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Development and Evaluation of a Collaborative Lesson Planning Model for Science Teacher Internships

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Abstract. Preservice science teachers often struggle with lesson planning due to limited pedagogical knowledge, insufficient collaboration, and a lack of structured reflective practice—challenges that are especially evident during internships. To address these issues, this study developed, validated, and evaluated a collaborative lesson planning (CLP) model to support both preservice and in-service teachers. Using a concurrent nested mixed-methods design, the study prioritized qualitative data while incorporating quantitative insights, all collected during the second semester of the internship. The model was implemented with 31 preservice and 17 in-service basic science education teachers. Informed by theoretical and empirical foundations, the CLP model addresses lesson planning challenges, fosters social interaction, and cultivates a community of practice. Validation by science education experts confirmed its feasibility, contextual relevance, and alignment with the Philippine teacher education curriculum. Evaluations by the implementing teachers revealed key themes and sub-themes, categorized as follows: strengths, including improved teacher preparation, enhanced lesson quality, and strengthened teamwork; weaknesses, such as time constraints, limited autonomy, and conflicting ideas; opportunities, including professional growth, deeper reflective practice, and addressing misconceptions; and threats, notably teachers' fixed mindsets and unequal involvement. Findings show that the model enhances pedagogical knowledge, promotes reflective practice, and strengthens collaboration, contributing to professional learning communities and improved science teaching. Its innovation lies in providing a structured,

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context-responsive framework with practical implications for advancing teacher preparation and internship programs.

Keywords: collaborative lesson planning; professional development; reflective practice; science education; teaching internships

1. Introduction

Lesson planning is widely recognized as a fundamental skill for effective teaching (Valdez et al., 2024), requiring not only pedagogical content knowledge but also cognitive expertise in designing coherent and student-centered instruction (König et al., 2021). Yet, for many preservice teachers, this task remains a significant challenge. A qualitative study by Koberstein-Schwarz and Meisert (2024) found that preservice biology teachers in a German university struggled to create learning activities that aligned with lesson objectives while responding to students' interests and needs. In the Philippine context, similar barriers have been observed. Dacanay et al. (2019) identified time constraints and structural difficulties in lesson design as major obstacles, while Ramirez (2020) and Enama (2021) documented preservice teachers' unsatisfactory performance in planning lessons. Ganal et al. (2016) further emphasized that inadequate lesson preparation often results in poor lesson delivery and limited responsiveness to student inquiries.

Despite these persistent challenges, lesson planning is often treated as an individual responsibility, especially during teaching internships. This approach neglects the potential of collaboration to enhance both instructional quality and teacher learning. Grounded in Vygotsky's (1978) social constructivist theory—which emphasizes the critical role of social interaction and collaboration in cognitive development, the concept of collaborative lesson planning (CLP) reframes planning as a shared, reflective practice. CLP encourages preservice science teachers and cooperating teachers (CTs) to engage in the co-construction of lessons, where knowledge is developed collectively and refined through dialogue, feedback, and reflective teaching. As Gutierrez (2020) argued, collaboration in lesson planning introduces productive dissonance, underscoring the idea of a professional learning community, which emphasizes learning through interaction and helps teachers develop skills in constructively critiquing lessons.

While CLP has demonstrated benefits for in-service mathematics teachers (Helmbold, 2021; Lanni, 2024) and preservice teachers in other disciplines (Alderton et al., 2024), research specific to preservice science teachers in the Philippine context remains limited. Most teacher education programs emphasize capacity-building for in-service teachers, particularly in lesson study (Dibaba et al., 2024; Yun et al., 2024), providing minimal structured support for preservice teachers during internships—a pivotal phase for developing pedagogical competence. Moreover, the absence of a clearly defined teaching internship framework in the Philippines leaves preservice teachers with limited access to consistent mentoring and guided instructional design.

This study addresses a critical gap in preservice teacher education by introducing a novel CLP model designed specifically for preservice science teachers and CTs within the context of teaching internships in the Philippines. What makes the CLP model unique is its integration of two well-established frameworks—lesson study and the community of practice (CoP)to support the development of instructional competence through structured collaboration and reflection. Unlike traditional lesson planning models that treat planning as an individual or procedural task, the CLP model repositions lesson planning as a socially mediated, iterative process that encourages joint inquiry, co-construction of pedagogical knowledge, and ongoing dialogue between novice and experienced educators.

Positioned within a social constructivist paradigm, the CLP model seeks to transform lesson planning from an isolated task into a collaborative, reflective process that supports capacity development and fosters a CoP. It aims to enhance preservice science teachers' instructional competencies while providing a framework that curriculum developers and program designers can use to improve the quality of internship experiences. By integrating collaborative structures into teacher preparation, this study contributes to reimagining lesson planning as a participatory practice central to preservice teacher education.

