

Enhancing Ability in Classroom Action Research Through the Integrated Learning for Early Childhood Teacher

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Abstract

Enhancing early childhood learning skills is an important process that requires skilled teachers. Classroom action research is a major tool for analyzing, designing, and evaluating learning activities for developing early childhood learning. Learning together, concept mapping, professional learning community are integrated to improve teacher's skills. Therefore, this study aims to investigate the conditions and needs in conducting classroom action research and to develop abilities in classroom research practice through the implementation of integrated learning of early childhood teachers. Questionnaires are utilized to assess the conditions and needs. Knowledge based quizzes in classroom action research and abilities to develop classroom action research proposals and reports are also evaluated. The finding indicated that those teachers possessed the ability to analyze individual learners and provide proper solutions. Knowledge of classroom action research using the integrated learning process of those teachers is very high at 77.41%. The average score for their ability to develop classroom action research proposals is 3.94, and for developing reports is 4.05. It can be concluded that three main techniques of integrated learning can enhance the ability in research classroom practice of early childhood teachers.

Keywords: classroom action research, early childhood, integrated learning

1. Introduction

1.1 Introduce the Problem

Early childhood teachers play an important role in developing and promoting children's learning, particularly in the 21st century. Consequently, these teachers must possess a high level of evaluating children's behavior and select a proper solution to enhance childhood development. Thai kindergarten teachers are responsible for closely observing children's growth in relation to their age and adherence to healthy habits, mental well-being, aesthetic appreciation, moral ethics, and great minds based on the principles of a sufficiency economy (Thailand Early Childhood Education Curriculum, 2017). Applying experiential activities by implemented systematically and effectively, utilizing learning management skills and innovative approaches aim to promote early childhood development in the 21st century and achieve four desirable characteristics of early childhood development, namely physical, emotional-mental, social, and intellectual aspects.

One of major tools for developing learning skills is classroom action research. Early childhood is a window of opportunity so they need a good mentor who can see their problems and fix them using a research process. However, early childhood teachers in Thailand are employing a trial-and-error approach to address student issues and foster their development. Additionally, the measurements taken before and after implementation yielded identical results, indicating that there was no discernible change. Furthermore, the research design used in some studies is not suitable (Ngadkratok, 2019). Cooperation of students, such as inattentive learners, having many students in a classroom, or having special students, is another factor that those teachers face in conducting practical research in the classroom. The primary reasons for that problem are not well understood in previous research methodology and are superficial in methods for promoting or solving student problems (Capodieci et al., 2019). Therefore, those teachers cannot design, and plan research correctly and then do not receive regular training continuously.

1.2 Research Objectives

Enhancing ability in classroom action research through integrated learning for early childhood teachers has the following objectives as follows:

- 1) To investigate the conditions and needs of early childhood teachers conducting classroom action research.
- 2) To develop early childhood teachers' ability in classroom research practice through the implementation of integrated learning.

1.3 Literature Review

Three techniques have been implemented in this study to enhance the ability of early childhood teachers conducting classroom action research. These techniques are as follows:

1.3.1 Learning Together Technique

The learning together technique is a one of cooperative learning as Khaemmanee (2021) said that collaborative learning has many forms, including grouping, studying content, test scoring, and reward system. This technique aims to help students learn as much as possible about the subjects they studied by working together, helping each other, and sharing knowledge between groups. The learning together model provides situations and conditions for members to work in groups, exchange ideas and share documents, provide a proper workload, and group rewards. Johnson & Johnson (1991) proposed principles for organizing cooperative learning activities according to the learning together model must have the following elements:

- 1) Create a feeling of positive interdependence among students, which can be done in several ways including setting common goals for the group (mutual goals), giving joint rewards, for example, if every member of the group gets 90 percent or more of the total score, members in that group will receive an extra 5 points each, and sharing documents or resources such as using only one set of required documents for a group then everyone must help read by dividing the document into sections to complete assigned tasks and determine the roles of members in group tasks or assigned roles.
- 2) Provide interaction between students or face-to-face by allowing students to work together in a helpful environment and promote each other.
- 3) Provide individual responsibility for learning or individual accountability, which makes each student study diligently and work together by managing the situation through periodic assessments and randomized group members to answer questions or report on their work. All members must be prepared to be a representative of the group.
- 4) Provide knowledge about social skills for working well with others with essential social skills, including leadership, decision-making, trust building, communication, and constructive conflict management skills.
- 5) Group Processing is an opportunity for students to evaluate the work of group members, encourage each other, and find ways to improve group work.

In this regard, Khamanee (2021), and Johnson and Johnson (1991) mentioned the process of organizing learning in the form of learning together, a simple and uncomplicated process as follows.

