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Igniting research competency: Empowering pre-service teachers through communities of practice plus lesson study

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ABSTRACT

The establishment of Communities of Practice (CoP) is recognized as a powerful means of fostering collaborative learning. CoP provides members with a platform to collectively develop their potential, exchange ideas, and engage in creative problem-solving. Similarly, LS is a well-established instructional improvement process that supports the holistic development of learners' knowledge and skills. In this study, a learning approach that integrates CoP principles with the LS framework was utilized to create a shared learning space for pre-service science teachers. The primary aim is to investigate the implementation and effectiveness of activities that combine CoP and LS approaches in enhancing research competence among pre-service teachers. Specifically, the study evaluates the development of three key components of research competence: research knowledge, research skills, and research attributes. The findings indicate that the integrated use of CoP and LS significantly enhanced the research competencies of pre-service teachers. Participants demonstrated the ability to adjust their strategies to align with the expectations of the CoP. Additionally, they exhibited improved self-regulation, enabling them to independently design, plan, and complete research projects. Increased self-efficacy was also observed, as the pre-service teachers reported greater confidence in their research competency.

Keywords: collaborative learning, teacher education, research knowledge, research skills, research attitude

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INTRODUCTION

Research competency is defined to be a key element in the preparation of professional teachers as these competencies cover important facets of scientific thinking, reflective practices, and developing competencies for ongoing professional learning. Teachers with high research competence are more likely to incorporate research-informed teaching strategies into their teaching and learning career pathways and thus will make significant contributions to the scholarly knowledge of teaching practice and to professional teaching and learning as evidence-based practice (Khotnarin et al., 2022; Lovat et al., 1995; Salmento et al., 2021). The literature suggests that research competence in teacher education forms three interrelated components of research competence: research knowledge, research skills, and research attitudes (Hastuti et al., 2022; Katayev & Burdina, 2023). Research knowledge refers to knowledge about the nature of research, types of research, methodologies, and conceptual foundations, research skills refer to the skills involved in doing research, these may include literature review, research design, data collection, data analysis, and writing a research report, and research attitudes, such as curiosity, responsibility to value and prioritise playing an active part in self-change, and commitment to self-improvement are important elements of effective engagement with research (Insorio, 2024; Katayev & Burdina, 2023; Lovat et al., 1995; Matjašič & Vogrinc, 2024; Salmento et al., 2021). In terms of professional development, widely recognized and effective approaches include

Technological Pedagogical Content Knowledge (TPACK), which integrates content knowledge, pedagogy, and technology into instructional design, and the LS model, which emphasizes collaborative planning, observation, and reflection among teachers to improve teaching practices (Bentri et al., 2025; Cerbin & Kopp, 2006; Darling-Hammond et al., 2017; Jiménez Sierra et al.,2023; Sonsupap & Cojorn, 2024; Wood, 2021). Additionally, the CoP framework has gained significant attention for its emphasis on shared learning and the co-construction of knowledge through collaborative experience among professionals within a common practice context (Wenger et al., 2002). Both LS and CoP highlight the importance of collective thinking, joint problem-solving, and ongoing professional growth, making them highly relevant for enhancing teacher research competence in authentic educational settings (Oryngaliyeva et al., 2024)

A Lesson Study (LS) is an approach to professional development for teachers which at its core is about lesson designing and instruction management. It builds a systematic model of teaching where teachers work in a group to analyze, refine and develop practices to improve their teaching (Lewis et al., 2006). LS advances reflection and systematic approaches to problem solving, content knowledge, and higher order and desirable skills in teachers and students (Cojorn & Sonsupap, 2024; Dahlan et al., 2020; Dudley, 2014; Fernandez and Yoshida, 2012; Nugroho, 2011). The basic cycle of LS is coordinated as collaborative lesson planning, teaching, observation and data gathering, evaluation, and commenting and rewriting the lesson plan (Lewis, 2016). This cycle encourages joint learning amongst students, teachers, and even other education practitioners. Teachers are able to perfect their teaching activities by observing classes and designing suitable lessons, then applying them, observing, reflecting, and revising. This dynamic process encourages immediate development and solution crafting (Cardoso et al. 2025). However, research indicates that both students and teachers engaged in LS often express uncertainty in their existing knowledge and require expert support for reflection and addressing challenges in designing learning activities (Botes et al., 2022; Cardoso et al.,2025; Miftah et al., 2024; Sonsupsp & Cojorn, 2024).

