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Developing reading comprehension of Thai primary students through the 5W1H learning management technique integrated with mind mapping

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ABSTRACT

The purpose of this study was to examine the effectiveness of the 5W1H learning management technique integrated with mind mapping in improving the reading comprehension of Grade 5 students. It also aimed to compare students' reading comprehension before and after instruction and to assess their satisfaction with the learning process. The participants were 33 Grade 5 students from Bhuraphapittayakarn Municipal School in Maha Sarakham Province during the second semester of the 2024 academic year, selected using cluster random sampling. The research instruments included six learning management plans based on the 5W1H–mind mapping technique, a 30-item reading comprehension test, and a 10-item satisfaction questionnaire. Data were analyzed using mean, standard deviation, percentage, efficiency index (E1/E2), and a paired-samples t-test. The results showed that the learning management plans achieved an efficiency level of 88.58/81.00, exceeding the standard criterion of 80/80. Students' post-test reading comprehension scores were significantly higher than their pretest scores at the 0.05 level. In addition, students reported a high level of satisfaction with the learning activities (mean = 4.11, SD = 1.06). These findings suggest that the 5W1H–mind mapping approach is effective in improving reading comprehension, analytical thinking, and positive learning attitudes among primary school students in Thailand. This study contributes to instructional design research by showing that combining structured questioning with visual mapping can support active, reflective, and meaningful reading in elementary education.

1. Introduction

Reading comprehension is a fundamental component of literacy that enables learners to construct meaning from written texts and to apply the acquired knowledge in both academic and everyday contexts (Grabe and Stoller, 2013; Snow, 2002). For primary school students, reading comprehension serves as the foundation for learning across all subject areas because it connects decoding skills with higher-order thinking processes such as interpretation, inference, and evaluation (Perfetti and Stafura, 2014). Students who can comprehend written texts effectively are more capable of integrating new information with prior knowledge, summarizing key ideas, and making critical judgments about what they read (Anderson, 2008). Therefore, reading comprehension is a crucial skill for developing lifelong learning and academic success.

In Thailand, however, reading comprehension remains one of the most challenging areas of language learning at the primary level. Reports from the National Institute of Educational Testing Service reveal that the average Thai reading literacy scores of Grade 5 students have consistently fallen below the national standard. Similar findings from the Office of the Basic Education Commission indicate that many students can read texts aloud but fail to grasp the meaning, summarize main ideas, or make inferences. Several factors contribute to these difficulties, including teacher-centered instruction, limited exposure to reading strategies, and a lack of integration between reading comprehension and thinking-skills development (Intasena and Nuangchalerm, 2022). Consequently, there is an urgent need for instructional innovations that can foster students' active engagement, analytical thinking, and ability to understand and interpret

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texts meaningfully. The 5W1H learning management technique, originally derived from journalistic questioning, Who, What, When, Where, Why, and How, has been adapted in educational contexts to promote systematic inquiry and critical thinking (Chang, 2020). Guiding learners to analyze textual information through these six key questions is how the 5W1H approach encourages comprehension beyond surface meaning and cultivates logical connections among textual elements. It is particularly effective in helping students identify main ideas, supporting details, and causal relationships in reading passages (Kesik and Bas, 2022). Moreover, when applied to classroom instruction, 5W1H transforms passive reading into an interactive process of questioning, reasoning, and interpreting.

To further enhance comprehension and conceptual retention, the mind-mapping technique can be integrated with the 5W1H approach. Mind mapping, introduced by Buzan (2006), is a visual learning strategy that enables students to organize information hierarchically and associate concepts through diagrams or semantic networks. When students use mind maps to summarize responses to the 5W1H questions, they not only visualize the relationships among ideas but also reinforce memory and conceptual understanding. The combination of 5W1H and mind mapping, therefore, aligns with constructivist learning theory, which emphasizes active knowledge construction, and with cognitive theory, which highlights information processing and concept organization. Through this integration, learners can engage in higher-order thinking, synthesis, and reflection, key elements of meaningful reading comprehension.