- 1) Arrange students into mixed ability groups, which is smart-intermediate-weak
- 2) Form small groups of four to study the content together and then assign each person a role to play in helping the group learn. The first person reads instructions, commands, or questions to complete, the second person listens to the steps and gathers information, the third person reads what the problem wants to know and then finds the word, and the fourth person checks the answer after completing each part, rotating roles to complete the next question.
- 3) Groups summarize answers together and submit the answers as group work
- 4) How many points did the group's work get? Every member of that group will receive the same score.

As mentioned above, learning together is a learning process for people with different abilities. They have worked together in their roles by relying on the principle of interdependence to help each other and interact with each other and group processes in learning. They will have communication skills, problem solving, and accepting each other.

1.3.2 Concept Map Technique

The concept map technique is a diagram showing the big concept or idea in the middle and the relationship between big concepts and smaller concepts in a hierarchical manner with connecting lines. This is a form of the technique of using graphic organizers as mind maps. It consists of important ideas or information that are linked together in various formats, giving a clear view of the structure of knowledge or content. Using graphic organizers is a technique that can be used in learning many different contents to help understanding content more easily and quickly remember it for a long time. Graphic organizers help students organize information into an easily explained and memorized format to process or organize knowledge.

Graphic organizers are also good thinking tools because creating abstract concepts in the brain requires concrete expression. Graphic maps are a form of expressing ideas that can be seen and explained systematically, clearly, and in a time-saving manner. Khamanee (2021) states that a concept map is a learning process that shows relationships using graphics by principles to connect the relationships of words or messages systematically. Words or messages are arranged in order of importance respectively and drawing lines to connect relationships. There may be an arrow to show the direction of that relationship from the study of collaborative learning and concept maps. It will be used to design the potential development of early childhood teachers and to create an exchange of knowledge together.

1.3.3 Professional Learning Community, PLCs Techniques

The professional learning community, PLCs techniques is a concept pioneered by Du Four (1998). This technique aims to improve effectiveness and emphasize the interests of the learners. Wallace, et al., (2020) mentioned that the results that can be obtained from learning communities include achieving success in developing students towards their goals and learning how to work effectively as a professional. Therefore, it is called a professional learning community. Panich (2012) divided the levels of the professional learning community into three levels: the educational institution level, network level, and national level. Each level is divided according to the level of a learning community. Developing a professional learning community for teachers is focused on results and finding ways to create a network of cooperation, promoting continuous learning, and reflecting on or evaluating learning for joint application. Improving learning ability for the 21st century seems to require a change in learning management. A teacher must be a coach and a learning facilitator who is helpful and collaborative with others. Therefore, PLCs techniques are important and must apply for enhancing ability of teachers (Chookhampaeng, 2021).

1.3.4 Potential for Classroom Research Practice

Phichitritcharoon (2013) stated that classroom research is operational research that solves problems or develops student learning. The teacher plays a vital role in planning the solution by studying the learning situations or problems with students and searching for methods or innovations to solve problems. Moreover, teachers can develop learning problem-solving operations by observing the results or checking the solution results and then reflecting on the results of problem solving or student learning development to find ways to continuously improve and develop until success in solving problems or developing student learning. Therefore, the starting point for classroom action research is to analyze the issues occurring in the classroom and then determine the questions that need to be answered. The classroom research practice is also possible to classify the methods that teachers should follow in the process of doing action research according to Kemmis's concept of the PAOR cycle as follows (Phochapipit, 2014).

1) Plan is conducting action research in the classroom. One must first understand and know each student individually as well as be able to analyze the school curriculum, learning standards, and desirable characteristics. To be a basis for examining whether there are problems with students. After that, an analysis of the problems occurring in the classroom is carried out to determine the issues that need to be researched. Teachers must evaluate the research issues themselves.

2) Act follows the specified plan. Teachers must conduct research during their routine work. Teachers must accept that teaching practice is doing action research in the classroom. Planning, implementation, and evaluation of teaching are things that teachers and researchers need to do. In this step, the teacher must act according to the plan systematically and continuously.

3) Observe is a step teachers must monitor in conjunction with research practice by recording details about each step of the process and what happened, as well as recording issues that need to be resolved to improve the next practice. In addition, they collect information from various sources and periodically review research results. This is to measure the development that occurs with students and analyze data according to the research objectives. Data analysis, including the selection of statistics, must be appropriate to the data without complex statistics. Data interpretation must relate research findings to one's own experiences by presenting the data in a clear, easy-to-understand, and compact format.

4) Reflect is a step where the teacher must summarize the findings from the practice and reflect on the results. Reflection involves discussion among participants about whether the desired outcome is achieved or not. The teacher-researcher must bring experience, practice techniques, problems, obstacles, and results from findings to exchange knowledge with those involved, including jointly criticizing the research to expand ideas or create more profound clarity in research findings.