1.1 Research Questions

The development, validation, and evaluation of the CLP model was guided by the following research questions:

1. What are the perceptions of preservice science teachers regarding lesson planning?
2. What collaborative model of practice may be designed to help improve preservice science teachers' teaching preparations?
3. What are the validation remarks of science education experts on the proposed CLP model?
4. What are the strengths, weaknesses, opportunities, and threats (SWOT) associated with implementing the CLP model?

2. Literature Review

2.1 The Teaching Internship as a Professional Learning Experience

The teaching internship serves as the culminating phase of teacher education, offering preservice teachers essential hands-on experience in actual classroom settings. It plays a pivotal role in their professional development, allowing them to design and implement lessons, manage classroom dynamics, and engage in reflective practice (Beckmann & Ehmke, 2023). During off-campus internships in the Philippines, preservice teachers are typically deployed to public high schools within their local communities. They are guided by mentor teachers—referred to as cooperating teachers (CTs)who provide instructional support, mentorship, and professional insight.

The supervising teacher, often a university-based adviser, assigns preservice teachers to the Department of Education public schools, where they are paired with CTs chosen by the school principal. These mentors or CTs emphasize open communication, observe instruction, and offer continuous feedback, creating a

supportive learning environment. This dual role of teaching and mentoring not only benefits preservice teachers but also provides CTs with opportunities to reflect on their own pedagogical practices. This reciprocal benefit is supported by findings from Li et al. (2024), which highlight that CTs, also regarded as teacher educators, gain valuable professional growth through mentoring.

2.2 Lesson Planning: A Core yet Challenging Practice

Lesson planning is a core instructional practice among the essential tasks preservice teachers perform during internships. It provides structure, direction, and confidence—making it indispensable for both novice and experienced teachers (König et al., 2020). In fact, preservice teachers are not allowed to conduct classroom demonstrations without a well-crafted lesson plan. Sebullen (2023) noted that lesson planning poses significant challenges for preservice teachers, particularly because it is typically approached as an individual task. This can be overwhelming for those who may lack sufficient pedagogical content knowledge or confidence.

Although some CTs promote informal peer mentoring, structured collaboration remains inconsistent. While some support collaborative practices such as lesson study, others still require preservice teachers to plan lessons independently (Lomibao, 2016). To address this, the CT pairs the preservice teacher with their peers, allowing them to co-develop lessons. This pairing significantly improves the quality of the lesson and boosts the intern's confidence. These observations are consistent with the findings of Bayram and Bıkmaz (2021), who reported that Turkish teachers often face challenges in designing lessons that promote student thinking. However, participation in collaborative lesson study was found to enhance their pedagogical content knowledge, reflective practice, and research skills and foster a greater sense of collaboration and collegiality.

2.3 Benefits of Collaborative Lesson Planning

Historically, CLP has its roots in the concept of lesson study—a professional development approach for teachers originating in Japan—which has demonstrated numerous benefits. These benefits align with the findings of Aykan and Yildirim (2022) and Baptista et al. (2025) emphasizing that lesson study helps preservice and in-service teachers develop high-quality STEM lessons and improve their pedagogical learning strategies and classroom management. Moreover, lesson plans created collaboratively have been found to contain fewer errors and demonstrate greater instructional coherence than those developed individually.

This is proven in the study of Wang (2022), who explained that the integration of collaborative lesson study into teaching internships enhances preservice teachers' understanding of students' learning and improves their lesson planning and teaching skills. Collaborative planning not only eases the burden of designing effective lessons but also fosters reflection, mutual learning, and pedagogical confidence. Despite these benefits, teacher education programs have not institutionalized CLP practices for preservice teachers. Existing support structures often prioritize in-service teachers through professional development

programs (Perry & Bevins, 2019), leaving a gap in capacity-building for preservice teachers at a time when scaffolding is most critical.

2.4 The Need for a Collaborative Lesson Planning Model

Given the importance of lesson planning, the benefits of collaboration, and the limitations of current practices, there is a clear need for a structured approach that supports preservice science teachers—particularly in science education—through collaborative means. While the challenges of lesson planning are well documented, few models provide systematic support for preservice science teachers to plan lessons in a collaborative, reflective, and practice-based manner. One such model is the teaching practicum developed by Newman and Rogers (2024), which offers preservice teachers' opportunities to design, teach, and reflect on lessons.

However, their model is limited to a community composed solely of preservice teachers, without the involvement of experienced in-service teachers who can provide mentorship and contextual insights. Addressing this gap underscores the need to develop a CLP model tailored to preservice science teachers—one that fosters shared professional inquiry, bridges theory and practice, and cultivates a supportive learning community that includes both novice and experienced educators.

To this end, the present study proposed the development, validation, and evaluation of a CLP model tailored to preservice and in-service science teachers during internships. Grounded in both theoretical frameworks and empirical insights, the CLP model seeks to enhance pedagogical competence, foster reflective teaching, and build a sustainable culture of collaboration among future educators. By embedding collaboration into the core of lesson planning, the model has the potential to improve lesson quality, increase teaching confidence, and strengthen professional learning communities in science education.