Community of Practice (CoP) is a well-established and widely accepted concept in the field of knowledge management. Social learning is described as a creative effort where people with diverse skills and experiences seek to come together for a common cause (Haerudin et al., 2023; Wenger et al. 2002). Within these communities, learning happens through participation, engagement, and the construction of the shared repertoire of practices. CoP are determined, not only by the existence of shared collaborative problem solving, but also by the level of cultivated psychological safety without which members will not feel free to share their ideas or recognize any errors made as part of a learning journey. As such, there is balance in participation equity that allows all members to offer their insights and experiences. In the case of education, especially in teacher training, CoP is a powerful catalyst for knowledge co-construction that enables movement of tacit into explicit knowledge through socialization, where pre-service teachers actively participate within contextually similar teaching practice. This implicit knowledge is then openly discussed and collaboratively designed or co-constructed using participatory dialogue, transforming this tacit knowledge into explicit knowledge through externalization. Then continues with combination, which refers to organizing the explicit knowledge into systems, for example, systematically developed lesson plans (Kassymova et al., 2025). Finally, through internalization, this knowledge is applied and integrated into real classroom practice. These iterative processes align with Nonaka and Takeuchi's (1995) SECI model, which outlines how knowledge is continuously created, shared, and applied within organizations to support meaningful and sustainable learning.

The integration of the Community of Practice (CoP) concept can significantly address this need. CoP provides its members with the confidence and skills required to craft effective learning experiences that enhance knowledge and skill self-exchange. This process takes advantage of the existing knowledge and skills in the community and simultaneously fosters a culture of learning that promotes teamwork and constructive engagement between learners and teachers. Consequently, the combination of LS and CoP concepts serves as a vital mechanism for teachers to achieve their educational objectives (Cojorn & Seesom, 2024; Doig & Groves, 2011) Previous studies have indicated that within teacher education programs, significant challenges remain

concerning the acquisition of core research concepts. The majority of pre-service and in-service teachers possess a shallow understanding of the concept of research, restricted to the knowledge of steps involved in the procedures, with only a handful possessing more profound understanding (Salmento et al., 2021).It has also been found that although pre-service teachers study research-related subjects as part of their coursework, many are unable to apply this knowledge to designing instruction or solving real-world problems within classroom contexts. This gap stems from an overemphasis in practical courses where students simply apply theory without guidance. Fragmented, disparate pieces of information on research often bear little to no relevance to actual teaching (Baan et al., 2019; Korthagen, 2017). As a result, many pre-service teachers perceive research as difficult, unengaging, or irrelevant to their future teaching roles, which leads to decreased motivation to engage with or apply research findings (Bibi et al., 2012; Hemsley-Brown & Charp, 2003).

Therefore, the purpose of this research is to investigate the implementation and effectiveness of activities that integrate the Community of Practice and Lesson Study (CoP plus LS) approaches in promoting research competence among pre-service teachers across three key dimensions: research knowledge, research skills, and research attitude. With the integration of these two frameworks, CoPs foster a mechanism for deep learning that occurs through systematic collaboration. LS encompasses the processes of teamwork for lesson planning, teaching and observation, and reflection on practice within an instructional cycle. On the other hand, CoP measurably contributes to learners' development by promoting collaborative experience sharing in knowledge construction within an inviting environment. This combination aids in bridging what is taught in theory and what is done in practice in real-life teaching situations. The framework combination appears to be very useful in overcoming the problems concerning the pre-service teachers' shallow comprehension of educational research. This not only provides comprehensive skills and knowledge of research; it also helps in shaping a favorable perspective and attitude towards conducting research. Ultimately, the goal is to prepare pre-service teachers to become professional educators who can design effective learning activities tailored to their learners' contexts and contribute to sustainable student development.

METHOD

This study involved 7 science pre-service teachers from Mahasarakham University, Thailand, who voluntarily participated during their teaching practicum in the 2024 academic year. The participants were organized into two CoPs based on the educational level of their practicum schools. CoP A comprised 4 pre-service teachers placed in secondary schools, while CoP B included 3 pre-service teachers assigned to primary schools. Both CoPs were briefly oriented to ensure a shared understanding of the activities they were expected to carry out through the integration of CoP plus LS approaches. Each CoP operated autonomously, with members collaboratively planning and implementing activities, including the development of a reflection schedule for each cycle. In this study, the researcher was responsible solely for observation and data collection. Additionally, the supervising teacher was required to participate in the process and assess the pr-service teachers' research report (see Figure 1).

