

A collaborative professional development and its impact on teachers' ability to foster higher order thinking

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ABSTRACT

The objective of this research is to examine teachers' competence in designing activities after engaging in professional development activities aimed at enhancing teaching design in order to develop students' thinking abilities that are contextually appropriate. The participants consist of 5 elementary school science teachers from schools. The research employed semi-structured interviews and classroom observation as research instruments. The findings reveal that teachers engaged in self-development through observation and learning from their peers within the community of practice (CoP). They receive advice and feedback from fellow teachers and apply these insights to improve their activities. Consequently, teachers are able to continuously refine and develop their teaching approaches to align with students' contexts. This approach facilitates diversification in thinking and learning management, as well as collaborative teamwork to enhance teaching methods. As a result, engaging and interesting thinking development activities are incorporated into student learning, along with the creation of a seamless learning-promoting environment. Collaborative teamwork in instructional design and problem-solving further afford teachers the opportunity for additional self-learning and personal development. This collaborative approach also contributes to fostering cognitive diversity and relieved the need for individual teachers to undertake all tasks independently.

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1. INTRODUCTION

In the realm of education, the journey from novice to expert teaching involves a multitude of challenges and learning curves. Even though, novice teachers possess a strong sense of social commitment and openness to innovation; these qualities may diminish if they are assigned to teach in schools with challenging environments or inadequate support systems. Novice teachers require time, assistance, and guidance to develop their capabilities. Unfortunately, many new teachers are often assigned to teach in small schools that present multiple challenges, such as resource constraints. In such settings, teachers are tasked with various responsibilities, including both teaching and administrative duties, and may need to teach multiple subjects.

Besides, developing higher order thinking skills is essential for students in today's educational landscape. These cognitive abilities encompass critical thinking, analysis, problem-solving, creativity, and evaluation. They empower students to go beyond rote memorization and surface-level comprehension, enabling them to engage with complex ideas, make informed decisions, and apply their knowledge in novel contexts [1].

However, a persistent challenge faced by teachers is the prevalence of low higher order thinking skills among students [2]. It requires a multifaceted approach to address the problem of low higher order thinking skills. Teachers need to shift from a focus on rote learning to fostering environments that encourage active engagement, problem-solving, and application. Strategies such as project-based learning, collaborative activities, and open-ended questioning can stimulate higher order thinking [3]. Besides the same higher order thinking teaching methods may not be effective in all settings. It is important to consider the cultural background, educational resources, and other factors of the learners when developing and implementing higher order thinking programs. By tailoring higher order thinking instruction to the specific context, learners are more likely to develop the higher order thinking skills they need to succeed in school and in life [4].

Nevertheless, novice teachers, specifically, may confront obstacles in formulating instructional plans. They might not be aware of the different strategies and techniques that can be used to foster higher order thinking skills. Furthermore, novice teachers often lack confidence in their teaching skills, including classroom management, which may lead to hesitancy in trying new teaching approaches. Fear of making mistakes may result in anxiety or stress, leaving them feeling isolated during the transition from being a learner to becoming a teacher. These challenges can adversely impact their motivation and willingness to continue in the teaching profession [5]. Hence, providing sufficient support and guidance during their initial years is a crucial factor in helping novice teachers develop their capabilities and grow into competent professionals.

Wenger [6] asserts that communities of practice (CoPs) consist of individuals who come together to exchange knowledge, expertise, and learn from one another within a shared domain of interest. They engage in continuous interactions and knowledge management, particularly in the context of intra-organizational knowledge exchange. CoPs serve as tools for overcoming organizational barriers that hinder the flow of knowledge, aiming to address issues and foster organizational development. The salient characteristics of vital CoPs involve the convergence of individuals with shared interests, collaborating to exchange and learn together, with mutual interactions and ownership, fostering strong bonds and shared knowledge for the purpose of mutual assistance and continuous development. The essential components of a CoP are threefold: domain, community, and practice [7]. All three elements must result from the collaborative participation of members, reaching a consensus and common understanding. The fundamental principles of CoPs include: i) being a group of individuals with shared interests and expertise in the same domain or field; ii) emphasizing sharing knowledge and experiences to enhance work efficiency and self-development; iii) comprising a self-organizing group that does not necessarily require leadership or control; iv) fostering communication and knowledge exchange among community members; v) developing oneself and generating new knowledge through shared experiences; vi) emphasizing experiential and problem-solving learning in real-life situations; and vii) promoting continuous exposure and sharing of knowledge and experiences to support members' knowledge and expertise development through feedback and mutual support in learning and self-development.

