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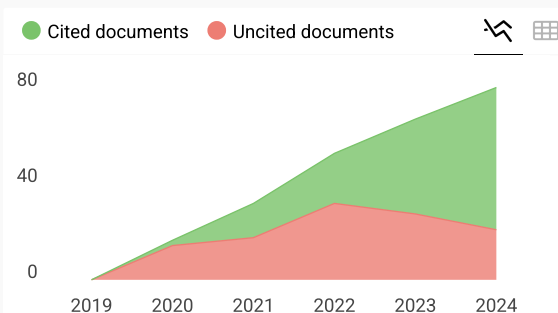
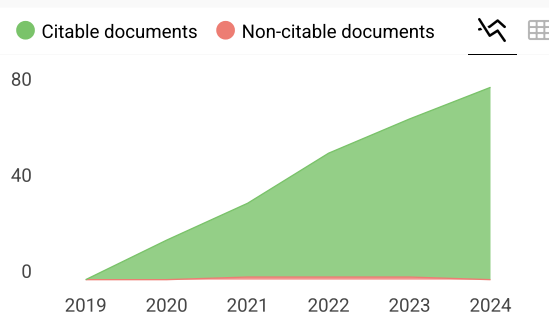
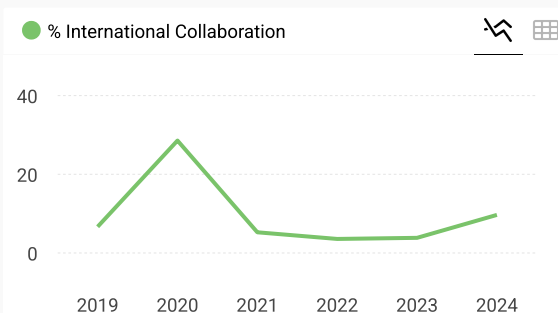
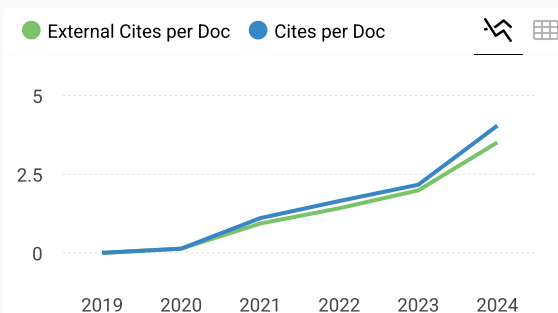
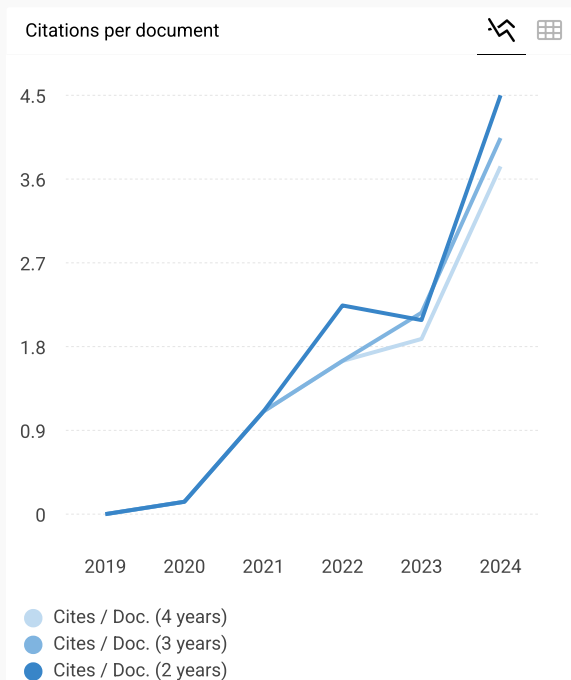
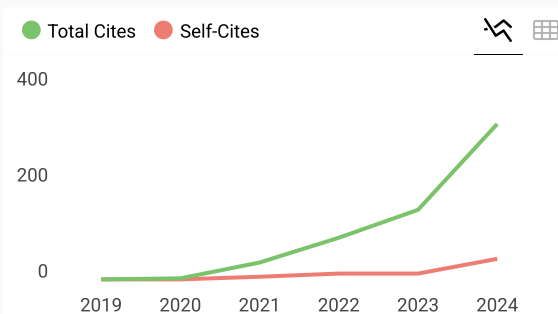
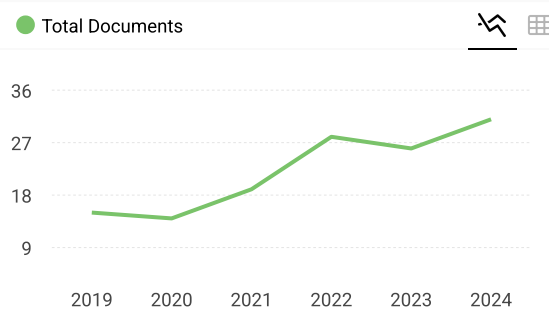
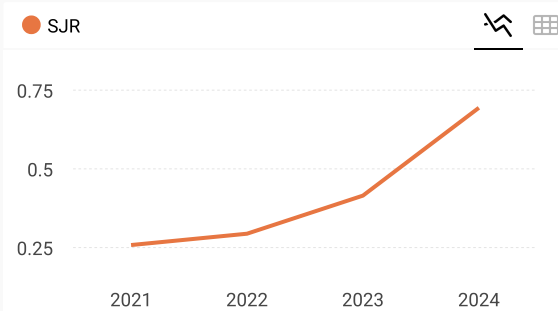
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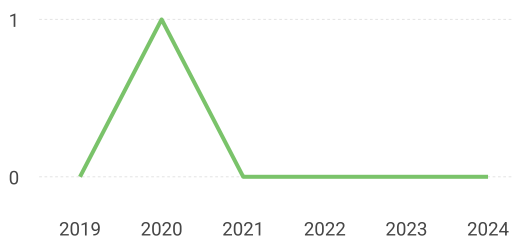
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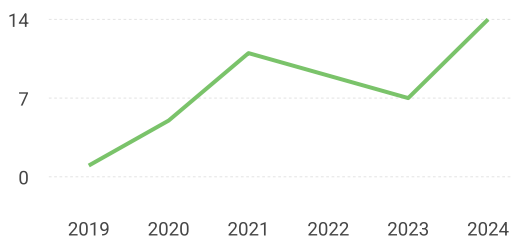