Consequently, the current study aimed to investigate the effectiveness of the 5W1H learning management technique integrated with mind mapping in enhancing the reading comprehension achievement of grade 5 students. Specifically, the study examined the efficiency of the developed learning management plans based on the 80/80 criterion, compared students' reading comprehension achievement before and after the implementation of the integrated 5W1H–mind mapping approach, and explored students' satisfaction with learning through this technique.

2. Literature review

Reading comprehension is a complex and interactive process in which readers actively construct meaning from written texts by integrating linguistic knowledge, prior experience, and strategic thinking (Grabe, 2009; Snow, 2002). It involves not only decoding symbols but also interpreting, analyzing, and synthesizing information to achieve understanding. Proficient readers constantly make predictions, generate questions, clarify meaning, and summarize key ideas as they read (Anderson, 2008). In this view, comprehension requires the coordination of multiple cognitive and metacognitive processes, such as attention, inference, monitoring, and evaluation (Perfetti and Stafura, 2014).

From a pedagogical perspective, reading comprehension instruction should go beyond literal understanding to include activities that foster critical and analytical thinking. Grabe and Stoller (2013) emphasize that effective reading instruction must integrate explicit strategy training and reflection to help learners become conscious of how they comprehend texts. Similarly, Snow (2002) views comprehension as a dynamic interaction among the reader, the text, and the context of reading. Therefore, teachers must design learning experiences that promote self-regulation, encourage questioning, and provide opportunities for students to engage meaningfully with text content. In the Thai context, this means shifting from teacher-centered reading lessons to learner-centered approaches that activate thinking and communication skills while supporting deeper comprehension.

The 5W1H technique, representing Who, What, When, Where, Why, and How, originated from the field of journalism as a framework for gathering and organizing information (Chang, 2020). In educational settings, it has been adapted as a learning management technique to promote systematic thinking and understanding of textual information. The technique guides students to ask and answer six essential questions while reading or analyzing a passage, thereby transforming the reading process into an inquiry-based activity. Each question plays a distinct role: "Who" identifies characters or subjects; "What" determines events or actions; "When" and "Where" specify time and place; "Why" explores causes or motivations; and "How" explains processes or results (Kesik and Bas, 2022).

Applying the 5W1H technique allows students to dissect textual content systematically, enhancing both comprehension and critical reasoning. The technique aligns with constructivist learning theory, which posits that learners construct understanding through active inquiry and reflection (Piaget, 1971). It also reflects principles of cognitive learning theory, emphasizing that information processing improves when knowledge is organized into meaningful categories (Flavell, 1987). Through structured questioning, the 5W1H approach promotes engagement, logical organization of ideas, and better retention of key information. In classroom practice, it encourages learners to read purposefully, connect ideas, and articulate understanding in their own words, essential skills for developing higher-level reading comprehension.

Mind mapping is a visual learning technique that helps students represent ideas and relationships through diagrams connecting key words, images, and branches (Buzan, 2006). It begins with a central concept placed at the center of the map, from which related ideas radiate outward in hierarchical or associative structures. This format mirrors the brain's natural way of organizing and retrieving information, supporting both comprehension and memory retention. By allowing learners to visualize

relationships among ideas, mind mapping encourages active engagement, creative thinking, and integrative understanding.

From a theoretical standpoint, mind mapping is grounded in dual-coding theory and cognitive schema theory, which suggest that learning is more effective when verbal and visual information are processed simultaneously. In reading instructions, mind mapping allows students to summarize passages, identify main and supporting ideas, and connect concepts across paragraphs or topics. When learners create maps during or after reading, they engage in organizing and restructuring information, processes that lead to deeper comprehension and longer retention. Moreover, mind mapping aligns with constructivist principles by enabling learners to externalize their thought processes, reflect on what they have learned, and demonstrate understanding through visual representation.