Apart from fostering positive relationships, CoPs also promote mutual understanding, knowledge exchange, and a culture of organizational learning and collaboration, creating a conducive environment for teachers to overcome the challenges in teaching and learning from others' experiences. Novice teachers participating in CoPs tend to demonstrate a propensity for skill and knowledge development as they have the opportunity to learn from experienced teachers and share their own ideas and experiences. CoPs can offer a sense of belonging, especially crucial for new teachers who may feel isolated or overwhelmed. When teachers are part of a CoP, they often feel motivated and committed to teaching, as they are surrounded by other passionate educators who offer support and encouragement. Teachers engaged in CoPs tend to develop a strong professional identity, as they can connect with like-minded colleagues who share the same values and interests and who can help them see themselves as professionals. Lawrence and Sankey [8] reports on a CoPs has had a major impact on the professional development of novice teachers, helping them to adopt a more transformative approach to learning. It has also provided a way to share best practices and promote high-quality teaching and learning across the faculty. While lesson study refers to research or testing and examination of teachers' teaching practices, which is one method of professional development rooted in the effort to internally improve schools by working collaboratively with other teachers. It involves scrutinizing and analyzing each individual's teaching methods, which are critical to classroom instruction. In this study, the emphasis is on integrating educational principles into lesson plans and applying them in the teaching and learning process. The approach focuses on allowing teachers to learn from their practical experiences, observe classroom activities, and reflect on the learning outcomes together, aiming to address problems and enhance students' thinking abilities [9]–[11].

Lesson study is an educational process that concentrates on the development of teaching and learning for both teachers and students, enabling teachers to comprehend the teaching process and students to the greatest extent possible. The steps involved in lesson study can be summarized as follows: i) plan: teachers participating in lesson study must design a teaching plan for development, taking into account the learning

objectives of students and appropriate teaching methods to prepare students for that lesson; ii) Do: teachers participating in lesson study will implement the planned teaching and present the lesson in their classroom; iii) See: teachers participating in lesson study will promote observation of the lesson leader and the students. They will observe classroom events and identify issues or directions for improving the teaching process; iv) Act: teachers participating in lesson study will consider ways to improve or modify teaching practices to increase effectiveness. This may involve creating new lessons or adapting them based on the study's findings; and v) Share: teachers participating in lesson study will share the knowledge and experiences gained from the process externally, possibly through academic conferences or online media. The results from lesson study help teachers gain more knowledge and understanding of the teaching and learning process, further developing more effective teaching methods and fostering cooperation and teamwork in educational institutions. Applying the knowledge acquired from lesson study to transform teaching practices in schools is beneficial in enhancing the sustainable quality of education for students. Lesson study enables novice teachers to learn from experienced teachers and practice teaching skills in a supportive environment. It helps new teachers learn from others' experiences in problem-solving situations similar to their own. This can assist novice teachers in developing new strategies and seeing different perspectives on teaching. Lesson study can also help novice teachers develop a strong professional identity by providing them with opportunities to work with like-minded teachers who share a passion for teaching.