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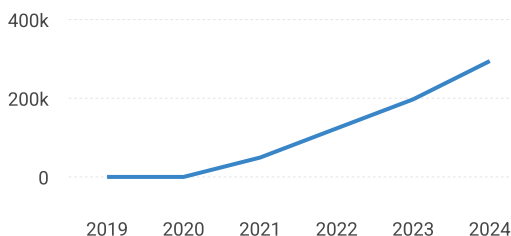
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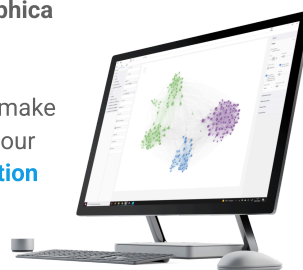
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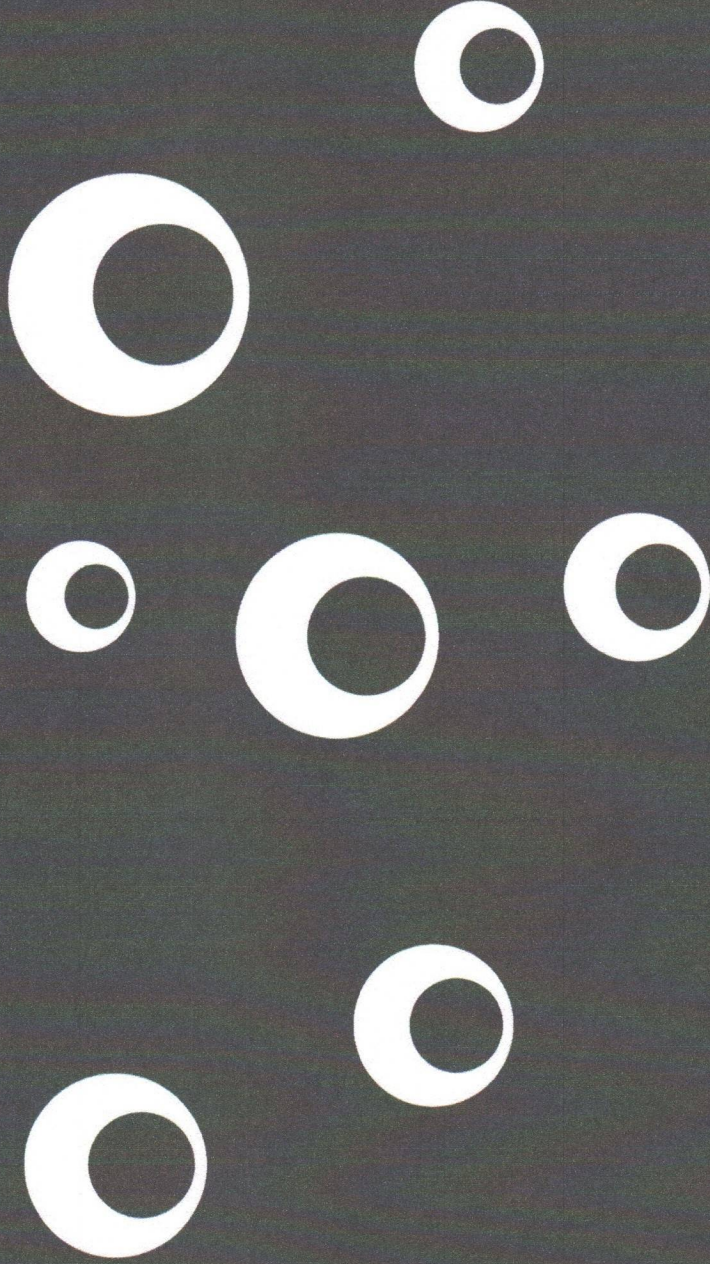
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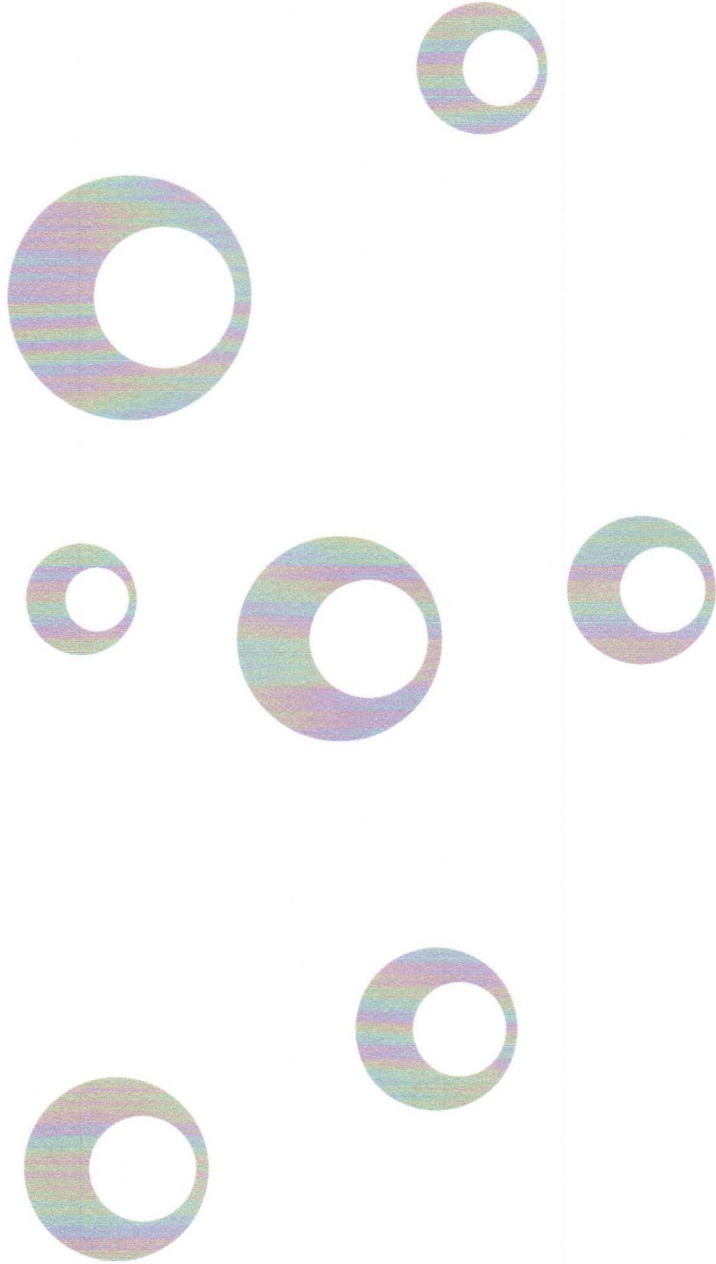
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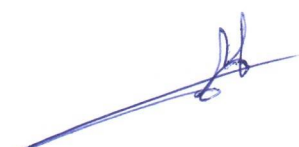
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Developing a Model to Enhance Teachers' Active Learning Instructional Management in Central Northeastern Thailand