Another cycle of classroom action research by Stringer (2016) proposed dividing the research process into five

steps: 1) Research design: It starts with surveying the general conditions to determine the problem. The scope of the problem is defined. Review relevant research documents, specify the data source, describe methods for analyzing data, consider ethics, and design quality assessments; 2) Data collection from experiences or perceptions of those involved, interviews, observations, and review of related documents. This is to provide a picture of the issues studied; 3) Data analysis: organize data and analyze data to present results from the data obtained; 4) Reflection of research results (communication outcomes) include writing a research report, reflection on the research process and research results to those involved; 5) Action is the use of research results to solve problems or use in classroom operations, including develop the curriculum and then evaluate it. It also connects operations between schools, families, and communities.

2. Method

2.1 Sample of Research

30 early childhood teachers in Assumption collage Lampang, Thailand organized classroom experiences in the first semester of the 2020 academic year were selected as volunteers.

2.2 Steps for Creating and Quantifying the Quality of Research Tools

2.2.1 Questionnaire on the Conditions and Needs of Early Childhood Teacher's Classroom Research Practices

The questionnaire on the conditions and needs of early childhood teachers' classroom research practices has been developed by determining the structure of the content to know the conditions of teachers' classroom research practices. The PAOR cycle is applied, and then the questionnaire format is divided into three areas: 1) basic information, 2) current conditions of classroom research practice of early childhood teachers, and 3) needs of teachers' classroom research practice in the future. Those are in the 5-level-rating scale by considering the suitability possibility, expectations and creating a questionnaire before taking it to experts for content validation. Selecting a list of questions with an IOC of more than 0.5 is between 0.67-1.00 from the validation results. The questionnaire was improved according to the suggestions and tested with early childhood teachers who were not the target group. Data has been analyzed for confidence values using Cronbach's coefficient of alpha (α) with a 0.87 confidence value before applying it to the research target group.

2.2.2 An Instrument to Measure the Potential of Early Childhood Teachers' Classroom Research Practices

This research tool is divided into three editions, consisting of 1) a test of knowledge and understanding of research practices in the classroom, 2) an assessment of the ability to prepare action research outlines in the classroom, and 3) an assessment of the ability to prepare action research reports in the classroom.

The principles and concepts of a test to measure knowledge and understanding of research practices in the classroom are created for a set of questions (20 questions) with four multiple-choice options. Those questions were validated by experts, and the questions are selected with an IOC value greater than 0.50 in range 0.67-1.00. Selected questions are tested by early childhood teachers who are not in the target group. The results are analyzed to find the confidence value with a difficult value between 0.30-0.80, the discriminatory power value between 0.20-1.00, and the confidence value using the Kuder-Richardson method KR-20 with a confidence value of 0.84. Finally, the questions passed these criteria and were used with the target group in research, totaling 15 items.

Methods and procedures for conducting research in the classroom are studied for creating the assessment and methods for developing evaluation criteria with a 5-level rating scale. The evaluation form is validated by experts to consider content validity and analyze the quality with an average score of more than 3.51. The result from experts shows that this evaluation form has a mean of 4.61 and then applies to early childhood teachers who are not the target group. Confidence values using Cronbach's coefficient of alpha (α) of this trial data is 0.93.

Methods and procedures for writing research in the classroom reports are studied for creating the assessment, as well as methods for developing evaluation criteria with a 5-level rating scale. The evaluation form is validated by experts to consider content validity and analyze the quality with an average score of more than 3.51. The result from experts shows that this evaluation form has a mean of 4.44 and then applies to early childhood teachers who are not the target group. Confidence values using Cronbach's coefficient of alpha (α) of this trial data is 0.83.

2.3 Implementation of Integrated Learning in Classroom Research for Early Childhood Teachers

To conduct research in the classroom with guidelines, four techniques of integrated learning are implemented in this study below:

1) The learning together technique is applied by setting situations and conditions for members to work in groups and giving them a chance to share ideas and documents in the proper division of workload

2) Concept mapping by graphic organizer consists of important ideas or information connected in various formats, showing the structure of knowledge or content to help understand the content more easily, quickly, and remember was the primary tool for showing conceptual thinking.

3) A professional learning community for teacher development is another process that encourages teachers who have the same interests, use similar methods of operation, treat each other by exchanging knowledge, and have continuous interaction to strengthen social bonds, also known as teachers' community of practice (Community of Practice, CoP) is also implemented.