Research instruments

The research instruments used in this study comprised three types: 1) A five-point Likert scale questionnaire adapted from the "Research Competence of Postgraduate Students" developed by the University of Nebraska, USA (Koikov, 2024). The questionnaire consisted of 31 items divided into three domains: *research knowledge* (12 items), *research skills* (11 items), and *research attitudes* (8 items). The quality of the instrument was verified, yielding a Content Validity Index (CVI) of 0.97; 2) A research report evaluation form in the format of a five-level scoring rubric (ranging from 0 to 4). Its quality was assessed in terms of appropriateness, with an average suitability score of 4.89; and 3) A semi-structured interview form used for group discussions covering three main topics: insights gained from the CoP plus LS activities, the development of research competence, and encountered problems and obstacles. The interview

protocol was developed by the researcher and evaluated for appropriateness, resulting in a suitability score of 5.00.

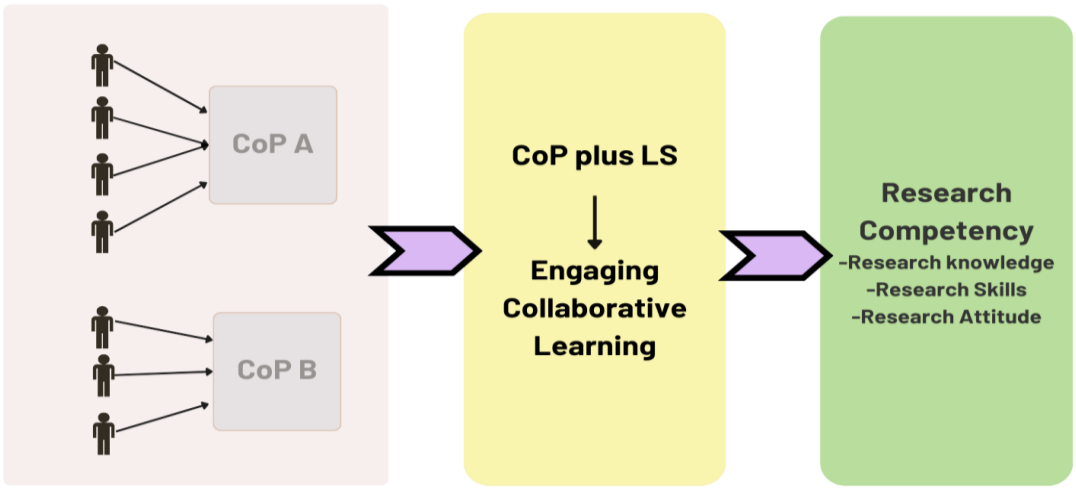

Figure 1. Research Framework of the Study

Data collection

The research process commenced with the formation of two CoPs consisting of pre-service teachers. The researcher provided an orientation to ensure a clear understanding of the CoP plus LS approach, which followed the four-stage model proposed by Cojorn and Seesom (2024): Eliciting, Designing, Implementing, and Reflecting (Figure 2). Each CoP was granted autonomy to structure the duration and design of each activity cycle as deemed appropriate throughout the research process, from initiation to completion and dissemination of the findings.

Figure 2. Stages of the CoP plus LS
(Source: Cojorn &Seesom ,2024)

Throughout the study, the researcher served solely as an observer. Data collection began with a pre-assessment of the participants' research competence prior to the implementation of CoP plus LS activities. Upon completion of the intervention, a post-assessment was conducted. Additionally, the participants' research reports were evaluated using a triadic assessment approach, involving one supervising teacher per participant, the university supervisor and researcher. A consensus-based evaluation method was employed to arrive at a final judgment. To

supplement the quantitative data, qualitative insights were gathered through focus group discussions.

Data analysis

Quantitative data were analyzed by assigning scores and calculating the frequency and percentage of pre-service teachers within each level of research competence. The assessment of research competence levels among pre-service t teachers was based on the evaluative framework proposed by Durmuşçelebi (2018). This framework classifies performance into five distinct levels according to average scores. A score ranging from 1.00 to 1.80 indicates a "Not at all" level of competency, while scores between 1.81 and 2.60 reflect a "Slightly" competent level. Scores from 2.61 to 3.40 are considered "Moderately" competent, and those between 3.41 and 4.20 are categorized as "Very" competent. The highest level, "Extremely" competent, is represented by scores ranging from 4.21 to 5.00. In addition, qualitative data were analyzed using content analysis, with key themes and issues synthesized and summarized.