Research across educational levels has consistently shown that both the 5W1H learning technique and mind mapping contribute positively to reading comprehension and higher-order thinking. Studies examining the 5W1H approach report that structured questioning supports learners in extracting essential information from texts and organizing ideas logically, leading to improved comprehension and interpretation (Kesik and Bas, 2022; Chanwiwattana et al., 2024; Li, 2025). When incorporated into reading instruction, this approach encourages active engagement with textual content, helping students identify main ideas, supporting details, and relationships among events or concepts. Empirical evidence further indicates that the 5W1H framework is adaptable across instructional contexts. For instance, Chanwiwattana et al. (2024) demonstrated that integrating 5W1H with the Content and Language Integrated Learning (CLIL) approach significantly enhanced secondary students' reading comprehension and summary writing, alongside high levels of learner satisfaction. Similarly, Kesik and Bas (2022) reported improvements in reading fluency, accuracy, and reading attitudes among primary students using a technology-supported 5W1H model. Studies in advanced literacy and translation contexts have also shown that 5W1H-based analysis promotes deeper processing and interpretive skills (Chang, 2020; Li, 2025), while its application in computational linguistics and text summarization highlights its effectiveness in identifying core textual elements (Hutama et al., 2017). Complementary findings from research on mind mapping further reinforce the role of visual organization in supporting comprehension. Mind mapping enables learners to structure textual information hierarchically, visualize relationships among ideas, and engage in deeper cognitive processing (Buzan, 2006). Previous studies have shown that incorporating mind or semantic mapping strategies into reading instruction leads to improved comprehension outcomes and increased learner motivation across educational levels (Fernández Fernández and Fonseca-Mora, 2022; Zamrizal, 2022; Sundari and Daulay, 2024). Digital mind-mapping tools have been found to enhance learners' understanding of text structure and their ability to organize ideas effectively, supporting both cognitive and affective dimensions of reading.

The reviewed literature demonstrates that 5W1H and mind mapping are complementary approaches grounded in constructivist and cognitive learning principles. The 5W1H technique fosters inquiry and logical reasoning through guided questioning, while mind mapping reinforces conceptual organization and retention through visual structuring. Although these methods have been widely validated across different contexts and age groups, studies combining them into an integrated instructional model remain scarce, particularly within the Thai primary-school setting. This gap underscores the need for empirical research investigating how the integration of 5W1H and mind mapping can enhance reading comprehension among Grade 5 students, a focus addressed in the present study.

Therefore, the current study aims to address the research gap by integrating the 5W1H learning management technique with mind mapping to enhance reading comprehension achievement among Grade 5 students. The objectives of this research were to: determine whether the learning management plans integrating the 5W1H technique with mind mapping achieved an efficiency level of 80/80; compare Grade 5 students' reading comprehension ability before and after participating in the learning management based on the integrated 5W1H–mind mapping approach; and examine students' satisfaction toward reading lessons focused on identifying main ideas through the 5W1H learning management technique combined with mind mapping.

3. Methodology

This study employed a pre-experimental one-group pretest–posttest design to investigate the effectiveness of the 5W1H learning management technique integrated with mind mapping in enhancing Grade 5 students' reading comprehension achievement. The research procedure consisted of three main phases: (1) pretesting to measure students' initial reading comprehension ability, (2) instructional implementation through six lesson plans developed based on the integrated 5W1H–Mind Mapping approach, and (3) post-testing and evaluation of students' satisfaction after the intervention. The total instructional period covered six lesson plans with a duration of twelve hours (two hours per lesson).

The participants were 33 Grade 5 students from *Bhuraphapittayakarn Municipal School*, Maha Sarakham Province, during the second semester of the 2024 academic year. The population consisted of 91 Grade 5 students from three classes, while the sample was one intact classroom selected through cluster random sampling. The participants were of mixed ability levels and had similar backgrounds in

Thai language learning. The learning management plans on *Reading Comprehension* for Grade 5 students were developed using the 5W1H learning management technique integrated with mind mapping. The development process aimed to create interactive and learner-centered lessons that enhanced comprehension, analytical thinking, and the ability to summarize main ideas. The plans were designed in accordance with the Basic Education Core Curriculum B.E. 2551 and the Thai Language Learning Area Standards to ensure alignment with national learning indicators and expected outcomes related to reading comprehension.