2.4 Data Collection and Statistics

Scoring of 5 rating scales in the conditions and needs of early childhood teachers' classroom research practices 30 volunteers have been averaged and interpreted (Table 1). The needs have been prioritized by modified priority needs index (PNI_{modified}) according to Wongwanich (2019). PNI_{modified} was calculated by the following equation.

$$PNI_{\text{modified}} = \frac{I-D}{D}$$

When PNI means Priority Needs Index

D: Degree of Success

I: Importance

The most important requirement was $PNI_{\text{modified}} > 0.35$. In this study, the average of conditions was the degree of success (D) and the average of needs was the importance (I). In table 1 represents a range of means of the condition and needs, the percentage of knowledge, the means of ability in preparing proposal and report with their interpretation.

Table 1. Descriptive narratives of the average scores and percentages

Average of the conditions and needs in classroom research practices	Interpreting	Percentage of knowledge in classroom research practices	Interpreting	Average of ability in preparing classroom research practice proposals	Average ability in preparing classroom research practice reports	Interpreting
4.51-5.00	Highest	80-100	Excellent	4.51-5.00	4.51-5.00	Highest
3.51-4.50	High	70-79	Better	3.51-4.50	3.51-4.50	High
2.51-3.50	Moderate	60-69	Good	2.51-3.50	2.51-3.50	Moderate
1.51-2.50	Low	50-59	Moderate	1.51-2.50	1.51-2.50	Low
1.00-1.50	Lowest	0-49	Less	1.00-1.50	1.00-1.50	Lowest

3. Results

3.1 Conditions and Needs of Early Childhood Teacher's Classroom Research Practices

Qualified questions were applied for the research target group with 5-level rating scales in 30 items. The results showed that the conditions of classroom research practice were more than 3.50, except a formally and informally publishing classroom research reports at 3.23 ± 0.82 . However, the average of those results was 3.75 ± 0.79 , which was at a high level. The highest average score was shown in an analyzing individual learner (4.20 ± 0.81) and a selecting proper problem-solving method (4.07 ± 0.83). On the other hand, the opportunity for fellow teachers or other stakeholders to apply the research results or plan the subsequent experience was lower at 3.50 ± 0.90 . These results were demonstrated that the condition of early childhood teachers' classroom research practices was acceptable (supplementary 1). The conditions and needs data in each section were arranged in order using PNI_{modified} (Table 2). The priority for improvement was conclusion, discussion, reflecting and publication. The following were the research design and the data collecting and analysis, respectively.

Table 2. The priority in each section of conditions and needs of early childhood teachers' classroom research practices

Section	Item	Conditions (D)		Needs (I)		PNI _{modified} (I-D)/D	Priority
		Degree of success		Importance			
		Mean	S.D.	Mean	S.D.		
1	Analysis and problem determination	3.91	0.81	4.30	0.76	0.10	5
2	Searching and selecting solutions to problems	3.89	0.82	4.32	0.77	0.11	4
3	Research design	3.67	0.74	4.28	0.79	0.16	2
4	Data collecting and analysis	3.74	0.71	4.29	0.75	0.15	3
5	Conclusion, discussion, reflecting and publication	3.61	0.79	4.33	0.72	0.20	1
Average		3.75	0.79	4.21	0.75		

According to the need to conduct research in the classroom of early childhood teachers in 30 items, it was found that those teachers required for all items with a high level with scores more than 4.00. The average of this data was 4.21 ± 0.75 . Most of their needs were published in their research results at 4.63 ± 0.49 . Following by advising from counselling or relevant people in their classroom research practice (4.57 ± 0.63) and the cause analysis from various aspects and prioritizing the causes (4.53 ± 0.57) shown in Appendix. The average of these data has been arranged using PNI_{modified} shown in Table 3. The priority in details of each item is the processes obtained from classroom research were used to prepare reports for dissemination both formally and informally. The followings were 1) there are reflections on classroom research practices from children, fellow teachers, 2) those involved and classroom research operations planned with detailed methods and procedures, 3) the quality of the tools was checked using various appropriate methods, 4) findings and suggestions from classroom research practices used and considered as a guideline for child development, and 5) providing an opportunity for fellow teachers or other stakeholders to analyze ways and apply the research results or plan the next experience.

Table 3. The priority in each item of conditions and needs of early childhood teachers' classroom research practices

No.	Item	Conditions (D)		Needs (I)		PNI _{modified} (I-D)/D	Priority
		Degree of success		Importance			
		Mean	S.D.	Mean	S.D.		
12	Classroom research operations are planned with detailed methods and procedures	3.57	0.73	4.3	0.82	0.20	3
16	The quality of the tools is checked using various appropriate methods	3.5	0.73	4.2	0.77	0.20	3
22	There are reflections on classroom research practices from children, fellow teachers, and those involved	3.5	0.9	4.27	0.76	0.22	2
24	Findings and suggestions from classroom research practices are used and considered as a guideline for child development	3.57	0.68	4.27	0.57	0.20	3
25	Providing an opportunity for fellow teachers or other stakeholders to analyze ways and apply the research results or plan the next experience	3.5	0.82	4.2	0.74	0.20	3
29	Processes obtained from classroom research are used to prepare reports for dissemination both formally and informally	3.23	0.82	4.63	0.82	0.43	1
Average		3.75	0.79	4.21	0.75		