FINDINGS AND DISCUSSION

Findings

Table 1. Results of pre-service teachers' activities within each CoP

CoP A	CoP B
-The implementation was carried out in 4 iterative cycles. -Cycle 1 – Research Topic: This cycle involved sharing problems and areas of interest, followed by collaborative discussion to determine the research topic and variables to be studied. Participants also engaged in reflective critique to refine and finalize an appropriate research title. -Cycle 2 – Research Proposal: In this cycle, participants shared experiences and studied sample proposals, then drafted their own research proposals. These drafts were presented for peer critique and feedback, leading to revisions and improvements. The cycle concluded with the design and planning for implementing the proposed research. -Cycle 3 – Research Report: This cycle focused on reviewing and exchanging experiences related to data analysis and research report writing. Participants proceeded to draft their own research reports and engaged in collaborative reflection to revise and enhance the completeness and quality of their reports. -Cycle 4 – Research Article: This cycle focused on studying examples of research articles and reviewing the university's publication guidelines. Participants then drafted their own research articles and engaged in reflective discussions to revise and improve them. The cycle also included overall reflection on the entire research process.	-The implementation was carried out in 5 iterative cycles. -Cycle 1 – Concept Paper: The process began with sharing the current situation and identifying problems, which were then used to draft a conceptual document. This document was collaboratively reviewed and revised to ensure its coherence and feasibility -Cycle 2 – Research Proposal: This cycle involved studying sample research proposals and sharing experiences, followed by the development of individual research proposals. Participants then engaged in collaborative reflection and critique to clarify and refine their proposals. -Cycle 3 – Research Instruments: This cycle involved studying examples of similar instruments, collaboratively designing and developing research tools, followed by reflective discussion and critique to improve the instruments for greater appropriateness and effectiveness. -Cycle 4 – Research Report: This cycle involved sharing approaches, reviewing relevant knowledge, and studying sample research reports together. Participants then drafted their own research reports, which were brought back for collaborative critique and revision to ensure greater accuracy and appropriateness. -Cycle 5 – Research Article: This cycle focused on studying research articles, planning for publication, drafting individual research articles, and engaging in collaborative critique and revision. It also included reflective discussions on the entire research process.

The outcomes of the activities carried out by pre-service teachers in each CoP are presented according to the stages of the integrated Eliciting, Designing, Implementing, and Reflecting

process. These results illustrate how each group applied the CoP plus LS framework to enhance their research competence within classroom teaching contexts, as detailed in Table 1.

From the implementation of activities based on the integrated concept of CoP plus LS, it was observed that the research competence levels of pre-service teachers in both CoPs improved significantly. The detailed results are presented in Table 2. In terms of research knowledge, all four preservice teachers in CoP A (100%) were at the moderately competent level before the activity, and all advanced to the very competent level afterward. In CoP B, two preservice teachers (66.67%) were at the moderately competent level and one (33.33%) at the very competent level prior to the activity; following participation, two reached the very competent level (66.67%) and one progressed to the extremely competent level (33.33%). These results indicate continuous development in research knowledge among both groups.

Table 2. The change in research competency levels of pre-service teachers in each CoP between before and after the activity

Domain	Competency level	CoP A (N=4)		CoP B (N=3)	
		Before	After	Before	After
Resarch Knowledge	Extremely	0	0	0	1(33.33%)
	Very	0	4(100%)	1(33.33%)	2(66.67%)
	Moderately	4 (100%)	0	2(66.67%)	0
	Slightly	0	0	0	0
	Not at all	0	0	0	0
Mean		3.12	3.44	3.96	4.02
S.D.		0.91	0.80	0.88	0.70
Research Skill	Extremely	0	0	0	0
	Very	0	1(25%)	0	2(66.67%)
	Moderately	1(25%)	3(75%)	2(66.67%)	1(33.33%)
	Slightly	3(75%)	0	1(33.33%)	0
	Not at all	0	0	0	0
Mean		2.48	3.36	2.70	3.55
S.D.		0.73	0.49	0.59	0.56
Research Attitude	Extremely	0	0	0	0
	Very	0	0	0	0
	Moderately	0	3(75%)	1(33.33%)	3(100%)
	Slightly	4(100%)	1(25%)	2(66.67%)	0
	Not at all	0	0	0	0
Mean		2.31	2.88	2.45	3.12
S.D.		0.64	0.66	0.51	0.74