Therefore, by using the potential of two intertwined strategies CoP and lesson study as powerful tools to bolster teaching competence and facilitate professional growth. These approaches capitalize on collaborative learning environments and reflective practices, fostering a supportive ecosystem for novice teachers to refine their instructional methods and develop into adept teachers who capable of nurturing students' cognitive capabilities effectively. The researchers developed a teacher potential-building activity based on the study of research documents on the CoP concept and lesson study [12]. They combined this with data gathered from interviews and observations of real classroom teaching activities. This resulted in the creation of a teacher capacity-building activity that integrated the CoP concept and lesson study framework. The activity capitalized on the strengths of these two concepts by fostering empathy and trust through collaborative work, sharing experiences, and reflections. It used lesson study to observe classrooms and improve teachers' capacity for instructional design. The activity aimed to enhance students' higher order thinking abilities in contexts relevant to their own experiences.

The activity was structured into four phases: educating, innovating, implementing, and reflecting. In the educating phase, teachers engaged in activities that emphasize in promoting higher order thinking skills to review and advance their knowledge of instructional design and create learning innovations suitable for their teaching contexts. In the innovating phase, teachers with similar goals and contexts formed groups to pool their experiences, skills, and learning to create innovative learning practices relevant to their own contexts. In the implementing phase, teachers applied the learning innovations they had developed to their own contexts, with observations and feedback from peers who had contributed to the innovations. Finally, in the reflecting phase, the CoP members gathered to collectively reflect on their practices, share insights, and distill best practices and guidelines for more effective teaching. Each phase included sub-activities that allowed teachers to engage in research practices actively. This paper explores the challenges novice teachers face in cultivating teaching competence as they engage in professional development activities aimed at equipping them with the necessary skills to design lessons that not only enhance students' higher order thinking skills but also foster a deeper understanding of pedagogical best practices.

2. METHOD

2.1. Participants

The participants consisted of five primary school science teachers who were purposively selected based on their teaching experience of no more than 5 years and their voluntary interest in participating in the research. The participants were drawn from five different schools, with three schools having fifth-grade classes and two schools having sixth-grade classes. All schools were located within the Mahasarakham primary education service area. After the completion of the first practical seminar, the participants then form 2 CoP by the similar interests which each CoP implemented the jointly designed activities. The details are as follow, CoP no. 5 conducted the teaching and learning activities with a sample group of fifth-grade students from three schools, while CoP no. 6 conducted the activities with a sample group of sixth-grade students from two schools. Both CoPs collaboratively designed and observed the activities, reflected on the outcomes together, following the agreements of each CoP. In this process, the researchers facilitated and regularly observed the CoPs' operational activities and provided tools to measure the three dimensions of thinking abilities: analytical thinking, problem-solving, and creative thinking.

2.2. Data collection

The research adopts a qualitative approach Creswell and Clark [13] utilizing semi-structured interviews, focus group discussion and classroom observations to collect data from participating teachers. A purposive sampling technique will be employed to select teachers who have undergone specific professional development activities focused on instructional design for critical thinking development. The data collected will be analyzed thematically to identify emerging patterns and themes related to teachers' instructional design strategies and their integration into classroom practices.

2.3. Implementation of activities

The researchers arranged and informed the participants about their involvement in a practical seminar training and understanding the implementation of activities in actual classroom contexts. The participating teachers attended two sessions of the practical seminar training to gain an understanding of the activities developed through the learning process of each CoP. After the completion of the first practical seminar, each CoP implemented the jointly designed activities, and CoP no. 5 conducted the teaching and learning activities with a sample group of fifth-grade students from three schools, while CoP no. 6 conducted the activities with a sample group of sixth-grade students from two schools. Both CoPs collaboratively designed and observed the activities, reflected on the outcomes together, following the agreements of each CoP. In this process, the researchers facilitated and regularly observed the CoPs' operational activities and provided tools to measure the three dimensions of thinking abilities: analytical thinking, problem-solving, and creative thinking. The participating teachers collected data from students both before and after the activities to assess their progress and analyzed the improvement of the learning plan developed by the participating teachers. Upon completing the activities, both CoPs scheduled a second practical seminar session to conduct the Reflecting stage through focus group discussions with the participating teachers and jointly summarized the best practices.