3.2 Potential Early Childhood Teacher's Classroom Research Practices and Reports Using Integrated Learning

The knowledge and understanding of test results of early childhood teachers in conducting classroom research were demonstrated high scores from 15 multiple-choice examinations. Only one early childhood teacher had a 100% test score, while 14 teachers had more than 80% test scores. The average percentage of this test was 77.41% (Figure 1). The results showed that the target group was understood in the classroom research. The assessment results of the ability to create research projects in the classroom after integrated learning was demonstrated that all teachers could develop research proposals in their classroom with an average value of 3.94 ± 0.80 . The highest average score was the ability to identify the research target group clearly and the appropriate tools at 4.30 ± 0.88 . The lowest average score was the ability to write definitions of terms in the classroom research proposal, which was measurable, appealing, and suitable for specifying the benefits of approaches or innovations to solving problems. The average score of these two items was 3.47 ± 0.68 and 3.37 ± 0.61 , respectively (Table 4).

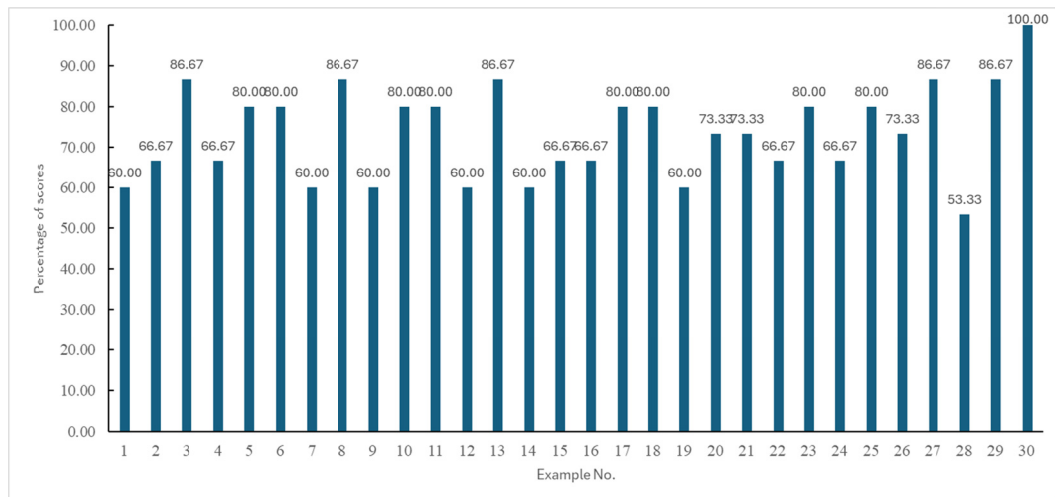


Figure 1. The results of the analysis of early childhood teachers' knowledge and understanding in conducting research in the classroom

Table 4. Average score of assessing the ability to prepare a research project

No.	Items	Average scores	S.D.
Section 1 Title			
1	The title has three parts: the aim of the research, variables to be studied and research target groups	3.97	0.81
2	The title is clear and doesn't use superfluous words	3.87	0.90
Section 2 Background and causes of the problem			
3	State the principles and reason, desired condition, or something that is hoped to happen	3.93	0.83
4	Clearly specify the research problem.	3.57	0.73
5	Choose a solution/innovation approach. Appropriately to the research problem	3.70	0.60
6	Clearly and appropriately identify the benefits of the approach or innovation in solving problems.	3.37	0.61
Section 3 Research objectives			
7	Set objectives correctly and clearly, consistent with and covering the research problem.	4.03	0.89
8	The defined objectives can be answered through research.	4.13	0.90
Section 4 Research scope			
9	Identify the target group that wants to study	4.27	0.87
10	Specify variables consistent with the research title	4.20	0.55
Section 5 Definition of specific terms			
11	Clearly define important variables and terminology	3.63	0.85
12	Write definitions of terms that can be measured and observed.	3.47	0.68
Section 6 Expected benefits			
13	Identify what is useful from the findings in terms of knowledge gained.	4.10	0.66
14	Identify the benefits of the findings in terms of their application	4.07	0.83
Section 7 Researching documents and related research			
15	Covers issues required for research	3.87	0.68
16	Having enough research documents to make the research work in the right direction	3.87	0.68
17	Arrange topics in an appropriate order, systematically, and linked to the subject to be researched	3.87	0.68
18	Have reliable, up-to-date, up-to-date references.	4.27	0.78
19	Correctly define the research concept. Shows the relationship between variables	4.17	0.83
Section 8 Research Methodology			
20	Identify the target group of research work	4.30	0.88
21	Choose the right tools for the variables in a research study	4.30	0.65
22	The quality inspection of tools is clearly explained	3.87	0.94
23	The steps for collecting data are explained clearly and completely	3.93	0.98
24	Determine how to analyze data correctly according to the basic agreement, the statistics used	3.93	0.87
25	Set appropriate statistics to use in data analysis	3.90	0.48
Total average scores		3.94	0.80