3. Research Methodology

3.1 Research Design

The study adopted a concurrent nested mixed-methods design (Kroll & Neri, 2009), wherein qualitative and quantitative data were collected simultaneously, with greater emphasis placed on the qualitative strand. In this design, one methodological approach is prioritized—qualitative in this case—while the other—quantitative—is embedded within it to enrich the interpretation of baseline information. While the quantitative component involved an exploratory survey to provide initial empirical data on how preservice science teachers approach lesson planning, the qualitative component—comprising open-ended questionnaires, semi-structured interviews, and focus group discussions—complemented these findings by offering deeper insights into participants' experiences and challenges. In this context, both questionnaire and interview protocols were validated by three science education experts.

Anchored in the developmental research framework (Ibrahim, 2016), the study aimed to design, validate, and evaluate a CLP model. Developmental research—also referred to as design-based or formative research—is a systematic and

iterative methodology used to generate practical educational solutions while simultaneously contributing to theoretical understanding (Reeves, 2006; Richey & Klein, 2014). This approach was chosen because it is particularly suitable for developing, refining, and evaluating innovative, evidence-based models within authentic educational settings. It involved the cyclical process of designing the CLP model, implementing it in real-world settings, and refining it based on empirical evidence and teacher implementers' feedback. Moreover, the implementation of CLP allows researchers to respond to contextual challenges, iteratively test interventions, and ensure relevance and feasibility in practice.

3.2 Research Participants

This study involved four groups of participants: (1) 89 incoming preservice science teachers, (2) 6 expert validators in science education, (3) 31 implementing preservice science teachers, and (4) 17 science CTs. Purposive sampling was employed to select participants based on predetermined criteria aligned with the objectives of the study. Firstly, the 89 incoming preservice science teachers were selected from two higher education institutions. They participated in an initial survey designed to gather baseline data on their perceptions of lesson planning prior to the implementation of the CLP model. Secondly, the expert validators were selected based on their recognized expertise in science education. All held doctoral degrees and were actively involved in academic or professional work relevant to science teaching. Their role was to assess the content validity of the proposed CLP model.

Thirdly, the 17 science CTs served as evaluators of the CLP model. Each had at least seven years of teaching experience and was directly involved in mentoring preservice science teachers during their internships. Their feedback provided practical insights into the model's applicability and effectiveness in real-world classroom settings. Lastly, the 31 implementing preservice science teachers, also enrolled in their teaching internships and affiliated with the same institutions, directly applied the CLP model during their practicum. Their experiences provided crucial data on the model's implementation in real educational contexts.

The adequacy of the participant sample is supported through both qualitative and quantitative justifications. For the qualitative component, data saturation was achieved through the repeated surfacing of themes and patterns across responses from interviews, focus group discussions, and open-ended questionnaires, indicating that additional data collection would likely yield no new insights. For the quantitative component, a sample size of 89 is considered acceptable for an exploratory study, meeting the assumptions of statistical power estimation for detecting medium effect sizes (Cohen's $d \approx 0.5$) with a power level of 0.80 at a 0.05 significance level (Cohen, 1992). This ensured that the findings from the survey were both reliable and adequately powered to inform the study's initial diagnostic phase.

3.3 Ethical Considerations

The study was submitted for review and approval to the Research Ethics Committee (REC) of the University of San Carlos, Cebu City, Philippines. Prior to the implementation of the CLP model, formal permission was obtained through a

transmittal letter addressed to the dean of the teacher education institution in Iligan City, Lanao del Norte, as well as to the principals of the two national high schools where the teaching internships were conducted. Letter of acceptance and informed consent forms were obtained from all preservice and in-service science teacher participants, outlining assurances of anonymity, confidentiality, and voluntary participation. The consent form detailed the scope of data collection methods—including survey questionnaires, in-depth interviews, and focus group discussions—and provided transparent information about potential risks, benefits, and participant rights.

3.4 Data Gathering Procedure

In this study, data collection was conducted both before and after the implementation of the CLP model, integrating qualitative and quantitative methods to facilitate a comprehensive and evidence-based evaluation of the model's effectiveness and practicality. This integration allows for a more nuanced understanding of the research problem by leveraging the strengths of both paradigms within a single phase of data collection. Data were gathered before and after the internship period of the 2023–2024 academic year.

An online exploratory survey was administered to 89 incoming preservice science teachers during the first semester of the 2023–2024 academic year. The survey instrument included both Likert-scale items and open-ended questions. Before the CLP implementation, semi-structured interviews were conducted with a purposively selected group of former preservice science teachers using a pilot-tested interview protocol. Each interview lasted approximately 45 minutes to 1 hour and aimed to gather initial insights into participants' perceptions of conventional lesson planning practices.