Autthapon Intasena^{ID}, Thussaneewan Srimunta^{ID}, Nattapon Yotha^{ID}

Abstract

Background/purpose: This study aimed to develop and implement a learning management model to enhance teachers' active instructional management abilities.

Materials/methods: The study was divided into four phases, including (1) Confirmatory Factor Analysis (CFA) to identify key components, (2) needs analysis to determine teachers' challenges and requirements, (3) model development through expert evaluation and a pilot study, and (4) implementation of the model to assess its effectiveness. The participants included 70 educators in the needs analysis phase, five experts and 30 teachers in the model development phase, and 40 teachers in the implementation phase.

Results: The results showed that the model significantly improved teachers' knowledge and instructional management abilities. Additionally, the model received high ratings regarding appropriateness, feasibility, and satisfaction, indicating its effectiveness for teacher professional development.

Conclusion: These findings suggest that active learning instructional management should be a core competency in teacher training programs and policies, and further research should explore its long-term impact in diverse educational settings.

1. Introduction

It could be claimed that a teacher's ability to manage effective learning is just as crucial as their mastery of content knowledge (Isuku, 2018; Klattenberg, 2021; Oliver & Reschly, 2007). While subject expertise forms the foundation of teaching, the way learning is structured, facilitated, and adapted to students' needs determines its true impact. Moreover, the dynamic characteristics of 21st-century education demand more than traditional lecture-based instruction, as class management requires interactive and student-centred approaches that put learners in meaningful and supportive learning (Brown & Green, 2015). Effective learning management, therefore, enables teachers to create environments where students are not mere recipients of knowledge but active participants in constructing their own learning. This shift is crucial for developing critical thinking, problem-solving skills, and lifelong learning - important qualifications for students to grow in an ever-evolving world (Garrett, 2008).

From a theoretical perspective, active learning can be seen as an instructional approach that enhances students' cognitive abilities, problem-solving skills, and capacity to apply knowledge meaningfully (Lutsenko & Lutsenko, 2022; Rollins, 2017). It shifts from passive learning that only relied on memorization to stimulating learners to participate in content learning through analysis, synthesis, and self-evaluation. In practice, this could result in the circumstance that classrooms are designed to maximize student participation, creating an environment where learners actively construct their own understanding rather than waiting for teachers to provide information (Fornari & Poznanski, 2021). Learning activities should encourage interaction, collaboration, and critical thinking, allowing students to explore concepts, integrate knowledge, and take responsibility for their learning (Rettig & Canady, 2013).

Therefore, it is essential for teachers to equip themselves with the necessary knowledge and skills to implement active learning instruction. To demonstrate, teachers should develop their understanding in active instructional methods such as Problem-Based Learning (PBL), Project-Based Learning (PjBL), and Case-Based Learning (CBL), in terms of both theoretical foundations and practical applications (Ishii, 2017). Additionally, they must be proficient in a variety of teaching techniques that support these methods. Beyond selecting appropriate methods, they should be able to effectively integrate these strategies into their classrooms as lessons should be managed to be interactive, meaningful, and student-centered (Neves et al., 2021). Moreover, the ability to design and administer authentic assessments and provide constructive feedback could lead to accurate measurement of students' learning progress (Nguyen et al., 2021).

However, developing these attributes is a demanding task for teachers, requiring significant time and effort, both during their teacher education and throughout their professional careers. In the Thai educational context, passive learning has long been a subject of criticism, deeply rooted in cultural perceptions of teachers as the sole dispensers of knowledge—figures of authority who are not to be questioned (Durongkaveroj, 2023; Oeamoum & Sriwichai, 2020; Sanguanngarm, 2020). This has fostered a learning culture centered on listening and memorization rather than practicing thinking and collaborative engagement in class.

Additionally, limited budgets, especially in rural schools, make it even more challenging to implement active learning strategies. Furthermore, national education policies often emphasize standardized test scores, pushing teachers to rely on lecture-based instruction that prioritize covering test content rather than student progress (David, 2018). As a result, many teachers default to traditional teaching methods that focus on immediate academic performance rather than long-term skill development. Given these challenges, it is crucial to provide teachers with the necessary support, resources, and professional development to transition toward more active and student-centred learning environments.

Therefore, the Thai education system faces ongoing challenges regarding teacher-centred instruction, passive learning environments, and limited professional development opportunities, particularly in rural and under-resourced schools. Despite national education policies promoting innovation and learner-centred approaches, many teachers continue to rely on traditional lecture methods due to deep-rooted cultural norms, insufficient training, and pressure to prioritise test results. Active learning has been recognized as a promising approach to address these issues by promoting student engagement, critical thinking, and autonomy in the learning process. For these reasons, a model for enhancing teachers' ability to manage active learning classrooms should be developed. Such a model would help teachers overcome challenges related to traditional learning culture, resource limitations, and policy-driven pressures, ensuring that they can foster meaningful learning experiences. Given that the developing process includes needs analysis of teachers to understand their current instructional practices, challenges, and areas for improvement, the model has the potential to provide practical guidelines, professional development opportunities, and structured support, enabling teachers to confidently integrate active learning methods into their classrooms and ultimately enhance students' learning outcomes.

2. Literature Review

2.1. Learning Management Ability

Learning management ability is a crucial competency for teachers. Encompassing the skills needed for effective planning, implementing, and assessing the process of learning and instruction. Scholars (e.g., Brown & Green, 2015; Isuku, 2018; Klattenberg, 2021) have discussed processes involved in effective learning management. To summarize, the process begins with thorough preparation, which includes designing lesson plans that align with learning objectives, selecting appropriate teaching methods and strategies, and considering the most effective ways to assess student understanding. In other words, teachers must have a strong foundation in instructional design to construct lessons that can to engage students actively while addressing diverse learning needs (Brown & Green, 2015). This phase also involves developing content knowledge and staying updated with innovative pedagogical approaches that enhance learning experiences.

Beyond preparation, learning management ability extends to the practical application of teaching strategies in the classroom. Teachers must be capable of introducing lessons to guide their students through learning activities and managing classroom interactions to encourage class participation (Fornari & Poznanski, 2021). Classroom management skills are also essential in maintaining a positive and productive learning environment. The ability to adapt to unexpected challenges and modify instructional strategies in real-time is also a key aspect of successful learning management.

Assessment and feedback provision form another critical component of learning management ability (Brookhart & Nitko, 2018; Gupta et al., 2007; McTighe et al., 2021). In this process, teachers should be able to utilize a variety of assessment methods to measure student progress. Both formative and summative assessments should be used to reveal authentic learning outcomes. Effective feedback assists students in understanding their strengths and areas for improvement and guides them toward more intensive learning. Additionally, assessment should go beyond rote memorization, emphasizing critical thinking, problem-solving, and real-world application of knowledge.

Finally, learning management involves reflection and evaluation of classroom outcomes (Shandomo, 2010; Slade et al., 2019). It is important for teachers to analyze the effectiveness of their instruction to identify areas that worked well and aspects that need improvement. This reflective process often requires research skills which allow teachers to explore evidence-based strategies for addressing challenges and refining their teaching practices. Via the processes of self-reflection, peer

collaboration, and action research, teachers can continuously develop their career progress to ensure that they can enhance their learning management abilities and create more effective and engaging classroom experiences.