In terms of research skills, three preservice teachers in CoP A (75%) were at a slightly competent level and one (25%) at a moderately competent level before the activity. After participating, three (75%) improved to the moderate level and one (25%) to a very competent level. In CoP B, one preservice teacher (33.33%) was initially at a slight level and two (66.67%) at the moderate level; these shifted to one (33.33%) remaining at the moderate level and two (66.67%) progressing to the very competent level. These findings suggest an upward development in research skill competence among both groups.

In terms of research attitude, all preservice teachers in CoP A (100%) were initially at a slightly competent level. After the activity, one remained at the slight level (25%), while three advanced to the moderate level (75%). In CoP B, two preservice teachers (66.67%) were at a slight level and one (33.33%) at the moderate level prior to the activity. Following participation, all three (100%) reached the moderate level. These results indicate an improvement in attitudes toward conducting research.

Moreover, the assessment employed a tripartite evaluation method involving supervising teacher, the university supervisor, and researcher. Through consensus-building discussions, the evaluation revealed that the majority of teacher candidates in both CoPs produced research reports rated at the "Very Good" level, with detailed outcomes as follows in Table 3.

Table 3. Research report evaluation levels of pre-service teachers by CoP

Level	CoP A (N=4)		CoP B (N=4)	
	Frequency	Percentage	Frequency	Percentage
Extremely	0	0.00	0	0.00
Very	3	75.00	3	100.00
Moderately	1	25.00	0	0.00
Slightly	0	0.00	0	0.00
Not at all	0	0.00	0	0.00

The evaluation results presented in Table 3 reveal distinct patterns in research report quality between the two CoPs. In CoP A, 3 pre-service teachers (75% or 3 out of 4) achieved a 'Very' rating for their research reports, while the remaining quarter (25% or 1 participant) received a 'Moderately' assessment. In contrast, CoP B demonstrated stronger overall performance, with all four pre-service teachers participating (100%) attaining the 'Very' standard for their research reports.

Findings from the focus group interviews revealed that preservice teachers responded positively to participating in activities based on the CoP plus LS approach. They reported that this form of collaborative learning enhanced their research knowledge, skills, and attitudes. Furthermore, the experience promoted greater self-awareness and strengthened their confidence in their own capabilities. The following excerpts provide further insight into these outcomes:

CoP designing and the implementation of CoP

CoP A initiated with open discussions and brainstorming from the very first meeting. After jointly setting their goals, the group collaboratively designed and periodically planned their activities throughout the research process. This is reflected in the interview excerpts below:

> *"From the beginning, we planned how many times we would meet so that it wouldn't be too frequent but still sufficient to complete the research."* - Preservice Teacher 1, CoP A

> *"Our group focused on key phases where we needed to think and work together. We scheduled regular intervals from the start not too far apart, but not overly frequent either just enough to complete the research."* - Preservice Teacher 3, CoP A

CoP B engaged in collaborative brainstorming and designed a meeting schedule from the outset, based on shared goals. Initially, four cycles were planned. However, during implementation, the group also communicated through online channels. When problems or uncertainties arose, they engaged in reflective dialogue and added more activity cycles as needed to collaboratively solve issues. This is illustrated in the interview excerpts below:

> *"Actually, our CoP group created a joint activity schedule from the beginning. But as we progressed, we also held discussions through our Line group."* - Preservice Teacher 1, CoP B

> *"We agreed that activity planning could be adjusted depending on the situation. When we encountered problems, we discussed them and arranged meetings through Line to work together."* - Preservice Teacher 2, CoP B

> *"Since we were already teaching at the same school, it was easy to add more cycles when needed. It helped us solve problems and keep the research moving forward, so we scheduled additional meetings as appropriate."* - Preservice Teacher 3, CoP B

Learning activities: Peer-supported and collaborative learning

The learning activities were characterized by peer support and collaborative learning, as participants learned together, helped one another, and jointly addressed challenges and weaknesses to achieve their goals. This is reflected in the following interview excerpts:

"Working on activities with peers who are dealing with the same workload is really helpful. We speak the same language, so to speak. It's about mutual support, some are strong in one area, others in another, and we help each other." - Preservice Teacher 3, CoP A

"It feels like we're helping to complete one another. Everyone has to finish their own research, and it's not about dividing tasks, but rather working together on all parts of the process. We give each other feedback, listen to problems, solve them together, and learn as a team." - Preservice Teacher 4, CoP A

"I enjoy this kind of activity because it helps me review and reflect on my own understanding through peers' suggestions. It encourages me to think and speak without fear of being wrong, because we're close friends. If we know, we share; if we don't, we figure it out together." - Preservice Teacher 1, CoP B

"I really appreciate learning together, reviewing knowledge, applying it in practice, then reflecting and analyzing to solve problems. It's a clear and meaningful process. It might seem stressful, but it isn't, because we're working with friends, and the research keeps progressing step by step until it's complete." - Preservice Teacher 3, CoP B

Development of research competence

The learning activities based on the CoP plus LS approach contributed to more accurate knowledge acquisition while also fostering confident practical application. The process included reflective thinking to examine and improve research practices. Moreover, it helped cultivate positive attitudes toward conducting research.

Research Knowledge: Engaging in activities based on the CoP plus LS approach enabled preservice teachers to revisit and deepen their understanding of research knowledge previously learned in coursework. By applying this knowledge in hands-on, collaborative contexts, they developed a clearer and more practical grasp of research concepts. This is evident from the following reflections

"I see it more as a review of prior knowledge. We've learned this before, so doing these activities felt like revisiting what we had studied. If we didn't understand or remember something, we helped each other search and learn it again." - Preservice Teacher 1, CoP A

"It wasn't really anything new, we had learned it all before. It's just that we might not have fully understood it or had forgotten. These activities helped us review and apply that knowledge in a more practical way." - Preservice Teacher 3, CoP A

"It was a process of collectively reviewing previously learned knowledge and applying it. This really helped deepen our understanding. Some things we learned but never actually used, until now, and that made them clearer." - Preservice Teacher 2, CoP B

"We reviewed lessons together, searched for examples, and tried creating our own. That really helped enhance our knowledge." - Preservice Teacher 3, CoP B

Research Skills: Preservice teachers developed research skills through the practical application of knowledge in real-world contexts. Actively engaging in research activities, receiving peer feedback, and reflecting on their own work contributed to skill refinement and deeper learning. This hands-on process, supported by collaborative interactions, strengthened their abilities throughout the research process. As noted in the following reflections:

"This aspect is very clear, because we actually did the work. That practice helped build our skills. Plus, getting feedback from peers and reflecting on our work helped us review, revise, and enhance our research abilities." Preservice Teacher 3, CoP A
"This activity required us to really do the work, and that's what helped us improve. We reflected, made revisions, and repeated the process. Over time, we became more skilled." - Preservice Teacher 2, CoP A

"It involved real thinking, real action, and real problem-solving. We received feedback from peers and worked together to solve problems. I gained skills while doing my own work, and again when giving feedback to others." - Preservice Teacher 1, CoP B

"We thought, acted, and revised everything together. It was great practice; we didn't need to wait for the instructor to check everything. That led to real learning and hands-on experience." - Preservice Teacher 2, CoP B

Reseach Attitude: Preservice teachers demonstrated a positive attitude toward research, expressing increased confidence in conducting research independently. This growth in self-belief stemmed from collaborative activities and peer support experienced through the CoP plus LS approach. The following interview excerpts illustrate these perspectives:

"These kinds of activities are really helpful. They've made me feel more confident about doing research. I used to think it was too difficult and that I couldn't do it, but having peers to brainstorm and solve problems with made me realize research isn't as hard as I thought." - Preservice Teacher 4, CoP A

"It feels like we have peers who really understand what we're going through. We can vent, share our problems, and once we feel better, we can share ideas and solve issues together. It makes research feel manageable; we can actually do it." - Preservice Teacher 2, CoP A

"It's like working with friends who share the same goal. It feels like a safe space where we can express ourselves freely, whether we're right or wrong. No matter how difficult the problem is, I feel reassured knowing we're in this together, our group will help listen and think things through. That's really boosted my confidence in doing research." - Preservice Teacher 3, CoP A

"From the start, I always thought research was too hard, so many steps, and I had no experience. But doing it this way, working with peers, having friends who listen, observe, and help solve problems with me, made me more confident. I now feel like research isn't beyond my ability." - Preservice Teacher 1, CoP B