Regarding the classroom research practice reports, this target group exhibited a high level at the average value at 4.05 ± 0.67 . The most significant ability was to define the target group that needed to be studied and choose the appropriate variable relevant to the problems. The average value of these items was 4.60 ± 0.62 and 4.50 ± 0.68 , respectively. On the other hand, they could not write reports accurately, especially with consistent references, enough reliable and up-to-date references, and sufficient documents for their research work.

The average of the three items is above 3.77 ± 0.86 , 3.60 ± 0.72 , and 3.53 ± 0.63 , respectively (Table 5).

Table 5. Average score of assessing the ability to prepare a research report

No.	Items	Average scores	S.D.
Section 1 Title			
1	The title has three parts: the aim of the research, variables to be studied, and research target groups	4.00	0.53
2	The title is clear and doesn't use superfluous words	4.17	0.65
Section 2 Background and causes of the problem			
3	State the principles and reasons, desired condition, or something that is hoped to happen	4.10	0.61
4	State the current condition or the nature of the research problem clearly	3.87	0.57
5	Clearly state the difference between the desired condition and the existing condition	3.63	0.76
6	Identify approaches or innovations in solving problems or developing following the problem conditions	4.10	0.66
7	Clearly specify the issue that wanted to research	4.03	0.61
8	Have reliable references	4.07	0.52
Section 3 Research objectives			
9	Set objectives correctly and clearly, consistent with and covering the research problem	4.17	0.70
10	The stated objectives can be answered through research	4.17	0.65
Section 4 Research scope			
11	Identify the target group you want to study	4.30	0.47
12	Specify variables consistent with the research title	4.17	0.53
Section 5 Definition of specific terms			
13	Clearly define important variables and terminology	4.17	0.65
14	Write definitions of terms that can be measured and observed	4.17	0.59
Section 6 Expected benefits			
15	Identify what is useful from the findings in terms of knowledge gained	4.47	0.73
16	Identify the benefits of the findings in terms of their application.	4.30	0.84
Section 7 Researching documents and related research			
17	Covers issues required for research	4.23	0.86
18	Research enough documents to make the research work in the right direction	3.53	0.63
19	Arrange topics in an appropriate order, systematically, and linked to the subject to be researched	3.97	0.67
20	Have reliable, up-to-date, up-to-date references	3.60	0.72
21	Correctly define the research concept and show the relationship between variables	3.90	0.61
Section 8 Research Methodology			
22	Identify the target group you want to study	4.60	0.62
23	Innovations or tools are used that are appropriate to the variables that need to be studied and are appropriate and consistent with the problem conditions	4.60	0.62
24	The tools used were able to collect complete information necessary for the study.	4.50	0.68
25	The results of the tool quality inspection are accurate and complete	4.23	0.77
26	Write the research process clearly and in order.	3.94	0.53
27	The research method is appropriate to the period and context of the problem	3.97	0.61
28	Use data analysis methods appropriate to the nature of the data	4.37	0.72
Section 9 Data analysis results			
29	Analyze data and interpret data analysis results correctly, statistically and linguistically	3.93	0.52
30	The presentation of data analysis results is concise and consistent with the research objectives	3.90	0.61
31	Present the results of the data analysis truthfully without distorting information	3.90	0.61
Section 10 Summary and discussion of research results and suggestions			
32	Mention a problem. Research objectives and methods by using a concise and clear message	3.93	0.58
33	Summary of research results within the scope of the data and research results obtained	4.00	0.59

34	Discuss research results in a reasonable, reliable manner	3.93	0.45
35	References are made to other past research results	3.87	0.57
36	Suggestions are given regarding the use of the research results and/or further research	3.83	0.53
Section 11 References			
37	The citation system is the same throughout the book	3.77	0.86
38	The reference list in the text is the same as the reference list in the bibliography	3.90	0.55
39	References are accurate and truthful. Do not impersonate other people's messages without references	4.00	0.64
Section 12 Overall			
40	There are complete topics according to the specified or international format, and the printing format is neat and in the same system throughout the book. Use an academic and linguistically correct writing style	3.83	0.59
Total average scores		4.05	0.67