2.2. Active Learning

Generally, active learning can be considered an instructional approach that emphasizes student engagement, critical thinking, and meaningful interaction with the learning material. This is a contrast to the traditional lecture-based methods in the way that active learning requires students to actively participate in constructing knowledge rather than passively receiving information. According to Lutsenko & Lutsenko, (2022), collaboration, discussion, problem-solving, and experiential activities are the roots of active learning as they help students develop theoretical knowledge and practical skills. Moreover, active learning provides learners greater independence and responsibility which should help them take ownership of their learning while applying knowledge in solving problems in authentic situations (Fornari & Poznanski, 2021).

In detail, scholars (Fornari & Poznanski, 2021; Lutsenko & Lutsenko, 2022; Rettig & Canady, 2013; Rollins, 2017) have presented several key components that contribute to the success of active learning. Most related documents mention participants as active learning requires students to be involved in the learning process through discussions, group work, hands-on activities, or problem-solving tasks. This led to collaboration and interaction among class components. Cooperative learning is one way to let students work together to construct knowledge rather than competing against one another. In addition, the simulation of life-related problems where students are encouraged to develop their thinking skills is essential. These learning activities are challenges for students to analyze, synthesize, and evaluate information, encouraging higher-order thinking skills. One of the most mentioned topics in active learning can be role shift in class. Instead of being the sole source of knowledge, the teachers shift their roles into facilitators who guide and support their learners. Moreover, the use of technology could also contribute to an active learning class. Digital tools, multimedia, and interactive learning materials can enhance student engagement and access to diverse learning experiences.

2.3. Use of Development Model in Teacher Professional Development

Therefore, developing active learning management ability requires a method that could deal with the complexity of the qualification. A development model in teacher professional development refers to a structured framework designed to enhance teachers' knowledge, skills, and instructional effectiveness through systematic and research-based approaches (Lasley et al., 2001). It serves as a blueprint for improving teaching practices via identifying specific needs, designing targeted activities, and providing ongoing support to educators. One of the key advantages of developing such a model is that it is typically based on a thorough needs analysis – the process that identifies teachers' challenges in their instructional practices (Lasley et al., 2001). This is to ensure that teachers receive training that is relevant to their subject matter while also equipping them with hands-on strategies for classroom application. Moreover, an effective development model consists of assessment and feedback processes to refine teachers' skills and adapt to evolving educational demands. Professional development with teachers' real-world needs plays an essential role for a well-designed model in improving teaching effectiveness and promoting long-term educational improvements.

2.4. Previous Studies

Research on teacher professional development (e.g., Aras, 2021; Imants & Van der Wal, 2020; Kerr, 2020; Kong & Lai, 2022; Vanassche et al., 2021; Zimmer & Matthews, 2022) revealed the positive impacts of structured models on several areas of teacher professional development. In detail, Aras (2021) found that action research was used as an effective model for inquiry-based teaching

development. The author suggested that the process of developing action research allowed educators to investigate their own classrooms, identify instructional challenges, and develop context-specific solutions. Similarly, Imants and Van der Wal (2020) proposed a teacher agency model in professional development and school reform which emphasized the importance of contextual factors, collaboration, and school-wide support in empowering teachers to implement new teaching strategies effectively. Kerr (2020) examined co-teaching as a model for teacher development in outdoor science and environmental education. The study found that collaborative teaching experiences across different grade levels helped teachers refine their instructional techniques and gain hands-on experience in active learning methods. Kong and Lai (2022) proposed a computational thinking teacher development framework guided by the TPACK (Technological Pedagogical Content Knowledge) model that supported the idea that a development model should address both conceptual understanding and practical teaching strategies to prepare educators for modern classrooms. Vanassche et al. (2021) introduced a conceptual model of teacher educator development involving structured support, opportunities for self-reflection, and collaboration among educators. Lastly, Zimmer and Matthews (2022) explored a virtual coaching model to enhance teachers' digital learning competencies. In this study, online professional development programs can be effective when they include personalized coaching, interactive learning experiences, and practical applications.

The use of models in developing various aspects of teachers' professional development has been widely explored. However, previous studies often lack construct validity analysis, which is essential for ensuring that the proposed models accurately measure what they intend to develop. Additionally, many studies do not specifically identify teacher groups based on particular educational contexts, making it difficult to tailor professional development models to the unique needs of educators in specific regions or subject areas.

To address these gaps, the current study will not only conduct a thorough needs analysis to design an effective learning management model but will also incorporate Confirmatory Factor Analysis (CFA) to establish the construct validity of the model. CFA offers ability to statistically verify whether the theoretical structure of a model aligns with empirical data, which could ensure that the development framework is both reliable and generalizable. This study aims to create a more detailed and evidence-based professional development model that is both practically relevant and theoretically sound for enhancing teachers' instructional management abilities. The purposes of the study were to conduct a confirmatory factor analysis (CFA) to examine the key components of teachers' instructional management ability, to explore the challenges and needs in learning management for enhancing teachers' active learning instructional management ability in central northeastern Thailand, to develop a learning management model that strengthens teachers' active learning instructional management ability in central northeastern Thailand, and to evaluate the effectiveness of the proposed learning management model in enhancing teachers' active learning management ability in central northeastern Thailand.

3. Methodology

3.1. Research Design

The study was conducted using a model development approach, which involved the following processes: (1) conducting a confirmatory factor analysis (CFA) to examine the key components of teachers' instructional management ability, (2) exploring the challenges and needs in learning management to enhance teachers' active learning instructional management ability in central northeastern Thailand, (3) developing a learning management model to strengthen teachers' active learning instructional management ability, and (4) evaluating the effectiveness of the proposed

model in improving teachers' active learning management ability in central northeastern Thailand. The study was divided into 4 phases which can be seen below.

Table 1. Research Design

Research Phase	Data Type	Analysis Method	Measurement Tool
Phase 1: Confirmatory Factor Analysis (CFA)	Quantitative	Confirmatory Factor Analysis (CFA)	Instructional Management Ability Questionnaire
Phase 2: Needs and Challenges Analysis	Quantitative	Descriptive Statistics (Mean, SD)	Challenges and Needs in Learning Management Questionnaire
Phase 3: Model Development (Expert Evaluation)	Qualitative & Quantitative	Content Validity (IOC), Descriptive	Model Evaluation Form (Checklist & Rating Scale by Experts)
Phase 4: Model Implementation (Pilot Study)	Quantitative	Paired Samples t-test	Knowledge Test, Competency Assessment, and Satisfaction Questionnaire

3.2. Confirmatory Factor Analysis (CFA) of Teachers' Instructional Management Ability

The first phase of this study aimed to examine and validate the key components of teachers' active learning management ability in central northeastern Thailand using Confirmatory Factor Analysis (CFA). This phase began with an extensive review of academic literature, theoretical frameworks, and previous research to identify the essential variables related to instructional management ability. After defining these variables, CFA was conducted to ensure the validity and reliability of the proposed model.