2.4. Data analysis

The qualitative data were obtained from classroom observations, semi-structured interviews and focus group discussions. In order to enhance the validity and reliability of findings, data were collected through multiple sources [13]. The transcribed the audio recordings and classroom observation field notes were analyzed by using content analysis and interpretation of the data.

3. RESULTS AND DISCUSSION

The research undertaken focused on the evaluation of instructional design competencies among elementary school teachers, with specific attention given to three grade 5 science teachers within a particular CoP. The study revealed insights into the instructional practices of these teachers and their impact on student engagement and learning outcomes. For Teacher 5A, the central activity revolved around water conservation, emphasizing problem-solving skills. The teacher's approach included interactive techniques such as posing questions, using visual aids, and encouraging collaborative thinking. The teacher demonstrated a commitment to fostering diverse and creative thinking, recognizing the importance of students' imaginative contributions. However, limitations in the clarity of visual aids led to misinterpretations, prompting the consideration of refining context and content. The teacher also acknowledged the need for students at the back of the class to be more actively engaged, suggesting strategies like assigning front roles to stimulate collective thought. This teacher expressed the intention to enhance teaching methods, incorporating local examples and storytelling to bolster creative thinking and participation, particularly among students with challenges in reading and writing.

Teacher 5B concentrated on clouds, fog, dew, and water, implementing innovative strategies like image-based partnering and storytelling through dice activities. While students exhibited enthusiasm, some challenges arose regarding the scientific accuracy of stories generated. To address this, the teacher proposed integrating more conditions and questions to reinforce scientific foundations. For students facing difficulties in reading and writing, the recommendation was to present activities verbally. The teacher advocated for more comprehensive timeframes and increased interactions, fostering deeper engagement.

Teacher 5C navigated water source education, utilizing jigsaw puzzle images and role-play scenarios to encourage comprehensive understanding and collaborative problem-solving. The teacher created an engaging classroom atmosphere through trust, respect, and interactive teaching methods. Despite the effective approach, limitations arose in time constraints hindering thorough discussions, prompting consideration for extended activity periods. Peer reflections highlighted the diversity and complexity of activities and the positive impact of the teacher's strategies on students' willingness to express opinions and engage in problem-solving. Suggestions encompassed reducing group segregation and expanding student participation and questioning for improved collective understanding.

In summary, the research illuminated the intricate dynamics of instructional design skills among elementary school teachers within the CoPs. The teachers' innovative strategies aimed to enhance students' engagement, thinking, and learning experiences. Challenges, including clarity of instructions and time management, were acknowledged, and remedies proposed, such as adjusting questions, providing examples, and facilitating increased interaction. This study unveiled valuable insights into effective instructional practices and their potential impact on student engagement, understanding, and holistic development.

While examining the instructional design skills of two grade 6 science teachers within a designated CoP. The results showcased varying instructional approaches and their impacts on student engagement and learning outcomes. Teacher 6A introduced the concept of electric circuits using visual representations and interactive questioning. While students were engaged, there were instances of disorganization due to inadequate planning and unclear instructions. Reflecting on this, the teacher emphasized the value of activities that prompt both thinking and doing, acknowledging students' effort to contribute even when criteria were unclear. Collaboration among teachers within the CoP was seen as mutually beneficial in refining activities to promote thinking. The importance of framing questions appropriately to mitigate student stress was underscored, along with the suggestion to provide clear instructions, examples, and reinforcement.

Teacher 6B's instructional strategy aligned with that of Teacher 6A, emphasizing step-by-step learning. Engaging students with practical scenarios like turning lights on and off effectively captured their attention. The teacher found satisfaction in observing students engaging in relatable activities, enhancing lesson comprehension. Although individual and group practice preceded lesson integration, some areas for improvement were identified. Rapid speech and minimal examples caused confusion, with limited space hindering student consultations. To address these issues, the teacher planned to provide detailed explanations, improve connection to student responses, and optimize activity spaces. Collaborating teachers endorsed the alignment of activities with student thinking, encouraging frequent questioning to gauge understanding. They emphasized the significance of creating conducive spaces for group work and the value of integrating student ideas and questions into class discussions.

