehension, then identified priority needs in classroom practice, and finally developed and tested a model aligned with those findings.

The results showed that the model had strong content validity, exceeded the 80/80 efficiency criterion, produced a substantial effectiveness index, and was associated with significantly higher posttest scores. Taken together, these findings suggest that a structured active learning approach can support improvements in reading comprehension when instructional processes, classroom interaction, and assessment are explicitly aligned.

This study contributes a context-responsive and empirically tested model that may support curriculum development, classroom instruction, teacher education, and language and literacy education. However, the study has an important limitation because it used a one-group pretest-posttest design without a control group. Although students showed significantly higher scores on the posttest, these gains cannot be attributed solely to the intervention. Other factors, including student maturation, previous exposure to reading activities, and testing effects, may have influenced the results. Therefore, the findings should be viewed as preliminary evidence of the model's potential usefulness. Future studies should use experimental or quasi-experimental designs with appropriate comparison groups. Such designs would provide stronger evidence of the intervention's effectiveness and allow more reliable conclusions about its causal effects on student reading outcomes.

List of abbreviations

ABL	Active blended learning
AR	Analyzing relationships among information
CFA	Confirmatory factor analysis
CFI	Comparative fit index
E.I.	Effectiveness index
E1/E2	Process efficiency and product efficiency
EFL	English as a foreign language
GOAL	Goal-oriented active learning
IOC	Item-objective congruence
IS	Interpreting and summarizing
MIAP	Motivation-information-application-process
PNImodified	Modified priority needs index
R ²	Coefficient of determination
RC	Reading comprehension
RMSEA	Root mean square error of approximation
S.D.	Standard deviation
S.E.	Standard error
SR	Reasoning and supporting details
SRMR	Standardized root mean square residual
TLI	Tucker-Lewis index

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Compliance with ethical standards

Ethical considerations

Participation was voluntary. All adult participants were informed about the objectives and procedures of the study and provided informed consent prior to participation. For student participants who were minors, consent was obtained from their parents or legal guardians in accordance with institutional ethical requirements. The collected data were treated confidentially and used solely for research purposes. This study was approved by the Mahasarakham University Ethics Committee for Research Involving Human Subjects, Thailand (Approval No. 472-469/2025; approved on 23 July 2025).

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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