To achieve this, Model Fit Indices of Chi-square (χ^2), Comparative Fit Index (CFI), Goodness of Fit Index (GFI), and Root Mean Square Error of Approximation (RMSEA) were used to assess how well the proposed model aligned with empirical data. Additionally, multicollinearity testing was conducted using Pearson's correlation coefficient, ensuring that variables were not excessively interrelated (values below 0.80 were required). Furthermore, Standardized Factor Loadings were examined, with all factor loadings above 0.40, indicating that the selected variables significantly contributed to the model's structure.

3.3. Analysis of Challenges and Needs in Developing a Model to Enhance Teachers' Active Learning Instructional Management Ability in Central Northeastern Thailand

3.3.1. Participants

The population for this study consisted of school administrators, educational supervisors, and teachers from schools under the jurisdiction of the Office of the Basic Education Commission (OBEC) in the central northeastern region of Thailand, covering four provinces: Roi Et, Khon Kaen, Maha

Sarakham, and Kalasin. The total population included 3,071 school administrators, 281 educational supervisors, and 29,256 teachers. The sample group of the second phase study was selected through purposive sampling. The final sample comprised 10 school administrators, 10 educational supervisors, and 50 teachers, totaling 70 participants. The purposive sampling criteria for participant selection consider direct Experience in Instructional Management, engagement with active learning implementation, and involvement in educational development.

3.3.2. Instruments

3.3.2.1. Questionnaire for Challenges and Needs in Learning Management to Enhance Teachers' Active Learning Instructional Management Ability in Central Northeastern Thailand

The questionnaire was designed to identify the challenges and needs in learning management that impact teachers' ability to implement active learning effectively. It utilized a 5-point rating scale and covered four key aspects of learning management: (1) the design of learning management (8 items), (2) hands-on learning management (4 items), (3) authentic evaluation and assessment (6 items), and (4) the use of technology in learning management (5 items). Each item requires respondents to assess both the challenges they face and their perceived needs for improvement. The questionnaire demonstrated acceptable psychometric properties, including content validity (IOC = 0.60–1.00), item discrimination ($d = 0.439\text{--}0.855$), and high reliability ($\alpha = 0.942$).

3.4. The Development of a Model to Strengthen Teachers' Active Learning Instructional Management Ability

3.4.1 Participants

There were 2 groups of participants in the second phase of the study. The expert panel consisted of five specialists selected to evaluate the proposed learning management model's quality, validity, and feasibility. They were chosen through purposive sampling based on their expertise in instructional management, active learning, and teacher professional development. These experts participated in a connoisseurship seminar, where they critically examined the model's framework, provided insights into its alignment with educational standards, and suggested refinements to enhance its practicality and effectiveness. Additionally, they reviewed the content validity, accuracy, and feasibility of the instructional materials accompanying the model, ensuring that they met high-quality standards before implementation.

The second group of participants consisted of 30 teachers from schools under the Office of the Basic Education Commission (OBEC) in central northeastern Thailand, selected through purposive sampling. Teachers were chosen based on (1) their active engagement or interest in applying active learning strategies, (2) their teaching experience in OBEC-affiliated schools within the target region, and (3) their willingness to implement and provide feedback on the proposed model. These teachers participated in a preliminary study to test the model's effectiveness and provide constructive feedback for model refinement.

3.4.2 Instruments

3.4.2.1. The Assessment of the Active Learning Instructional Management Model

The assessment followed a structured process to ensure its quality and appropriateness. The evaluation tool was designed in three sections: (1) general information about the experts, (2) assessment of the draft model, and (3) additional comments and suggestions. The second section used a 5-point rating scale to evaluate the model's completeness, accuracy, alignment, and appropriateness, ranging from 1 (needs significant revision) to 5 (highly appropriate and well-structured). The assessment form demonstrated acceptable content validity (IOC = 0.60–1.00).

3.4.2.2. Assessment of the Appropriateness and Feasibility of the Instructional Model Supporting Documents

An evaluation tool was developed to assess the appropriateness and feasibility of the supporting documents for the Active Learning instructional management model. The assessment questionnaire was structured into three sections: (1) general information of experts, (2) evaluation of the draft curriculum, and (3) additional comments and suggestions. The second section utilized a 5-point rating scale, where 1 indicated the lowest level of appropriateness and feasibility, and 5 indicated the highest. The assessment form demonstrated acceptable content validity (IOC = 1.00).

3.4.2.3. The Assessment of the Knowledge and Competency Test on Teachers' Learning Management

The test was designed to be a four-part multiple-choice test with 45 items and was developed to measure teachers' knowledge and competency in active learning instructional management. The test covered theoretical concepts, instructional strategies, and learning management approaches related to active learning. After expert review, 30 items were selected for actual use, ensuring coverage across all key learning units. The assessment demonstrated acceptable psychometric properties, including content validity (IOC = 0.60–1.00), item discrimination ($d = 0.20-1.0$), and difficulty ($b = 0.21-0.49$).

3.4.2.4. The Active Learning Instructional Management Competency Assessment

A Likert-scale questionnaire was developed to assess teachers' active learning instructional management competency, with five proficiency levels ranging from 1 (lowest) to 5 (highest). The assessment consisted of two sections: (1) general information of respondents and (2) evaluation of instructional management competency. The assessment demonstrated acceptable psychometric properties, including content validity (IOC = 0.60–1.00), item discrimination ($d = 0.491 - 0.847$), and reliability ($\alpha = 0.897$).

3.5. The Implementation of the Model to Strengthen Teachers' Active Learning Instructional Management Ability

3.5.1. Participants

The participants for Phase 4 consisted of teachers from schools in central northeastern Thailand under the jurisdiction of the Office of the Basic Education Commission (OBEC) during the 2024 academic year. The total population included 29,256 teachers. A sample of 40 teachers was selected using purposive sampling during the second semester of the 2024 academic year. The selection criteria ensured that participants were actively involved in teaching and had experience or interest in applying active learning strategies.

3.5.2. Instruments

3.5.2.1. Model to Enhance Teachers' Active Learning Management in Central Northeastern Thailand

The model was developed to enhance teachers' active learning instructional management abilities in central northeastern Thailand. It was designed with key components, including theories and principles of active learning, model objectives, teaching and learning processes, social system, response mechanisms, and a supportive system, ensuring a comprehensive framework for effective as shown in Table 1.