4. Discussion

The early childhood teachers in this study were good at analyzing their learners and then selecting suitable methods to solve the problems appropriately to the age of the learners. This was aligned with Wongwanich (2017), who stated that the starting point for classroom action research was to analyze the problems and then determine the questions by diagnosing and finding solutions. The less common practice of classroom research was using research results or publishing the studied process coherently to Phochapipit (2014). His findings show that the process of reflecting on the results after practice was not broadcast because most teachers only implement problem solving in their classrooms. Therefore, the findings needed to be shared and learned together. Phochapipit (2014) stated reflecting results after work by summarizing and discussing experience, practice techniques, problems, and obstacles to create clarity and expand ideas. Inquiring about the need for classroom research, teachers desire to apply the processes obtained from conducting research in the classroom to prepare reports for formal and informal dissemination. Moreover, they also required counseling or advice from classroom research practices from fellow teachers or those involved, as well as knowledge about analyzing the causes of research problems from various areas. This result was reflected that early childhood teachers' classroom research practices require self-development with consultants to analyze research problems.

The study results showed that early childhood teachers receiving integrated learning had a high potential for conducting research in the classroom. The early childhood teachers' knowledge and understanding of conducting research in the classroom was excellent. One reason was the method for developing early childhood teachers' knowledge such as a workshop, organizing learning experiences: innovations or appropriate student activities Bunpitak (2014). The ability of early childhood teachers to prepare research proposals in the classroom was high. In particular, the issue with the highest average was identifying the target group. This was because the learning together process raised from activities that early childhood teachers did together as a group and closeness to the learners, so their behavior were observed. In addition, another highest average was being able to choose tools that appropriated for the variables you want to study. Concept mapping showed a hierarchical relationship with connecting lines which was allowed early childhood teachers to see the structure of variables so that they choose tools to solve problems correctly. It was an expression of ideas that can be seen and explained systematically, clearly, and time-saving (Khamanee, 2023). At the same time, the ability to create research outlines in the classroom of early childhood teachers were demonstrated that clearly and appropriately specifying the benefits of approaches or innovations in solving problems were the lowest average score but still within a moderate level. This was because early childhood teachers confused about identifying the benefits and explaining in detail how this innovation would be solved their problems (Jongjit et al., 2022). Therefore, to successfully carry out research activities in the classroom, early childhood teachers must prepare reports to show evidence that reflects early childhood development. The ability of early childhood teachers to prepare reports on classroom research practices was also at a high level. The evaluation results found that among the issues with the highest averages was identifying the target group that needs to be studied and innovations or tools that were appropriate to the studied variables and consistent with the problem condition. Therefore, they exhibited an ability to prepare research classroom proposals. A primary reason for improving the skill of those teachers was applying the professional learning community or PLC, which was a process in which early childhood teachers practice the same thing, exchange information, knowledge, understanding, and methods of practice, create interest and reflect on the results of early childhood development together. Therefore, it encouraged those teachers to have these skills and eventually become professional early childhood teachers (Ritcharoon, 2023).

Developing the potential for classroom research practice for early childhood teachers in the 21st century to be able to rely on integrated learning methods from the first step to the last step of the classroom research process. The

researcher had to synthesize the steps for conducting classroom research for early childhood teachers in Lampang Province 8 steps as follow; 1) Define the problem, 2) Analyze the problem or diagnose the problem, 3) Find a solution, 4) Design the research, 5) Collect data, 6) Analyze the data and interpret the results, 7) Summarize the results and Discuss research results, 8) Write a research report and reflect on the results. These steps have enhanced the quality of education at an early level, according to Klibthong and Agbenyega (2019). Early childhood teachers in the 21st century should act to equip early childhood children with 21st-century skills as well. Therefore, using integrated learning processes gave early childhood teachers the potential to practice research in the classroom. Integrated learning methods with collaborative learning techniques (learning together), concept map learning, and professional learning communities gave early childhood teachers in the 21st century the potential to conduct research in the classroom (Aras, 2023).

Furthermore, teachers should have the knowledge and ability to conduct research continuously and systematically from the first step to the last step from participation throughout the semester. This would be solving problems or improving the quality of education at an early level. The research finding demonstrated that the integrated learning could enhance the understanding and the action of those teachers. Therefore, early childhood teachers should change the operations, knowledge and skills for applying them to develop the teaching profession further. On the other hand, limitations of this research were 1) non continuous classroom action research from some early childhood teachers affected to uncompleted reports, 2) an overload tasks of early childhood teachers take a longer time for research action.