To conclude, the study illuminated the instructional practices of grade 6 science teachers within the CoP, underscoring diverse approaches and their implications for student engagement and learning outcomes. Teacher strategies ranged from interactive questioning and visual aids to relatable real-life scenarios. The findings demonstrated the importance of clear instruction, effective time management, and the integration of students' ideas for enhancing instructional efficacy. Collaboration within the CoP played a pivotal role in refining instructional approaches and sharing insights for improved teaching methodologies. The research underscored the potential for adaptive instructional design to foster critical thinking and engagement among elementary school students. According to Boobphan *et al.* [4], the classroom's atmosphere such as good student/teacher relationships, freedom of expression, teachers' listen to students' opinions, and higher order thinking promotion materials are used is judged to be the most important factor to promote higher order thinking. The teacher's classroom environment, whether it is focused on mastery or performance, has an impact on the student's learning outcomes [14].

The research undertaken involved the reflective insights of five collaborating teachers upon completion of activities, aimed at discovering effective practices that foster critical thinking. These teachers have identified key attributes characterizing successful practices to enhance cognitive engagement among students. Firstly, the timing and alignment of activities with students' existing knowledge are paramount, facilitating the application of prior understanding to novel challenges. Open-ended questions that stimulate explanations are crucial for achieving this alignment. Secondly, activities should be structured to enable voluntary and unrestrained student participation. The design should encourage decision-making and problem-solving autonomy, cultivating student interest and motivation. Thirdly, activities should incorporate well-defined parameters, establishing clear boundaries that align outcomes with the activity's objectives. Fourthly, activities geared towards nurturing problem-solving abilities should incorporate role-playing, diverse scenarios, and probing questions to encourage multifaceted exploration and collaborative brainstorming. Introducing progressively complex conditions fosters skill refinement and adaptation to intricate scenarios, catering to diverse student capabilities. Fifthly, activities fostering creative thinking should immerse students in hands-on experiences, such as designing models. Students should work independently, experimenting with explanations and adjustments while guided by expanding questions. Pre-designed or student-created storytelling dice can prompt factual-based narratives, enhancing interest, summarization, and knowledge extension. Lastly, activities to enhance analytical thinking should focus on practical application, training students to independently observe and categorize. Guiding questions can stimulate analysis of similarities, differences, relationships, classifications, and connections to principles. Combining analytical thinking with problem-solving can effectively refine students' causal analysis and logical solution generation.

In conclusion, the collaborative teacher reflections emphasize the significance of well-timed, student-centered, and structured activities that promote critical thinking. The identified attributes provide a comprehensive framework to design effective learning experiences that cater to diverse cognitive skills and enhance overall student engagement and understanding. The research findings underscore the significant potential of teachers in designing instructional activities that highly enhance students' thinking competency when engaging in such activities. The teacher's professional background, such as their job title, teaching experience, and educational qualifications, are strongly linked to the strategies they use to teach higher order thinking skills [15].

Teachers' competence plays a crucial role in equipping students with advanced thinking skills, thereby preparing them to navigate and thrive in a dynamically changing and challenging world [16]. Teachers can observe their classrooms and assess students to determine the benefits of these activities in developing students' creativity in various aspects, analytical thinking, and particularly problem-solving skills. Additionally, they notice that students possess diverse perspectives and thinking abilities, and these activities allow students the freedom to express themselves fully. This fosters responsibility, teamwork, and an understanding of others' ideas and approaches within the group, encouraging problem-solving and the creation of high-quality work. Indeed, these activities can be effectively applied in teaching, as students show genuine interest in the activities selected by their teachers. Moreover, these activities add excitement and interest to the lessons, capturing students' attention and encouraging their active involvement in designing, planning, analyzing, and creatively solving problems. Furthermore, they provide opportunities for students to appreciate each other's differences, promoting diverse thinking skills and leadership qualities among students.