Table 2. The Components of the Model

Model components	Details
Theories and principles of active learning	1. Theories and Concepts of Constructivist Learning 2. Theories and Concepts of Multiple Intelligences Learning 3. Theories and Concepts of Active Learning Management 4. Concepts of Learning Management Design 5. Concepts of the Basic Education Core Curriculum
Objective	Enhancing Teachers' Instructional Management Ability in Central Northeastern Thailand
Teaching and learning processes	1. Preparation 2. Engagement 3. Reflection 4. Application and Evaluation
Social system	Teachers: Teachers must be aware of the importance of learning and prioritize designing challenging learning situations that align with students' abilities. These carefully structured experiences help develop students' learning skills, encouraging them to engage in critical thinking, synthesis, and reflection. Students can construct new ideas through this process, fostering more profound understanding and intellectual growth. Students: Learners play an active role in their education by engaging fully in the learning process, interacting with peers, exchanging knowledge, and respecting diverse perspectives. Active learning also requires students to collaborate in problem-solving, fostering a sense of shared responsibility and ultimately leading to successful achievement of learning objectives.
Response mechanisms	Active Learning plays a crucial role in enhancing students' analytical thinking and learning processes. Teachers should provide creative and context-appropriate responses that align with each student's needs. This includes offering constructive feedback that not only supports students' development but also motivates them to engage in self-directed learning and collaborate effectively. By fostering an interactive and supportive learning environment, teachers can maximize students' learning potential and ensure meaningful engagement in the learning process.

Model components	Details
Supportive systems	The use of diverse instructional media and activities allows students to access information and resources quickly and conveniently. Additionally, it helps create a varied and enriched learning experience, enabling students to engage with content through multiple approaches. This enhances their understanding, retention, and application of knowledge, making learning more dynamic and effective.

The development of the model includes experts' discussion a panel and preliminary study as discussed in the previous section. The impact of the model was examined using The Active Learning Instructional Management Competency Assessment discussed earlier in phase 3.

3.5.2.2. Satisfaction Questionnaire on the Learning Management Model

A satisfaction questionnaire was developed to assess teachers' perceptions of the Active Learning instructional management model in enhancing their teaching abilities. The questionnaire was designed as a Likert-type rating scale with five levels, ranging from 1 (least satisfied) to 5 (most satisfied). It consisted of 15 items, covering various aspects of the model's effectiveness and applicability. The assessment form demonstrated acceptable content validity (IOC = 06-1.0), discrimination (d= 0.987-0.956) and reliability (α = 0.946).

3.6. Data Collection and Data Analysis

The data collection process was conducted during the 2024 academic year and followed a structured sequence. It began with a review of theories, principles, and related studies to identify key components of active learning instructional management. These components were then validated through Confirmatory Factor Analysis (CFA) before being used to assess teachers' challenges and needs. Based on this analysis, a draft model was developed and refined through an expert discussion panel. A preliminary study was conducted to test the model's feasibility, followed by its full implementation to develop teachers' instructional management abilities. The model's effectiveness was evaluated by comparing teachers' pre- and post-assessments and measuring their satisfaction with the model.

The collected data were analysed using CFA, mean scores, standard deviation, and a paired samples t-test to assess the impact of the model. The interpretation criteria for the five-point rating scale were as follows:

- 4.51 – 5.00 = Very High
- 3.51 – 4.50 = High
- 2.51 – 3.50 = Average
- 1.51 – 2.50 = Low
- 1.00 – 1.50 = Very Low

4. Results

4.1. Confirmatory Factor Analysis on Components of Active Learning Instructional Management

We conducted first-order and second-order Confirmatory Factor Analysis (CFA) based on active learning instructional management literature. The identified components included Lesson Planning,



Learning Process Management, Learning Assessment, Classroom Management, Self-Development, and Communication Skills. The results of the second-order CFA are presented below.

Table 3. Second-order Confirmatory Factor Analysis (CFA) of active learning instructional management

Second-order Confirmatory Factor Analysis (CFA)							
1. Lesson Planning	1.00	0.92	0.01	111.56	0.000	0.85	-
2. Learning Process Management	1.61	0.95	0.01	166.74	0.000	0.91	-
3. Learning Assessment	2.20	0.89	0.00	402.57	0.000	0.82	-
4. Classroom Management	1.53	0.94	0.01	163.44	0.000	0.88	-
5. Self-Development	1.59	0.97	0.01	200.24	0.000	0.95	-
6. Communication Skills	1.01	0.87	0.00	286.56	0.000	0.81	-
7. Academic Leadership	1.90	0.90	0.00	370.80	0.000	0.87	-
$\chi^2 = 4.80$, $df = 4$, $\chi^2/df = 1.20$, $p\text{-value} = 0.985$, $CFI = 1.00$, $TLI = 1.00$, $RMSEA = 0.01$, $SRMR = 0.02$							

The results of the second-order Confirmatory Factor Analysis (CFA) for active learning instructional management indicate that all seven components—Lesson Planning, Learning Process Management, Learning Assessment, Classroom Management, Self-Development, Communication Skills, and Academic Leadership—demonstrate strong factor loadings and statistical significance ($p < 0.001$). The model fit indices confirm an excellent model fit with $\chi^2 = 4.80$, $df = 4$, $\chi^2/df = 1.20$, $p\text{-value} = 0.985$, $CFI = 1.00$, $TLI = 1.00$, $RMSEA = 0.01$, and $SRMR = 0.02$, indicating that the proposed structure aligns well with the empirical data. These findings suggest that the identified components effectively represent active learning instructional management, with Self-Development (0.95), Learning Process Management (0.91), and Classroom Management (0.88) showing particularly high contributions to the construct validity. It can be interpreted that these seven elements are critical to strengthening teachers' instructional management in active learning environments. The results of this CFA validation provide a strong foundation for the development of the proposed learning management model, as shown below.

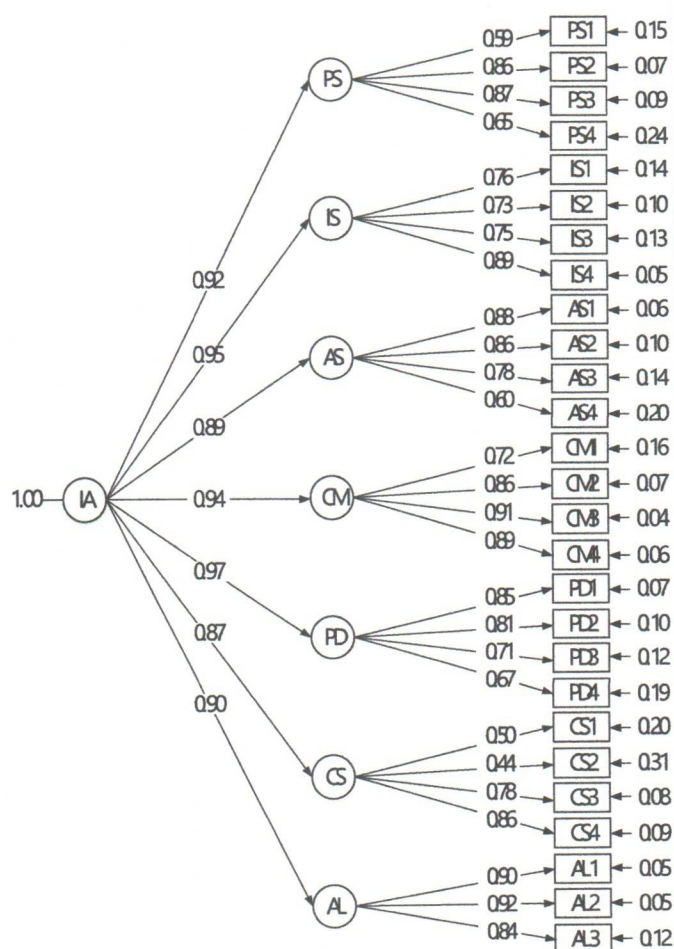


Figure 1. Confirmatory Factor Analysis (CFA) of Active Learning Instructional Management