"I've learned new perspectives and problem-solving strategies from my peers. Sometimes I can't see a solution, and that makes me afraid of research. But when friends help me think and reflect, it's really not as difficult as I imagined." - Preservice Teacher 3, CoP B

Enhancing self-understanding, and self-efficiency through CoP plus LS activities

Participation in CoP plus LS activities enabled preservice teachers to gain deeper self-awareness. Through self-reflection, they were able to identify their own strengths and areas for improvement, while peer reflections offered new perspectives and insights into their personal and professional development. This is evident in the following interview excerpt

"Reflecting on my own work gave me time to review and better understand myself. At first, I was confused and didn't know why I was doing things. But over time, I

started asking myself what I was thinking when I did something, whether the outcome was good, and if not, how I could improve." - Preservice Teacher 1, CoP A

"Self-reflection helped me accept myself more acknowledging both what I did well and what I didn't. And peer feedback made me recognize my weaknesses too. Sometimes others see things about me that I don't. That helped me understand and accept myself better." - Preservice Teacher 4, CoP A

"This cyclical process helped me repeatedly look back at how I worked and thought. It revealed aspects of myself I hadn't noticed before, and that helped me better understand my capabilities." - Preservice Teacher 3, CoP B

"Sometimes I didn't want to admit things to myself, but when several friends pointed out the same issue, it made me think. I had to reflect, accept it, and understand my abilities. It made me more confident in myself and also in giving feedback to others." - Preservice Teacher 1, CoP B

Fostering self-discipline, self-regulation, and responsibility through cop plus ls activities

Participation in the CoP plus LS activities encouraged preservice teachers to develop self-discipline, responsibility, and self-regulation. The cyclical nature of the activities, with scheduled check-ins and collaborative expectations, required them to plan, manage time effectively, and consistently follow through with their responsibilities, not only for their own progress but also to contribute meaningfully to the group. This structure promoted a sense of accountability and fostered habits of self-management and personal responsibility. As expressed by the participants:

"This kind of cyclical activity, with scheduled meetings, required me to manage myself and complete the work by the deadline agreed upon by the group. Otherwise, I wouldn't have anything to share or contribute during the exchange." - Preservice Teacher 2, CoP A

"Normally, I tend to act on impulse, but this setup made me think more carefully. I had to plan and manage my own research and stick to the timeline. I had to regulate myself because if I didn't, it would affect my friends too." - Preservice Teacher 3, CoP A

"I had to plan carefully and design a schedule that fit my own situation to complete things on time. It helped me practice self-discipline, responsibility, and self-control." - Preservice Teacher 4, CoP A

"I had to discipline myself to meet goals and take more responsibility. I had to push myself to stay on track." - Preservice Teacher 1, CoP B

"We agreed that the activity process was flexible—we could adjust as needed. When we faced challenges, we communicated via Line and scheduled group sessions to keep things moving forward." - Preservice Teacher 1, CoP B

"I had to understand myself, design and manage my own life schedule, and push myself to stick to the plan. It helped me build discipline and responsibility, without even realizing it." - Preservice Teacher 2, CoP B

Discussion

This study indicates that learning activities integrating the concepts of Community of Practice (CoP) with Lesson Study (LS) not only enhance pre-service teachers' research competence but also help build their confidence. According to the principles of CoP, knowledge

development occurs through social processes, where individuals can expand their understanding by participating in CoP activities (Lave & Wenger, 1991). Moreover, the structure of the CoP plus LS model creates a safe and supportive learning environment in which members of the CoP can comfortably and openly reflect without fear or anxiety. They engage in collaborative knowledge construction and joint problem-solving based on shared experiences. These processes lead to significant and concrete development in various aspects of learning (Vescio et al., 2008).