The development procedure comprised several stages. First, the researcher analyzed the curriculum documents, textbooks, and learning standards to define appropriate objectives and key performance indicators. Second, theories and prior studies concerning the 5W1H technique and mind mapping were reviewed to inform the instructional framework. Third, six lesson plans were drafted, each lasting two hours, for a total of twelve instructional hours. Each lesson incorporated the six guiding questions of the 5W1H technique—*Who, What, When, Where, Why,* and *How*—as prompts for reading activities, combined with mind mapping tasks that required students to visually organize and connect ideas.

For example, in the lesson on "Identifying Main Ideas in Short Stories," the teacher began with a pre-reading activity by asking students predictive 5W1H questions (e.g., *Who might the main character be?* or *What could happen next?*). During the reading stage, students worked in small groups to identify key details and complete a 5W1H chart to summarize the text's important information. Afterward, students collaboratively created a mind map on poster paper to illustrate the relationships among the story's characters, setting, events, and moral message. Finally, the class discussed how each element contributed to the story's main idea, and students reflected on their learning outcomes. This activity encouraged active participation, critical questioning, and the integration of textual and visual reasoning skills.

The Reading Comprehension Test comprised 30 four-choice items derived from six types of texts used in the lesson plans: advertisements, short stories, folktales, articles, documentaries, and news reports. Initially, 45 items were constructed and validated by three experts, and only those with IOC values between 0.50 and 1.00 were retained. Item analysis showed acceptable difficulty (0.20–0.80) and discrimination (0.22–0.85) values. The test demonstrated high reliability (r = 0.91) using the Lovett method, and the final 30-item version was used for both the pretest and post-test.

The Student Satisfaction Questionnaire consisted of 10 items on a 5-point Likert scale, ranging from *most satisfied* (5) to *least satisfied* (1). It was developed to assess students' satisfaction with the integrated 5W1H–Mind Mapping learning management process. Three experts evaluated the questionnaire for language clarity, content coverage, and alignment with research objectives. The instrument showed good discrimination (0.58–0.80) and high reliability (α = 0.86). The finalized version was administered to the sample group after the intervention.

Data collection was carried out in three stages: pretesting, instructional treatment, and post-testing. Before instruction, students were oriented to the learning objectives and administered a pretest on reading comprehension to determine their initial ability. The main intervention involved six lesson plans using the 5W1H learning management technique integrated with mind mapping, conducted over twelve instructional hours. After completing all lessons, students took a post-test on reading comprehension and responded to a satisfaction questionnaire.

The data collected were analyzed using descriptive and inferential statistics. The efficiency of the lesson plans (E1/E2) was calculated according to the 80/80 criterion, where E1 represents the average percentage score obtained from formative assessments during instruction, reflecting process efficiency, and E2 represents the average percentage score from the post-test, reflecting product efficiency. When both indices meet or exceed 80/80, the learning process and outcomes are considered effective. Mean, standard deviation, and percentage were computed to describe students' comprehension and satisfaction levels, while a paired-sample t-test was used to compare pretest and post-test mean scores to determine statistical significance at the $p < .05$ level.

4. Results

From Table 1, the learning management plans demonstrated a process efficiency (E_1) of 88.58 and a product efficiency (E_2) of 81.00, resulting in an overall efficiency of 88.58/81.00, which exceeds the predetermined 80/80 criterion. This indicates that the learning plans designed through the integration of the 5W1H technique and mind mapping effectively enhanced students' engagement during lessons and supported successful comprehension outcomes.

Table 1: Efficiency of the learning management plans on reading comprehension of Grade 5 students using the 5W1H technique integrated with mind mapping (N = 33)

Evaluation item	Full Score	Mean	SD	Percentage (%)
Formative assessment during instruction (E_1)	100	88.58	2.09	88.58
Post-test after instruction (E_2)	30	24.30	3.60	81.00
Efficiency of the learning plans (E_1/E_2)	–	–	–	88.58/81.00

As shown in Table 2, students' mean reading comprehension score increased from 12.61 before instruction to 24.30 after instruction. The paired-samples *t*-test revealed a statistically significant difference ($t = 31.79$, $p < .05$), confirming that the 5W1H–Mind Mapping learning management technique significantly improved students' ability to understand, summarize, and infer meaning from texts. In addition to statistical significance, the magnitude of the instructional effect was examined using Cohen's d. The effect size was very large (d = 3.33), indicating a substantial practical impact of the 5W1H–Mind Mapping learning management technique on students' reading comprehension achievement.