Drawing from the initial data, insights from literature, and theoretical perspectives, the CLP model was developed and validated by six science education experts. The model was then implemented during the second semester of the specified academic year, particularly during the teaching internship, involving fifteen teams. Each team consisted of two preservice science teachers and one in-service teacher, assigned to two high schools under the Department of Education.

Following the implementation of the model, focus group discussions were conducted to gather qualitative data. Separate focus group discussions were held with the 31 implementing preservice science teachers and the 17 CTs involved in the classroom application of the CLP model. The primary objective of these sessions was to elicit in-depth feedback, including participants' ideas, suggestions, and critical reflections regarding the CLP process. All discussions were recorded using Google's online recording tool to ensure the accuracy and integrity of the data for subsequent analysis.

3.5 Data Analysis

Data from the survey questionnaire were analyzed using descriptive statistics, with Likert-scale responses summarized through means and standard deviations. These quantitative findings provided baseline information on preservice science

teachers' approaches to lesson planning, helping to identify broad patterns and areas of interest that informed and guided the qualitative inquiry. Qualitative data, including responses to open-ended survey questions, semi-structured interviews, and focus group discussions—were transcribed and analyzed thematically using Braun and Clarke's (2006) six-phase framework. The six phases are: (1) familiarization with the data, (2) generation of initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. To ensure the trustworthiness of the qualitative findings, triangulation across data sources was employed, drawing from preservice teachers, in-service CTs, and science education experts.

4. Results and Discussion

4.1 Perceptions of Preservice Science Teachers on Lesson Planning

Preservice teaching presents initial challenges and anxiety in individual lesson planning, as stated by the selected former preservice science teachers in the semi-structured interviews. Interview excerpts from the former preservice science teachers (fPST1 and fPST4) reveal a central theme of difficulty and emotional stress associated with lesson planning, particularly when done individually. Both participants highlighted how limited preparation and lack of collaborative support intensify these challenges. This challenge concurs with Iradel et al. (2021), who found that strong support systems—that is, parents, mentors, and peers—helped interns navigate lesson planning and online teaching demands during the pandemic.

In an interview, fPST1 shared:

> *"Lesson planning was tough, as I came from online classes and worried about being assigned to a higher section"*, highlighting the stress from limited preparation.

Similarly, fPST4 stated:

> *"Lesson planning was challenging for me because I'm doing it alone. I find it hard ... especially if the subject matter is difficult ... I need help and opinions from other people."* These accounts emphasize the need for collaborative support.

While CTs offer guidance, peer input is equally essential. This is reflected in the survey results from the 89 preservice science teachers, who rated lesson planning as moderately difficult (see Table 1).

Table 1: Perceived difficulty levels of lesson planning tasks (N = 89)

Lesson planning task	Mean difficulty level
Writing the objectives	2.28
Accessing prior knowledge of the students	2.44
Identifying relevant activities for the topic	2.57
Formulating relevant questions	2.45
Giving examples related to real-life situations	2.20
Making authentic assessments	2.33
Identifying short activities for motivation	2.28
Overall (mean ± SD)	**2.36 ± 0.13**

The data in Table 1 show that the preservice science teachers perceived lesson planning tasks ranging from average to moderately difficult, on a 4-point Likert scale (1 = *easy*, 4 = *very difficult*). The most challenging task was *identifying relevant activities for the topic* (M = 2.57), followed by *formulating relevant questions* (M = 2.45) and *accessing prior knowledge of the students* (M = 2.44), reflecting difficulties in designing engaging and instructionally aligned activities. These findings align with Cevikbas et al. (2024), who noted that preservice teachers often struggle with differentiating activities and managing large classes.

Conversely, *giving examples related to real-life situations* was rated the least difficult (M = 2.20), indicating greater teacher confidence in contextualizing content. With an overall mean of 2.36 (SD = 0.13), lesson planning was viewed as moderately difficult, underscoring the need for collaborative peer support. Engaging in collaborative planning and reflective dialogue can help teachers overcome common challenges and strengthen lesson planning practices.

4.2 Development of the CLP Model

Drawing on the benefits of professional learning communities (Gore & Rosser, 2022), lesson study (Bridget et al., 2021), social constructivism theory (Vygotsky, 1978), and collected empirical data, a CLP model (Figure 1) was developed. In this CLP model, teams of three or four (preservice and cooperating teachers) form a functional learning community. Collaboration begins with lesson planning, reflection, revision, and demonstration, with lesson plans improving through iterative cycles. A shared visual aid supports interns, and new topics are planned for each cycle. This model enhances teacher preparation by fostering knowledge sharing, reflection, and collaborative learning.