Furthermore, the research project's participating teachers have undertaken a comprehensive reflection upon their experiences in implementing capacity-building activities, aligned with the CoP approach and integrated into the educational curriculum to enhance students' critical thinking skills. The insights garnered from their reflections are as follows: The teachers have actively embraced opportunities for self-improvement by assimilating lessons from their colleagues' teaching practices and incorporating valuable feedback. These insights are harnessed to refine their instructional methodologies, fostering an unwavering commitment to continuous enhancement. As one teacher articulated, *"I have developed myself and observed fellow teachers' methods, adapting and refining my approaches accordingly."* The exchange of experiences among peers within the CoP has broadened the participating teachers' perspectives, leading to the conception of novel activities that can be tailored and integrated into their classrooms. This collaborative environment has not only dispelled initial concerns about added workload but also kindled positive outcomes that enrich pedagogical practices. The teachers have evolved from adhering to set teaching patterns to incorporating innovative activities, thus diversifying their teaching repertoire. Participating teachers have reported a transformation in their analytical thinking skills and a broader outlook, refining their personal approaches accordingly. Engaging in these activities has prompted a reassessment of goals in performance appraisal, underscoring the role of the activities in shaping professional advancement. One teacher's remark encapsulated this sentiment, *"These activities have prompted me to set new goals in Performance Appraisal, aligning with the students' comprehension level. The dynamic activity design resonates with our students, leading to a positive shift in my goals."*

The teachers have acquired insights into innovative techniques and activities that foster students' thinking skills, appreciating their practicality and applicability within the classroom setting. These strategies have been described as straightforward yet impactful, capable of seamless integration into teaching practices. The participatory learning and exchange of experiences within the community of practitioners have yielded benefits such as collaborative teaching and learning activities, workload reduction, and time efficiency in preparing teaching materials. This collective approach instills confidence in the effectiveness of the activities, fostering an environment of mutual support and shared responsibility. A notable revelation has been the recognition of the pivotal role of students' data in shaping effective teaching and learning activities.

Teachers have gained profound insights into individual students' thought processes through activity-based designs, thus facilitating tailored instructional strategies that cater to diverse perspectives. Collaborative teaching and learning activities within the community of practitioners have resulted in highly effective approaches aligned with students' contexts, kindling enhanced interest, enthusiasm, and engagement. This has spurred a positive shift in students' attitudes towards science, creating a newfound appreciation for the subject matter and their educators. The experience of collaborative activities has infused participating teachers' professional development with enrichment and empowerment.

By embracing activity-centric frameworks, teachers have acquired diverse insights into their students, revitalizing their enthusiasm for teaching and leading to a more engaging educational environment. These activities have transcended the boundaries of science, equipping participating teachers with insights into methodologies and principles applicable across various disciplines. This versatility holds particular significance for educators responsible for multiple subjects, enabling them to infuse engaging elements into

diverse subject matter. The participatory learning experience within the community of practitioners has fostered camaraderie, mutual support, and genuine understanding among peers sharing similar contexts. This collaborative atmosphere has facilitated knowledge construction through interactions with fellow teachers. This mode of learning encourages introspection and effective problem-solving, leading to sustainable and impactful instructional practices.

In summary, the participating teachers' reflections underscore the transformative impact of integrating the CoP approach and capacity-building activities into the curriculum. Their experiences reflect an evolution in pedagogical perspectives, fostering an environment conducive to continuous improvement and student-centered engagement. In line with Fauziyah *et al.* [17], the utilization of the lesson study approach led to notable advancements among participating teachers. They demonstrated heightened creativity in designing effective learning activities. Additionally, this approach positively influenced their attitudes, fostering a constructive mindset, and fostering improved communication and collaboration skills. Simultaneously, teachers also benefit significantly from utilizing these activities. They enhance their professional growth by observing and learning from their peers within the same CoP.