4.2. An Analysis on Challenges and Needs for Developing Teachers' Active Learning Instructional Management Abilities

Table 4. Challenges and Needs for Developing Teachers' Active Learning Instructional Management Abilities

Active learning components	Challenges			Needs		
	$\bar{x}$	S.D.	Level	$\bar{x}$	S.D.	Level
Learning Management Design	4.62	0.48	Very high	4.72	0.48	Very high
Hands-on Learning Management	4.63	0.48	Very high	4.83	0.41	Very high
Authentic Assessment and Evaluation	4.70	0.45	Very high	4.75	0.44	Very high
Use of Media and Technology in Learning Management	4.70	0.45	Very high	4.84	0.38	Very high
Overall	4.66	0.47	Very high	4.78	0.43	Very high

The findings indicate that both challenges and needs in active learning instructional management were rated at a very high level across all components. Teachers reported facing significant challenges in Learning Management Design ($\bar{x} = 4.62$, S.D. = 0.48), Hands-on Learning Management ($\bar{x} = 4.63$, S.D. = 0.48), Authentic Assessment and Evaluation ($\bar{x} = 4.70$, S.D. = 0.45), and the Use of Media and Technology in Learning Management ($\bar{x} = 4.70$, S.D. = 0.45). Similarly, the need for development in these areas was also rated at a very high level, with the highest demand in the Use of Media and Technology ($\bar{x} = 4.84$, S.D. = 0.38) and Hands-on Learning Management ($\bar{x} = 4.83$, S.D. = 0.41). Therefore, it is crucial to develop a structured learning management model that directly addresses these challenges and meets teachers' needs.

4.3. The Development of a Model to Strengthen Teachers' Active Learning Instructional Management Ability

Table 5. Experts' Discussion Panel

No.	Aspects of evaluation	Appropriateness		
		$\bar{x}$	S.D.	Interpretation
1	Theories and principles of active learning	4.80	0.40	Very high
	1.1 Clearness of theories and principles of active learning	4.80	0.40	Very high
	1.2 Alignment of theories and principles of active learning	4.80	0.40	Very high
	1.3 Importance of Theories and principles of active learning	5.00	0.00	Very high
2	Model objectives	5.00	0.00	Very high
	2.1 Enhancing Teachers' Instructional Management Ability in Central Northeastern Thailand	5.00	0.00	Very high
3	Teaching and learning processes	4.90	0.20	Very high
	3.1 Preparation	5.00	0.00	Very high
	3.2 Engagement	4.80	0.40	Very high
	3.3 Reflection	5.00	0.00	Very high
	3.4 Application and Evaluation	4.80	0.40	Very high
4	Social systems	5.00	0.00	Very high
5	Responsive mechanism	4.80	0.40	Very high
6	Supportive systems	5.00	0.00	Very high
	Average	4.91	0.18	Very high

The expert evaluation results indicate that the learning management model was rated at a very high level of appropriateness across all components. Expert evaluators consistently rated each aspect very high, with key elements such as theories and principles of active learning ($\bar{x} = 4.80$, S.D. = 0.40), model objectives ($\bar{x} = 5.00$, S.D. = 0.00), teaching and learning processes ($\bar{x} = 4.90$, S.D. = 0.20), and supportive systems ($\bar{x} = 5.00$, S.D. = 0.00) receiving particularly strong validation. The overall average score of 4.91 (SD = 0.18) further supports the model's high level of suitability.

It can be interpreted that the proposed model is well-structured, theoretically sound, and practically applicable for enhancing teachers' instructional management abilities.

Table 6. The Evaluation on Assessment of the Appropriateness and Feasibility of the Instructional Model Supporting Documents

	Evaluation items	appropriateness			feasibility		
		$\bar{x}$	S.D.	Interpretation	$\bar{x}$	S.D.	Interpretation
1	Accuracy and comprehensiveness of content	4.80	0.40	Very high	4.70	0.44	Very high
2	Clarity in explaining learning management steps and processes	5.00	0.00	Very high	5.00	0.00	Very high
3	Applicability to diverse educational contexts	4.80	0.40	Very high	4.80	0.40	Very high
4	Flexibility and adaptability for learners at different levels	4.80	0.40	Very high	4.60	0.49	Very high
5	Systematic organization of content for easy understanding	4.60	0.49	Very high	4.80	0.40	Very high
6	Clear, concise, and easily understandable language	4.60	0.49	Very high	4.80	0.40	Very high
7	Guidelines and strategies for continuously enhancing teachers' learning management abilities	4.40	0.80	High	4.60	0.49	Very high
8	Mechanisms for collecting feedback and continuously improving the document	4.60	0.49	Very high	4.80	0.40	Very high
9	Support for creating a teacher learning community to exchange experiences and best practices	4.80	0.40	Very high	4.80	0.40	Very high
10	Document structure that encourages teachers to design engaging and student-centered learning activities	4.60	0.49	Very high	4.60	0.49	Very high
	Overall	4.70	0.44	Very high	4.75	0.39	Very high

The evaluation of the appropriateness and feasibility of the instructional model supporting documents indicated that both aspects were rated at a very high level. The appropriateness of the documents received an average score of 4.70 (S.D. = 0.44), while the feasibility was rated slightly higher, with an average score of 4.75 (S.D. = 0.39). These results suggest that the supporting documents are well-structured, relevant, and practical for implementation in real educational settings. It can be interpreted that the instructional model supporting documents effectively aligns with the needs of teachers and provides clear, comprehensive guidance.