The research findings reveal that combining CoP plus LS concepts into learning activities significantly boosts pre-service teachers' research skills. The method creates a psychologically safe environment which allows participants to openly revisit and reflect upon the research knowledge they implement. In this educational setting pre-service teachers have the opportunity to share their ideas with others while participating in collaborative discussions and learning collaboratively from their peers (Edmondson, 1999; Wenger, 1998). The Plan-Do-Reflect cycle leads to systematic learning and professional development through repeated structured reflection practices (Lewis et al., 2006 Kolb, 1984; Stigler & Hiebert, 1999; Wenger-Trayner & Wenger-Trayner, 2015). The cyclical activities help pre-service teachers gain profound conceptual insights (Murata, 2011) and improve their research abilities through practical experiences and mentorship along with peer evaluation. Pre-service teachers develop their research design capabilities through critical thinking and problem-solving while continuously enhancing their work. Research capability requires practical competence and analytical reasoning which this process supports (McDonough, 2006; Zuber-Skerritt, 1994). Self-reflection and peer reflection serve as tools that boost awareness and deepen research process comprehension while promoting continuous self-improvement. Reflective engagement facilitates both quick learning of skills and continuous development of reflective practitioners over time (Cochran-Smith & Lytle, 2009).

In particular, regarding fostering a positive attitude toward research, the findings indicate that encouraging collaboration between pre-service teachers and instructors, through joint brainstorming, research design, implementation of learning activities, and shared classroom observations, contributes significantly to the development of both teaching practices and research competence. This collaborative process not only enhances pedagogical potential but also builds confidence in conducting classroom-based research, thereby supporting professional growth and reflective practice among teachers (Levin & Rock, 2003; Sonsupap & Cojorn, 2024). In this study, it was observed that pre-service teachers initially demonstrated relatively low levels of research attitude. Many expressed negative perceptions, feeling that research was difficult to understand and fearing failure. However, once they participated in the CoP plus LS-integrated activities, which emphasized peer support, collaborative learning, shared reflection, and joint problem-solving throughout every step of the research process, these pre-service teachers began to develop greater self-understanding and self-efficacy. They came to recognize the importance of research in enhancing their professional expertise and began to form more positive perspectives. This suggests that a structured CoP plus LS learning model, grounded in peer-supported activities, can effectively reduce stress and anxiety related to conducting research. Moreover, it helps foster positive research attitudes, especially among pre-service teachers who typically have limited research experience. The findings also revealed notable development in self-regulation and learning responsibility among pre-service teachers. Participants reflected that they were better able to manage themselves, including planning, designing, and monitoring their own learning processes. They also reported stronger academic discipline and a clearer awareness of their learning goals, qualities aligned with the core characteristics of effective lifelong learning (Zimmerman, 2002). This result is further supported by the work of Hadwin et al. (2011), who emphasized that collaborative-reflective learning environments effectively foster self-regulated learning behaviors in a concrete and meaningful way.

Moreover, it was found that engaging in cyclical activities following the Plan-Do-Reflect model, used as the core mechanism of the CoP plus LS integration, clearly reflects the principles of participatory action research and the concept of reflective practice as proposed by Schön (1983). This process not only supports the development of practical skills but also fosters metacognitive awareness regarding one's learning process and professional development. This aligns with the findings of Cochran-Smith and Lytle (2009), who emphasized the importance of

continual inquiry, questioning, reflective analysis, and the improvement of professional practice as central elements of teacher education. These elements are particularly vital in preparing teachers to navigate the complexities of today's classrooms and in promoting sustainable professional growth.

CONCLUSION

The learning activities based on the integrated CoP plus LS approach have proven to be an effective method for enhancing the research competence of pre-service teachers. These activities follow a collaborative learning framework, involving brainstorming, designing, planning, implementing, observing, reflecting, and refining through peer support within a supportive and safe learning environment. This allows pre-service teachers to think flexibly, design context-appropriate work plans, and regulate themselves to effectively achieve the goals set by the CoP.

Through continuous cycles of collaborative thinking, action, reflection, and knowledge exchange, this approach fosters increasing expertise. The approach promotes developing greater expertise through ongoing collaborative processes of thinking together with action and reflection phases and knowledge sharing. These activities both review research theories previously studied by pre-service teachers and provide practical applications which enhance their understanding. The iterative process of discussion and practice combined with reflection sessions builds research abilities such as peer observation and reflective thinking inside the CoP. Iterative research cycles with peer collaboration boost pre-service teachers' confidence and foster positive research attitudes. This methodology strengthens research skills while simultaneously developing reflective thinking and essential teaching competencies like self-efficacy, self-regulation, self-discipline, and accountability.

Therefore, integrating the CoP plus LS approach in learning activities cultivates confident, self-aware, and collaborative pre-service teachers, preparing them for future professional growth. It also nurtures teacher-researchers capable of creating research-based learning environments to foster self-directed learning development in their future careers.

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