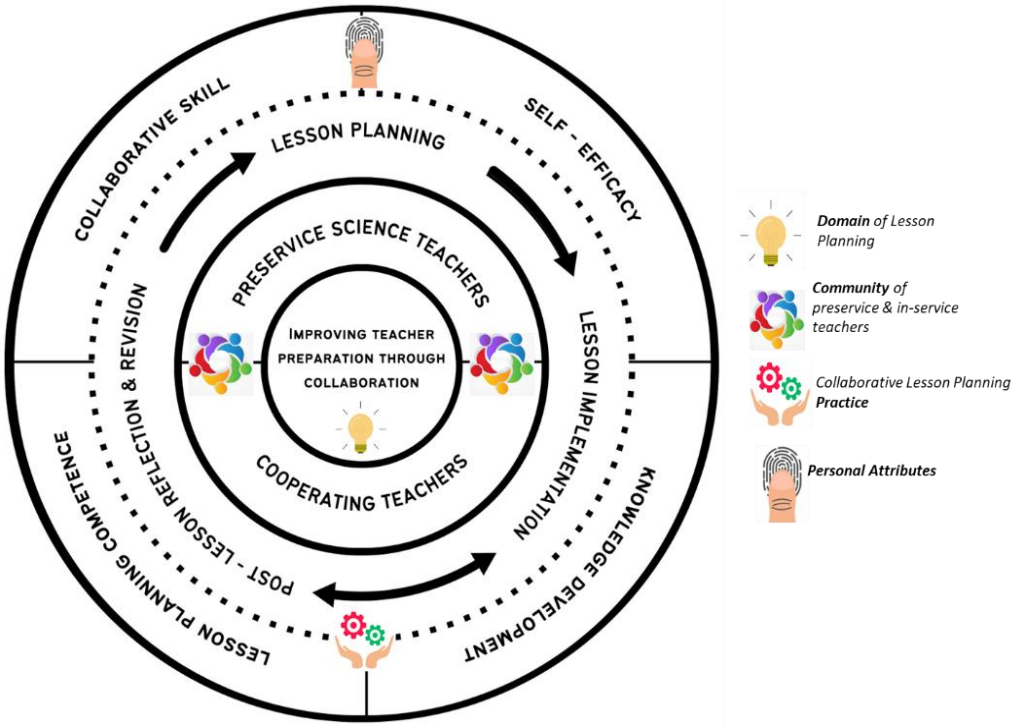

Figure 1: The collaborative lesson planning model

Figure 1 illustrates the layers of the CLP model, explaining their functions and connections. The model integrates concepts from lesson study and the CoP. The CLP model has three layers. The innermost layer, the *domain*, represents the goal of improving teacher preparation through collaboration, symbolized by a guiding lamp. The middle layer, the *community*, includes preservice and cooperating teachers working toward this goal. The inner half of the outermost layer, *practice*, is a cyclical process of designing, implementing, and refining lessons, represented by moving gears. The outer half of the outermost layer represents *personal attributes* and extends the CoP, encompassing teachers' knowledge, self-efficacy, collaboration, and lesson planning competence.

The *broken line* represents the permeability between teaching practices and personal attributes, indicating a bidirectional influence wherein changes in instructional approaches can affect personal characteristics, and vice versa. For example, enhanced student engagement resulting from CLP may bolster teachers' confidence, thereby contributing to their professional development. Each of the layers is explained in more detail below.

Domain of lesson planning. The domain of lesson planning represents the shared focus that unites the community. Both groups share a common goal: creating effective lesson plans while learning from each other. Preservice science teachers refine their planning skills, while CTs gain insights through reflective teaching. The team focuses on enhancing knowledge, pedagogy, and collaboration to improve instruction, self-efficacy, and lesson planning skills.

Community of preservice and in-service teachers. The community consists of preservice and in-service teachers who collaborate regularly on lesson planning. They support each other, share best practices, and reflect together to enhance learning. Through these interactions, they build relationships and exchange both tacit and explicit knowledge. Members of the CLP team play various roles. The first preservice science teacher is the ***implementer,*** responsible for a lesson demonstration in the classroom. The second preservice science teacher is the ***observer***, with a task to observe, document, and collect data about the lesson and students' responses. The CT is the ***knowledgeable other***, who will ensure that the group is developing the correct concepts and appropriate pedagogy and ensure alignment of assessment with the learning competencies.

Collaborative lesson planning practice. As practitioners, teachers engage in knowledge sharing through planning, reflecting, implementing, and revising lessons. This approach follows three steps. The first is ***planning a lesson***. The team collaboratively designs the lesson, discussing strategies, engagement, misconceptions, resources, and assessments. The second step is ***lesson implementation***, where one preservice teacher delivers the lesson while others observe, documenting challenges, student difficulties, and misconceptions. The last step is ***post-lesson reflection and revision***. Here, the team reviews the lesson, sharing insights and student responses to refine strategies for improved teaching and learning.

Personal attributes. Though not an original part of a CoP, personal attributes enrich the community by shaping collaboration and learning. Based on Clarke and Hollingsworth's (2002) model, these attributes—self-efficacy, collaboration skills, lesson planning competence, and knowledge development—interact with CLP practice, influencing and being influenced by the community. This study suggests personal attributes as an extension of the CoP.