Through valuable feedback and reflections from fellow teachers, they develop their skills in lesson planning and problem-solving, adapting the activities to suit their students' context and interests effectively. Additionally, this collaborative approach reinforces teamwork and shared responsibilities in teaching and problem-solving. Collaborating with colleagues in designing learning activities provides teachers with valuable opportunities for continuous learning and self-improvement. Moreover, it fosters diverse thinking and relieves the pressure of handling everything alone. This type of learning encourages teamwork and collaborative problem-solving, promoting creativity in teaching and presenting captivating content to students. In addition, lesson study has been found to foster students' diverse thinking skills and leadership qualities. A research study conducted by Lewanowski-Breen *et al.* [18] on the long-term impact of participating in lesson study revealed that it can effectively contribute to the sustainable development of professional communities among subject-specific teacher groups. The activity aimed at enhancing teachers' potential in designing instructional practices to develop students' thinking abilities within a collaborative CoP, as well as through lesson study, has proven to be highly effective.

For students, the activities created by teachers offer increased learning opportunities and the development of diverse thinking skills, including problem-solving. Moreover, these activities encourage students to express their opinions freely and showcase different perspectives. The activities also promote a sense of responsibility, teamwork, and an understanding of others' ideas and approaches within the group. As for the teachers, the development of their potential through these activities further strengthens their ability to observe and learn from fellow teachers participating in the CoP. The valuable feedback and reflections from their peers in the program enable teachers to continuously improve their teaching methods effectively. According to Pan and Chen [19], being part of a learning community allows teachers to engage in mutual learning and benefit from their colleagues' experiences. This fosters a positive attitude and mindset towards teaching and learning, motivating teachers to embrace change and experiment with innovative instructional methods in their classrooms. Additionally, it enhances teachers' abilities in lesson planning and effective problem-solving, boosting their confidence and knowledge to tailor instructional activities to suit the unique contexts of their students. Moreover, consistent with Bautista and Baniqued [20], the positive outcomes of educational experiences through lessons show that teachers develop a collaborative team-working culture. It instills confidence in teachers and enhances their effectiveness in designing lessons, promoting critical thinking [21], [22]. The implementation of higher order thinking through lesson study can be particularly beneficial for students from diverse backgrounds with varying levels of cognitive competence [23]. These activities also foster teamwork and collaborative problem-solving among teachers, leading to creative and engaging teaching practices, presenting interesting content to students. As highlighted by Cojorn [24], CoPs play a crucial role in enhancing teachers' proficiency in lesson planning and research. These communities foster a culture of collaboration among educators, encouraging mutual support, motivation, and unity [25]. Working together with fellow teachers to design learning activities enables educators to fully engage in their professional growth while promoting diverse perspectives and alleviating the individual workload of teachers.

4. CONCLUSION

It affirms that these activities have fostered a sense of responsibility, teamwork, and an understanding of others' ideas and approaches among the teachers, encouraging collaborative problem-solving and the creation of high-quality outcomes. These activities have proven to be effective tools for professional development. As a result, these activities can be further developed to enhance students' higher order thinking skills efficiently. Participating teachers have derived significant advantages from joining activity bases on CoP

and lesson study by elevating their teaching practices through keen observation and learning from their peers. The valuable feedback they received empowered them to refine their instructional techniques and incorporate novel activities that stimulate critical thinking among students. This collaborative in the CoP endeavor bolstered teamwork and collective responsibilities in both teaching and problem-solving. Teachers derived immense satisfaction from implementing these innovative activities, effectively capturing students' attention and fostering their active engagement in problem-solving endeavors. Moreover, these activities fostered a culture of mutual acceptance, trust and respect among fellow teachers, nurturing diverse thinking capabilities and fostering teaching professional qualities. Ultimately, this dynamic learning environment has proven to be exceedingly effective for both students and teachers, establishing a constructive and growth-oriented ambiance within the educational setting.

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