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Appendix

Supplementary 1: Priority of conditions and needs in each item of early childhood teachers' classroom research practices

No.	Item	Conditions (D)		Needs (I)		PNI _{modified} (I-D)/D	Priority
		Degree of Success		Important			
		Mean	S.D.	Mean	S.D.		
Section 1 Analysis and problem determination		3.91	0.81	4.30	0.76	0.10	5
1	Having individual learners' analysis	4.20	0.81	4.40	0.84	0.05	15
2	Analyzed destinations, standards, and desired characteristics of the early childhood curriculum	4.00	0.87	4.23	0.78	0.06	14
3	Analysis of problems in organizing classroom experiences to determine the research problem	3.87	0.78	4.2	0.8	0.09	13
4	Analysis of the importance of the problems that will be solved through the research process	3.83	0.79	4.23	0.73	0.10	12
5	Information about research problems is studied from a variety of sources, such as observing student behavior, asking knowledgeable people, studying documents, textbooks, or articles	3.90	0.80	4.30	0.71	0.10	12
6	Having appropriated search or assumption of the cause of research problems	3.77	0.82	4.2	0.8	0.11	11
7	The causes of research problems are analyzed from various aspects and then prioritize them	3.80	0.81	4.53	0.57	0.19	4
Section 2 Searching and selecting solutions to problems		3.89	0.82	4.32	0.77	0.11	4
8	Selecting to solve problems from causes that can be controlled	3.77	0.77	4.23	0.78	0.12	10
9	Solutions are selected through studies in research techniques or developed innovations that are related to research problems	3.70	0.79	4.27	0.83	0.15	7
10	Choose a method to solve problems that are appropriate to your abilities	4.03	0.85	4.43	0.66	0.10	12
11	Problems-solving methods are selected and adapted to the age of the students	4.07	0.83	4.33	0.82	0.06	14
Section 3 Research design		3.67	0.74	4.28	0.79	0.16	2
12	Classroom research operations are planned with detailed methods and procedures	3.57	0.73	4.3	0.82	0.20	3
13	Classroom research operations are controlled according to the established plan	3.7	0.75	4.33	0.84	0.17	5
14	The measurement and evaluation methods are selected following what is wanted to be measured	3.83	0.75	4.23	0.86	0.10	12
15	Tools are created or selected appropriately	3.77	0.73	4.33	0.68	0.15	7
16	The quality of the tools is checked using various appropriate methods	3.5	0.73	4.2	0.77	0.20	3
Section 4 Data collecting and analysis		3.74	0.71	4.29	0.75	0.15	3
17	Detailed information about each step of the classroom research practice was recorded realistically and appropriately	3.67	0.76	4.23	0.75	0.15	7
18	Data is collected from appropriately used tools such as observation forms, behavior recording forms, tests, workpiece quality assessment forms, etc.	3.77	0.68	4.33	0.75	0.15	7
19	The accuracy and reliability of the information is checked	3.73	0.74	4.33	0.87	0.16	6

20	Data is analyzed and presented in a clear, easy-to-understand format	3.77	0.68	4.27	0.75	0.13	9
21	Statistics are used to analyze data appropriately	3.77	0.73	4.27	0.75	0.13	9
Section 5 Conclusion, discussion, reflecting and publication		3.61	0.79	4.33	0.72	0.20	1
22	There are reflections on classroom research practices from children, fellow teachers, and those involved	3.5	0.9	4.27	0.76	0.22	2
23	Techniques, methods, innovations, and research results are used in the classroom and sharing knowledge with fellow teachers within the school or school network	3.6	0.77	4.27	0.73	0.19	4
24	Findings and suggestions from classroom research practices are used and considered as a guideline for child development	3.57	0.68	4.27	0.57	0.20	3
25	There is an opportunity for fellow teachers or other stakeholders to analyze ways and apply the research results or plan the next experience	3.5	0.82	4.2	0.74	0.20	3
26	There is research practice in the classroom that focuses on solving problems or developing individual students	3.87	0.73	4.23	0.49	0.09	13
27	Research is conducted in class as part of the regular experience	3.8	0.71	4.33	0.63	0.14	8
28	Encourage teacher friends and commanders to participate in classroom research practices	3.63	0.85	4.17	0.82	0.15	7
29	Processes obtained from classroom research are used to prepare reports for dissemination both formally and informally	3.23	0.82	4.63	0.82	0.43	1
30	Processes obtained from classroom research are used to prepare reports for dissemination both formally and informally	3.83	0.75	4.57	0.63	0.19	4
Average		3.75	0.79	4.21	0.75		

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Authors contributions

Asst. Prof. Wilaiwan Klintavorn was the coordinator of the target group area, developed research tools, collected data, and co-wrote research articles.

Wisathorn Thanukit was co-designed the research instruments, collected data, co-wrote the research article, and translated the research article.

Asst. Prof. Benjamas Phutthima was the research tool developer, data collection, data analysis, research report preparation and research article completion.

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