4.3 CLP Model Validation

The CLP model was validated as contextually appropriate, easy to implement, and strongly aligned with educational standards. It is especially effective in fostering collaboration and professional development, though minor refinements may enhance clarity and broaden its perceived benefits among all teachers. Table 2 shows a summary of the emerging themes and sub-themes, with thematic quantification and sample quotes by validators.

Table 2: Summary of themes and sub-themes of the model validation

Theme	Sub-themes	No. of validators (N = 6)	% of validators	Validator quotes
1) Appropriateness of the context, focus, and flow of the CLP model	Expanding learning opportunities	4	67%	*"The proposed model can broaden the learning opportunities of preservice teachers through collaborative activity of lesson planning."* (MV3)
	Focused collaboration and feedback for instructional improvement	5	83%	*"The CLP allows teachers to engage in a worthwhile sharing of knowledge, skills, and best practices."* (MV6)
2) Adherence to the rules and guidelines of teaching internships	Compliance with institutional and professional teaching standards	6	100%	*"The model adheres with the implementing rules and guidelines of teaching internship, as well as CHED and PPST standards."* (MV3)
3) Ease of interpretation and implementation	Clarity and applicability of the model	4	67%	*"In terms of clarity and alignment with educational standards, I would say it will certainly maximize ease of interpretation for educators."* (MV4)
	Structured design facilitates collaborative practice	6	100%	*"The model uses a structured approach that enables teachers (preservice and in-service) to work together in order to improve their teaching practices."* (MV5)

Note: MV = model validator; CHED = Commission on Higher Education; PPST = Philippine Professional Standards for Teachers

The thematic validation of the CLP model revealed three major themes: (1) appropriateness of the context, focus, and flow of the model, (2) adherence to the rules and guidelines of teaching internships, and (3) ease of interpretation and implementation. These themes reflect the perceived relevance, compliance, and practicality of the model in the context of preservice teacher education. Table 2 presents a summary of these themes along with representative quotes that illustrate validators' perspectives during the validation process.

4.3.1 Theme 1: Appropriateness of the context, focus, and flow of the model

Validators recognized the model's alignment with the needs of teaching internships, particularly in promoting collaboration and reflective practice. Two sub-themes emerged: expanding learning opportunities through collaboration (67%) and focused collaboration and feedback for instructional

improvement (83%). These sub-themes underscore the model's capacity to foster a collaborative environment wherein both preservice and in-service teachers engage in collaborative planning, feedback, and professional development. As noted by one validator, this structure provides a "*worthwhile sharing of knowledge, skills, and best practices*", which is essential in developing pedagogical competence.

4.3.2 Theme 2: Adherence to the rules and guidelines of teaching internships

A unanimous agreement (100%) was reached among validators regarding the model's compliance with existing standards, specifically those set by the Commission on Higher Education (CHED) and the Philippine Professional Standards for Teachers (PPST). This theme emphasizes the model's integrity in aligning with institutional expectations and regulatory frameworks, thereby ensuring its legitimacy and applicability in formal teacher training programs.

4.3.3 Theme 3: Ease of interpretation and implementation

The model was highly regarded for its clear and systematic structure, which contributes to its ease of understanding and implementation in teaching internships. Validators highlighted two sub-themes: clarity and applicability of the model (67%) and structured design facilitates collaborative practice (100%). These findings suggest that the model is not only theoretically sound but also practical for day-to-day use in internship settings. Its logical flow and clear structure were particularly valued for supporting consistent implementation and fostering meaningful cooperation between preservice and cooperating teachers.

Collectively, these themes confirm that the CLP model is a well-grounded, standards-aligned, and context-responsive framework. It demonstrates strong potential to enhance the quality of internship experiences by promoting collaborative, reflective, and standards-based professional learning.

4.4 CLP Model Evaluation

SWOT analysis was employed to evaluate the CLP model based on its strengths, weaknesses, opportunities, and threats (see Table 3). These four constructs emerged as themes from the model validators' feedback. The implementing CTs assessed the model through reflective questions during the teaching internship.

Table 3: SWOT analysis of collaborative lesson planning based on evaluators' feedback

Theme	Sub-themes	No. of Evaluators (N = 17)	% of evaluators	Evaluator quotes
Strengths	Improve teacher preparation	17	100%	*"It allows the team to do feedbacking on how to improve teacher preparation and instructional practices."* (CT13)
	Enhances lesson quality	17	100%	*"It fosters collaboration among educators and student-teachers, promotes an innovative lesson design."* (CT16)
	Promotes teamwork	11	65%	*"The CLP allows teachers to engage in worthwhile sharing of knowledge, skills, and best practices."* (CT9)
Weaknesses	Time constraints	5	29%	*"One of the biggest challenges is the limited time to make revisions in the lesson based on what is observed."* (CT9)
	Limited autonomy	6	35%	*"Instructional and decision-making autonomy cannot be avoided."* (CT2)
	Conflicting ideas	2	12%	*"Conflicting ideas lead to disagreements, which hinder planning processes."* (CT4)
Opportunities	Professional growth	16	94%	*"CLP provides opportunities for professional growth and learning from each other's methods, strategies, and resources."* (CT4)
	Reflective practice	14	82%	*"Encourages professional teachers to reflect on their instructional practices."* (CT13)
	Addressing misconceptions	12	71%	*"Settling of misconceptions can be addressed directly and able to come up with an effective lesson plan."* (CT5)
Threats	Fixed mindset	3	18%	*"Resistance to change."* (CT8)
	Unequal involvement	4	24%	*"CLP has threats, such as loss of individual autonomy and unequal participation"* (CT17)