Table 7. The Effectiveness of the Model at the Preliminary Study Process

Effectiveness	Maximum score	$\bar{x}$	S.D.	%
Process effectiveness (E_1)	300	252.93	4.92	84.31
Product effectiveness (E_2)	30	25.23	2.21	84.11
Effectiveness (E_1/E_2) = 84.31/84.11				

The results show that the participants' average score in the preliminary study during the model accounts for 84.31 % ($\bar{x}$ = 252.93, S.D = 4.92) of the full mark. Meanwhile, the participants' average score in the post-test accounts for 84.11% ($\bar{x}$ = 25.23, S.D. = 2.21) of the maximum score. Therefore, the model's effectiveness (E1/E2) was 84.31/84.11, surpassing the predetermining criteria of 80/80.

Therefore, the model was approved by experts and validated through an experimental pilot study, confirming its appropriateness, feasibility, and effectiveness. Based on these findings, the model can be implemented to enhance teachers' active learning instructional management, ensuring its practical application in real educational settings.

4.4. The Implementation of the Model to Strengthen Teachers' Active Learning Instructional Management Ability

Table 8. Participants Knowledge of Active Learning Instructional Management Before and After the Model

Knowledge of active learning instructional management	n	$\bar{x}$	S.D.	df	t	Sig.
Pre-test	40	19.63	2.52	39	11.22*	0.00
Post-test	40	25.40	1.69			

*p< .05

After implementing the model, the results indicate a significant improvement in participants' knowledge of active learning instructional management. The pre-test mean score ($\bar{x}$ = 19.63, S.D. = 2.52) was significantly lower than the post-test mean score ($\bar{x}$ = 25.40, S.D. = 1.69), $t(39) = 11.22$, $p < .05$. The findings suggest that the implementation of the instructional model effectively contributed to developing teachers' competencies in active learning management.

Table 9. Participants' Active Learning Instructional Management Ability Before and After the Model

Active learning instructional management ability	n	$\bar{x}$	S.D.	df	t	Sig.
Pre-assessment	40	60.20	4.85	39	27.515*	0.00
Post-assessment	40	88.13	4.63			

*p< .05

After implementing the model, the results indicate a significant improvement in participants' active learning instructional management ability. The pre-test mean score ($\bar{x}$ = 60.20, S.D. = 4.85) was significantly lower than the post-test mean score ($\bar{x}$ = 88.13, S.D. = 1.4.63), $t(39) = 27.515$, $p < .05$. The findings suggest that the implementation of the instructional model effectively contributed to developing teachers' active learning instructional management ability.

Table 10. Participants' Satisfaction with the Model

Aspects of Evaluation	$\bar{x}$	S.D.	Level of satisfaction
Learning Management Design	4.76	0.41	Very high
Hands-on Learning Management	4.73	0.45	Very high
Use of Media and Technology in Learning Management	4.82	0.38	Very high
Overall	4.77	0.41	Very high

The results show that participants' satisfaction with the model was rated at a very high level across all aspects. The highest satisfaction was observed in the use of media and technology in learning management ($\bar{x} = 4.82$, S.D. = 0.38), followed by learning management design ($\bar{x} = 4.76$, S.D. = 0.41) and hands-on learning management ($\bar{x} = 4.73$, S.D. = 0.45). The overall satisfaction score ($\bar{x} = 4.77$, S.D. = 0.41) further confirms that participants found the model to be highly effective and appropriate for enhancing active learning instructional management.

5. Discussion

The Confirmatory Factor Analysis (CFA) findings confirmed that Lesson Planning, Learning Process Management, Learning Assessment, Classroom Management, Self-Development, Communication Skills, and Academic Leadership are essential components of active learning instructional management. The model showed strong fit indices, indicating structural validity. These components align with those identified in the international literature. For example, Brown and Green (2015) and Rollins (2017) emphasized lesson planning and classroom management as foundational for facilitating active learning environments, while Fornari and Poznanski (2021) highlighted the role of communication skills and reflective practices in collaborative learning settings. Similarly, Lutsenko and Lutsenko (2022) noted that teacher self-development and leadership contribute significantly to sustained instructional innovation. However, unlike some Western models that emphasize data-driven instruction or tech integration as standalone domains (e.g., Darling-Hammond et al., 2017), the current model integrates those elements under broader, practice-based domains, reflecting the Thai educational context's emphasis on adaptability and holistic learning design. This difference underscores the importance of cultural and contextual relevance in instructional model development.

In addition, the results demonstrated a statistically significant increase in teachers' knowledge and ability to manage active learning classrooms after participating in the model. The pre- and post-test comparison revealed substantial improvement, which aligns with international studies advocating for experiential and needs-based professional development. For instance, Aras (2021) supported the use of action research and inquiry-based design in teacher education, which parallels this study's needs-driven approach. Likewise, Imants and Van der Wal (2020) emphasized teacher agency in professional development—a quality nurtured in this study through hands-on learning and classroom-level adaptation. Moreover, Kerr (2020) found that co-teaching and experiential projects significantly enhance teachers' confidence and instructional adaptability, supporting the results here. The alignment with Kong and Lai's (2022) TPACK-based model, which integrates technology, pedagogy, and content, is also notable, especially considering how media and technology use was included as a dimension in this study's model. However, in contrast to models that rely heavily on digital tools, this study emphasizes balanced, flexible strategies, blending technology with reflective practice to better suit the infrastructure and readiness levels in rural Thai contexts.

Participants also reported very high levels of satisfaction with the model. This reflects the value of grounding model design in needs assessment, a principle supported by Hubbell and Goodwin (2019) and Lasley et al. (2001), who advocate for personalized, teacher-informed development models. Teachers in this study appreciated the experiential learning structure, as it offered them opportunities to practice, reflect, and adapt strategies in contextually relevant ways. The satisfaction levels also align with global research stressing the importance of ownership and contextual fit in teacher training. Notably, Zimmer and Matthews (2022) demonstrated that professional development that is interactive and tailored to teachers' day-to-day realities tends to be more impactful and sustainable. The findings reinforce that when professional development is collaborative, responsive, and embedded in actual practice, it increases not only teacher satisfaction but also long-term application in classrooms.

6. Conclusion

This study developed a learning management model for enhancing teachers' active learning instructional management abilities through a structured process that included Confirmatory Factor Analysis (CFA), needs analysis, expert evaluation, and a pilot study. The model was implemented to develop teachers' instructional knowledge and abilities in using active learning in their instruction. The findings revealed that it was effective in improving both qualifications. Additionally, the model led to high levels of satisfaction signifying its practicality and relevance in real classroom settings.

The results of this study have implications for teacher career development, as it provides a structured framework for enhancing professional teaching practices through active learning strategies. Furthermore, the findings have policy implications, suggesting that active learning instructional management should be considered a fundamental skill for teachers in the 21st century to foster student engagement and critical thinking.

Nevertheless, it cannot be denied that the study has certain limitations, including a relatively small sample size and the lack of a control group, which may affect the generalizability of the results. Future studies could address these limitations by expanding the sample size, incorporating a control group for comparison, and conducting long-term evaluations to assess the sustained impact of the model on teaching practices and student learning outcomes.

Declarations

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