According to Table 3, students reported an overall satisfaction mean of 4.11 (SD = 1.06), interpreted as a high level of satisfaction. They particularly appreciated the use of visual and collaborative activities, the clarity of reading steps, and the stimulating learning environment. These findings suggest that the 5W1H–Mind Mapping technique not only improved reading comprehension but also fostered positive learning attitudes and engagement among Grade 5 students.

Table 2: Comparison of Grade 5 students' reading comprehension achievement before and after instruction using the 5W1H–mind mapping technique (N = 33)

Test occasion	Mean	SD	df	t	p
Pretest	12.61	3.90	32	31.79	.05*
Post-test	24.30	3.06			

*: p < .05

5. Discussion

The findings revealed that the 5W1H–Mind Mapping learning management plans achieved an efficiency level of 88.58/81.00, which exceeded the 80/80 criterion. Moreover, students' post-test reading comprehension scores were significantly higher than their pretest scores, and their overall satisfaction with the lessons was rated at a high level (Mean = 4.11, SD = 1.06). These results indicate that integrating the 5W1H questioning technique with mind mapping effectively enhanced Grade 5 students' ability to analyze and organize textual information, leading to improved reading comprehension and positive learning attitudes. The extremely large effect suggests that the integration of structured questioning and visual mapping not only produced statistically significant gains but also resulted in meaningful and educationally important improvements in students' reading comprehension.

The results are consistent with previous research emphasizing the value of both the 5W1H technique and mind mapping in promoting comprehension and retention. Kesik and Bas (2022) reported that the 5W1H model improved reading speed, accuracy, and attitude toward reading among primary students. Similarly, Chanwiwattana et al. (2024) found that CLIL integrated with 5W1H significantly enhanced secondary students' reading and summary writing performance. Li (2025) also demonstrated that applying 5W1H analysis in reading instruction cultivated deeper textual understanding and interpretive skills. In parallel, Fernández Fernández and Fonseca-Mora (2022) confirmed that mind-mapping techniques strengthened comprehension by visually linking main ideas and supporting details, while Sundari and Daulay (2024) and Zamrizal (2022) found significant comprehension gains through semantic mapping. Therefore, the current study's results reinforce earlier findings that both questioning-based and mapping-based approaches can enhance reading comprehension when effectively combined in a single instructional framework.

From a theoretical perspective, the effectiveness of the 5W1H–Mind Mapping technique can be explained through constructivist and cognitive learning theories. According to Piaget (1971) and Vygotsky (1987), learners construct knowledge through active engagement and interaction with content. The 5W1H component stimulates analytical questioning and the connection of new information with prior knowledge, while mind mapping facilitates the cognitive organization of ideas into meaningful structures. These processes align with the information-processing model of learning, which posits that repeated rehearsal and elaboration strengthen memory encoding and retrieval. Moreover, by allowing students to visualize textual relationships and summarize information in their own words, the integrated approach supports metacognitive regulation, enabling learners to plan, monitor, and evaluate their comprehension strategies.

Table 3: Students' satisfaction toward learning through the 5W1H–Mind Mapping technique (N = 33)

Item	Mean	SD	Level
1. I enjoyed learning through 5W1H with mind mapping because I could participate actively.	4.12	0.91	High
2. The classroom environment supported my learning.	4.06	0.85	High
3. I became more confident in expressing my opinions.	4.15	1.05	High
4. The instructional media were interesting.	4.33	0.94	High
5. The reading materials used were engaging.	4.30	0.94	High
6. I did not feel bored while practicing comprehension activities.	3.67	1.36	Moderate
7. I understood the steps of reading comprehension more clearly.	4.33	0.84	High
8. I felt proud when summarizing ideas in my own words.	3.61	1.58	Moderate
9. I could apply what I learned to daily life.	4.27	1.21	High
10. I was happy to join the classroom activities.	4.27	0.96	High
Overall	4.11	1.06	High

Students' high satisfaction further reflects the principles of humanistic learning theory, emphasizing learner autonomy, emotional engagement, and intrinsic motivation. When students actively question, visualize, and discuss meaning, they experience ownership of learning, which fosters confidence and enjoyment. These affective benefits correspond to findings by Chanwiwattana et al. (2024), who reported that learners found such strategies motivating and enjoyable.