Note: CT = cooperating teacher

4.4.1 Theme 1: Strengths

CLP was widely recognized by evaluators for its substantial positive impact on teaching practices. All 17 evaluators (100%) unanimously agreed that CLP significantly enhances teacher preparation and instructional quality by facilitating peer feedback, fostering collaboration, and generating innovative lesson plans that lead to more effective learning outcomes. These outcomes resonate strongly with the principles of social constructivism, which posits that knowledge is co-constructed through social interaction and shared experiences. Within the CLP framework, teachers engage in dialogic processes where meaning is negotiated and instructional strategies are shaped collectively, rather than in isolation. This collaborative environment not only refines pedagogical content knowledge but also supports reflective practice and mutual learning, critical tenets of Vygotsky's theory.

Moreover, 65% of the evaluators highlighted the role of CLP in promoting teamwork, emphasizing its capacity to encourage the exchange of knowledge, skills, and best practices among educators. This aligns with the social constructivist view that learning is embedded in cultural and interpersonal contexts. Through collaborative planning, teachers become part of a CoP, where their professional growth is mediated by shared discourse, joint problem-solving, and the co-creation of teaching materials. Such social interactions serve as a form of scaffolding, not only enhancing individual competencies but also elevating the collective instructional capacity of the group.

These findings are consistent with Drouillard (2025), who indicated that collaborative planning is the best practice that enables teachers to share strategies and resources through a sense of shared responsibility, ultimately improving instruction and student performance.The results further demonstrate that CLP fosters a collaborative professional environment that enhances lesson quality. This finding aligns with previous studies showing that collaboratively developed lesson plans often lead to more innovative instructional approaches (Canalita et al., 2019). Specifically, Alrwaished (2024) emphasized the value of structured peer collaboration among preservice teachers in promoting reflective practice and the co-construction of pedagogical content, ultimately improving the coherence and creativity of lesson delivery.

Similarly, Ariffa and Mohammed (2024) highlighted how team-based lesson planning in teacher preparation programs strengthens instructional design skills and supports the integration of student-centered strategies, particularly in science education. Moreover, Nahar and Machado (2025) found that students achieve better learning outcomes when taught by effective teachers by employing sound instructional strategies that, in this case, are collaboratively developed and refined through socially grounded practices.

The shared responsibility inherent in CLP fosters increased confidence in collective outcomes, as noted by Zottoli-Lee (2024). Working together allows educators to share knowledge, enhance lessons, and develop their skills

(Vathanavong et al., 2024), reinforcing the value of CLP as both a professional development tool and a means of improving instructional practice.

4.4.2 Theme 2: Weaknesses

Despite its notable strengths, the CTs also indicated that CLP presents certain limitations that may impede its effective implementation. Approximately one-third of the evaluators (35%) cited limited autonomy as a challenge, noting that some teachers prefer to pursue individual instructional goals and may find it difficult to reconcile differing pedagogical perspectives within a group setting. Additionally, 29% of the evaluators highlighted time constraints as a barrier, expressing concerns about the limited time available for revising lesson plans based on peer observations. This concern is consistent with the findings of Shingphachanh (2018), who identified the difficulty of coordinating common meeting times as a significant obstacle to collaborative planning. A smaller proportion (12%) pointed to the potential for conflicting ideas to disrupt the planning process, indicating that effective facilitation is essential to manage group dynamics and ensure productive collaboration.

4.4.3 Theme 3: Opportunities

CLP offers substantial opportunities for professional development. A large majority of evaluators (94%) recognized its potential to enhance professional growth by enabling the sharing of instructional strategies and resources. This finding aligns with Almahdi (2025), who recommended that Libyan teachers engage in continuous professional development to improve their instructional practices. Furthermore, 82% of evaluators emphasized the role of CLP in fostering reflective practice, which encourages educators to critically assess and refine their teaching methods. As noted by Norwich et al. (2025), this reflective process is one of the strengths of the lesson study done by primary and secondary teachers in the University of Exeter, Exeter, UK which contributes to improving the overall quality of education. Through ongoing reflection, teachers are better equipped to enhance their instructional approaches and design more effective learning experiences.

Moreover, 71% of evaluators identified CLP as an effective means of addressing student misconceptions, as it enables collaborative clarification of concepts and refinement of lesson plans. This aspect of the CLP model—providing structured, peer-supported opportunities for guided instruction—mirrors findings by Neuhoff (2022), who reported that lesson study helps teachers detect and respond to students' misunderstandings. Collectively, these findings suggest that CLP enhances both teaching practice and student learning outcomes, as noted by Herlanti et al. (2025).

However, while these benefits are compelling, alternative interpretations must be considered. It is possible that the observed improvements in teaching and learning outcomes stem not solely from the CLP model itself but from individual teacher competence. For example, more proactive, experienced, or intrinsically motivated teachers may be more likely to engage meaningfully in CLP, thereby skewing perceptions of its effectiveness. In such cases, the positive outcomes may reflect the qualities of the participating individuals rather than the collaborative process

per se. Additionally, selection bias may play a role if evaluators base their judgments on particularly successful implementations of CLP, overlooking less effective or poorly facilitated scenarios. Furthermore, the development of reflective practice and instructional improvement might also occur in other forms of professional development not involving collaboration, such as mentoring or self-directed inquiry. Therefore, while the data suggest that CLP is a promising mechanism for teacher development and improved instructional quality, these outcomes may also be partially attributed to contextual factors, such as school culture, leadership support, and individual teacher competence. A more nuanced evaluation should consider how these variables interact with the CLP model to produce the reported outcome.

4.4.4 Theme 4: Potential threats

While CLP has clear benefits, it also faces potential threats that could limit its effectiveness. Some CTs (18%) reported issues with a fixed mindset, indicating that resistance to change can hinder the adoption of collaborative approaches. This fixed mindset makes them believe that their current methods are unchangeable, prioritizing tasks such as paperwork over collaboration. This issue of teacher hesitancy aligns with Tan-Chia et al. (2013), who found that a key factor in success is teachers' willingness to implement the approach. Additionally, 24% cited unequal involvement, pointing to issues such as inconsistent participation and perceived loss of autonomy. This second threat has something to do with dependency—relying too much on group members. Experts predicted that some members might contribute less, with preservice teachers hesitating to speak up or CTs dominating discussions. One teacher also noted that student teachers might become too dependent on their mentors.

> *"There is a risk that team members are not equally involved. Some teachers dominate discussion, while others remain passive. Preservice teachers may find it awkward or difficult to identify areas for improvement and make necessary adjustments, especially if the ideas that need improvement come from the in-service teachers."* (CT5)

CT5 highlighted that dependency in CLP can create imbalance and limit growth. When some teachers dominate discussions, others stay passive, making preservice teachers hesitant to share ideas. This reliance on experienced teachers can prevent them from developing independent teaching styles and creativity. This issue is similar to the findings by Le et al. (2018) on groupwork, where some members contributed more while others did little or nothing (free riders). To fix this, CLP should promote equal involvement by setting clear roles, encouraging participation, and fostering open communication so all members feel comfortable sharing ideas.

The findings highlight the practical value of integrating CLP into science teacher education policy, particularly during teaching internships. Given its demonstrated impact on enhancing instructional quality, fostering reflective practice, and building a professional learning community, CLP should be institutionalized as a structured component of internship programs. Science education policies can mandate dedicated time for collaborative planning between preservice and cooperating teachers, supported by school leaders and

mentors trained in facilitation. By embedding CLP in policy frameworks, teacher education institutions can ensure that preservice science teachers are not only guided in content delivery but also immersed in collaborative, socially grounded practices that strengthen pedagogical content knowledge, promote professional growth, and ultimately improve student learning outcomes.

5. Conclusion

The CLP model offers a structured, research-informed approach to enhancing professional development by fostering collaboration, reflective practice, and mentorship among preservice and in-service teachers. Aligned with social constructivist principles, the model emphasizes the co-construction of knowledge and the development of a shared professional identity within a supportive CoP. Through its emphasis on dialogue, feedback, and joint problem-solving, CLP empowers teachers to move beyond isolated lesson delivery toward more thoughtful, evidence-based pedagogy.

Importantly, the CLP model contributes to broader educational goals. It supports the achievement of Sustainable Development Goals (SDGs) by improving the quality of education (SDG 4), advancing inclusive teaching practices (SDG 10), and reinforcing educational partnerships (SDG 17). For teacher education programs, CLP provides a scalable and practical framework for embedding collaborative planning, peer learning, and reflective inquiry into internships and practicum experiences, thereby narrowing the gap between theory and practice.

Future research should explore the model's adaptability across various disciplines and educational contexts, its longitudinal impact on both teaching efficacy and student outcomes, and effective strategies for integrating CLP into institutional practices without increasing teacher workload. As educational systems seek sustainable models for professional learning and school improvement, CLP stands out as a promising innovation. Its potential to transform teacher collaboration from a peripheral activity into a central pillar of professional growth underscores its relevance and urgency in 21st-century teacher education.

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