In summary, integrating the 5W1H questioning framework with mind mapping offers a balanced instructional model that enhances both the cognitive and affective dimensions of reading. It supports comprehension development through structured inquiry and visual synthesis while promoting a positive classroom atmosphere that values participation and creativity.

6. Conclusion

This study investigated the effectiveness of the 5W1H learning management technique integrated with mind mapping in developing reading comprehension achievement among Grade 5 Thai students. The findings showed that the learning management plans achieved an efficiency level of 88.58/81.00, exceeding the 80/80 criterion. Students' post-test reading comprehension scores were significantly higher than their pretest scores, and their overall satisfaction with the lessons was at a high level. These results confirm that the integration of 5W1H questioning and mind-mapping visualization can effectively enhance students' ability to identify main ideas, summarize content, and connect textual information, while also promoting engagement and positive attitudes toward learning.

Despite the positive findings, this study has several limitations that should be acknowledged. First, the research employed a one-group pretest–post-test design without a control group, which limits internal validity and restricts the ability to make strong causal inferences. Although this design is commonly used in classroom-based instructional development research to examine feasibility and preliminary effectiveness, future studies should incorporate experimental or quasi-experimental designs with comparison groups to strengthen causal interpretation. Second, the sample consisted of only 33 Grade 5 students from a single municipal school, which constrains the generalizability of the findings. The results should therefore be interpreted as context-specific rather than representative of all Thai primary students. Third, the intervention was implemented over a relatively short instructional period of twelve hours, which may not fully capture the long-term impact of the 5W1H–Mind Mapping approach on reading comprehension development. Finally, the study focused solely on reading comprehension achievement and students' satisfaction; other learning outcomes, such as critical reading, writing performance, or long-term retention, were not examined.

Despite these limitations, the findings offer important pedagogical implications for Thai primary education. The results suggest that integrating structured questioning through the 5W1H technique with visual organization via mind mapping can serve as an effective instructional framework for promoting active engagement, analytical thinking, and meaningful comprehension among young learners. Thai language teachers may adopt this integrated approach as a practical strategy to move beyond teacher-centered reading instruction and support learner-centered, constructivist classrooms. For curriculum developers and school administrators, the 5W1H–Mind Mapping model provides a flexible framework that can be adapted to different text types, grade levels, and learning contexts. Future research should expand the sample size across multiple schools or regions, examine the long-term effects of the approach, and explore its application to other language skills such as writing, speaking, or integrated literacy development. Such investigations would further clarify the instructional value and scalability of the 5W1H–Mind Mapping learning management technique in diverse educational settings.

List of abbreviations

5W1H	Who, what, when, where, why, and how
B.E.	Buddhist era
CLIL	Content and language integrated learning
E_1	Process efficiency
E_1/E_2	Efficiency index
E_2	Product efficiency
IOC	Item–objective congruence
N	Number of participants (sample size)
SD	Standard deviation
d	Effect size (Cohen's d)
df	Degrees of freedom
p	Probability value (significance level)
r	Reliability coefficient
t	t-value (t-test statistic)
α	Cronbach's alpha

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Compliance with ethical standards

Ethical considerations

The study adhered to basic ethical principles in educational research. Participation in the study was voluntary, and all participants were informed about the purpose of the research before data collection. Informed consent was obtained from the students and their guardians. The questionnaire used in this study was a satisfaction questionnaire and did not involve any sensitive or harmful content. Participants' responses were kept confidential and

used solely for research purposes. No personal identifying information was collected, and anonymity was ensured throughout the study.

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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